R/3 System

Product Costing

Made Easy

For R/3™ Releases 3.x-4.x

Typical Costing Scenarios for Various R/3 Manufacturing Processes

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R/3 Simplification Group

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Chapter 1: Introduction

Contents

This guide is designed to help you to understand how the SAP product costing module can be used to collect and allocate costs in your manufacturing environment. It explains what you need to know to perform these tasks and helps you to assess the most appropriate costing method for your situation.

About this Guide

The SAP product costing module is a good example of the integrated nature of the R/3 System. Information is extracted from many modules including:

- Financial (FI)
- Controlling (CO)
- Material Master (MM)
- Production Planning (PP)
- Sales and Distribution (SD)
- Project Systems (PS)

It is precisely these integration aspects that combine to create a highly functional, albeit complex, tool. The most common issue arising from product costing is the lack of knowledge of these integration steps. Typically, SAP consultants focus on specific modules and may not be aware of how their decisions impact the other modules. It is the cross-modular aspect of product costing that this guide addresses. This guidebook is applicable from Release 3.1 onwards, except for chapter 4—the make-to-order strategy with valuated stock—which is available in Release 4.0:

- Various "typical" scenarios for different manufacturing environments
- A graphical overview of the production process

  Each step in the process is described and helps you track the flow through the various PP, MM, and SD transactions.

- The T-accounts used in the Pre-Configured Client (PCC)

  In addition, a method of reconciling the general ledger (G/L) accounts with the CO objects used is also explained. This method helps you follow each example on your own system and get practical experience. If you do not use the R/3 Simplification Group's PCC, you will probably have to adjust the data.

Also included are special topics for information on issues related to product costing that impact all the scenarios and enable an inexperienced R/3 System user to understand how issues are handled.

All consultants must be aware of the particular scenario that your firm has chosen. Many times it is at the first period end closing that a customer realizes the implications of the decisions made during the

implementation, a point which is too late. Make sure that everyone agrees on the scenario, that test scripts accurately reflect this scenario, and that sufficient testing is done. We focus on the direct, controllable costs that are incurred during the production process and how the product costing module allocates and collects these costs.

In addition, the indirect costs associated with the product's cost are also tracked, which may include costs that are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to a production order

Although this guidebook is not country-specific, the following differences exist between SAP's product costing process and most U.S. legacy systems:

- In R/3, inventory does not flow through cost centers.

  Rather than tracking inventory, the cost centers track total available labor and machine costs and indirect production expenses. Instead of cost centers, the cost objects used in the manufacturing scenario capture the product's total cost. These cost objects can be production orders, production cost collectors (CO production orders), sales order items, or project master data such as WBS elements and networks.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet.

  Production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. In the R/3 System, using CO, the production costs associated with the manufacturing cost objects are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account. This aspect is often the most difficult of the R/3 System's product costing module to understand, so SAP recommends the reader examine the first scenario in depth to understand this process.

- In the R/3 System, scrap of a finished product is handled using normal variance categories in the R/3 System.

  Scrap of components is handled as a normal variance. In R/3, scrap of a finished product is treated as a variance category. Assuming that the finished product is valued using standard cost, the standard cost multiplied by the number of units scrapped is included in the variance calculation and offsets other variances incurred on the cost object. Unless a manual change is made to the settlement rule of the cost object, this variance is also settled to the production variance account. Scrap of material components that were issued to the cost object are treated as a normal variance (usually a quantity variance) since additional material components need to be issued to complete the manufacturing of the finished product.

Who Is this Guide For?

This guide is for the following people who are impacted by product costing decisions in an implementation project:

- Consultants and business analysts inexperienced with the R/3 System
- Consultants experienced with the R/3 System

- Customer personnel from the Manufacturing and Finance departments

How to Use this Guide

Based on our experience and feedback from internal and external consultants and customers, each chapter is a "typical" scenario for various manufacturing environments. These scenarios are purely examples of how one could use the R/3 functionality; there is no "right" or "wrong" way. However, the scenarios could be described as good business practices, offering sufficient functions without being too cumbersome to maintain and operate on a daily basis.

Chapter 2: Product Costing Flow for Discrete Manufacturing Without Profitability Analysis

Contents

The following graphic provides an overview of the process:

This chapter describes the accounting logic associated with the R/3 System's discrete production process, using production orders and valuing the finished product in inventory using a standard cost. In this process, the following items are documented:

- Production flow with production orders

- Associated T-accounts

- Reconciliation of the T-accounts

The current example does not use profitability analysis (CO-PA). The production order is the focus of the direct, controllable costs that are incurred during the discrete production process. These costs may be incurred during the production of a finished product or a semi-finished product.

The indirect costs associated with the product's cost are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to a production order

The differences between SAP's product costing process and most U.S. legacy systems are that:

- In R/3, inventory does not flow through cost centers.

  Rather than tracking inventory, the cost centers track total available labor and machine costs and indirect production expenses. Instead of cost centers, our production orders capture the product's total cost.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet.

  Production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. In R/3, using the Controlling (CO) module, the production costs associated with an order are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account.

- In the R/3 System, scrap is treated as variance.

  The scrapped material's cost is posted to the production variance (price difference) account. The scrapped product's cost is based on the standard cost of that product and is reported as a variance category. Scrap will be discussed in a separate section after the initial example of production order processing.

On the following pages, each step in the process is described, followed by the T-accounts used in the Pre-Configured Client. A method of reconciling the general ledger (G/L accounts with the CO objects used in discrete production is also explained.

TechTalk

> The numbering scheme was developed to allow additional processing for product costing using different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Production Orders

Overview

Each step in the discrete production process is described on the next page. Product costing is closely tied to production. The financial and costing entries automatically result from the daily production transactions entered into the system. The month-end processes are necessary to complete the financial picture for product costing. In the following example, we assume that the production order remains open for two periods. In each period, the following process is followed:

1. Costs are posted to the cost centers.

2. Material is issued to the production order.

3. Resources (activities) are provided from the production cost center to the order.

4. The month-end process is executed for production orders and cost centers.

This business process may not reflect every manufacturing scenario. For example, in many industries all component materials are issued to the production order up-front and not across periods. There may also be

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differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, others are manufacturing overhead (indirect) costs (steps A-1 to A-3 are examples of these postings). In this example, the cost center design uses separate cost centers for the direct production costs and for each type of manufacturing overhead cost. The cost center design is flexible, but other options are not discussed at this time.

The following is a list of the types of possible postings:

1. Posting of costs to service or administrative cost centers

    At a plant-wide level, costs such as utilities, rent, and certain services must be considered during the production process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products that are produced, but the overall indirect costs and their variances (over and under absorption to products) are not managed at the production order level. In this cost center design, the utilities and services are managed at a cost center level, but these cost centers allocate their costs to the manufacturing overhead pools.

    In this example, actual salaries are posted to a utility cost center in both periods. Salaries are a direct cost for the utility cost center, but an indirect cost for the overall production process. Other costs, such as maintenance, repair, and operations (MRO) materials; and supplies may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

2. Allocating from service and administrative cost centers to manufacturing overhead pools

    Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers will allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this example, the expenses incurred by the utility cost center are evenly allocated to all manufacturing overhead pool cost centers.

3. Posting costs to the production cost center

    Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center will later supply resources, such as labor and machine time, to the production order. The cost center manager will determine a rate for each of these resources, represented by system activities, which are often managed in hours. The hourly rate may be manually entered by the cost center manager, or be calculated by the system based on the planned expenses and planned hours available in the cost center.

Step B: Raw Material Is Issued from Inventory to the Production Order

Raw material is issued to the production order from inventory. The quantity of finished goods to be produced with the bill of materials used in the order defines the quantity of raw materials that will be issued. The raw materials may be manually updated to reflect actual usage. In this example, raw materials are issued to the production order at their moving average cost.

The raw materials may be issued to the production order in one of the following ways:

- As a manual goods issue

- With backflushing

- Automatically when the first operation is confirmed, if materials are allocated to the operation

In this example, all required components are issued to the production order at the beginning of period 1, and additional raw material components are issued at the beginning of period 2. This process may regularly occur in some industries, but in others only if there is a problem with the quality of a previously issued component.

Series C: Activities Are Allocated from the Production Cost Center to the Production Order

The production cost center supplies value-added resources, such as labor and machine time to the production order. These resources are represented by system activities, such as labor hours and machine hours, and each activity has a planned rate. The resources (activities) used to produce the finished goods are posted to the production order. The quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed, which is based on the quantity of finished goods to be produced by the production order and the routing used in this order.

For this production order, because confirmation occurs manually at the operation level (and not through backflushing), the standard number of hours that default from each operation in the routing can be updated to reflect actual hours. This example assumes that setup time is posted to the production order for period 1, but no additional setup is required in period 2. Setup time is assumed to be labor time. Labor and machine times are posted to the production order for both open periods.

To allocate these resources (or activities), you must:

1. Allocate setup labor hours from the production cost center to the production order

   The standard setup time is developed for a lot size, so it is spread over the entire quantity of finished products that are manufactured with the production order. If there are lot size fluctuations, according to the lot size used to develop the standard cost, the standard setup time still does not change. We assume that setup is unrelated to the lot size. In this example, setup time is assumed to be labor hours.

2. Allocate labor hours from the production cost center to the production order

   The standard number of labor hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units produced in the production order.

3. Allocate machine hours from the production cost center to the production order

   The standard number of machine hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units that are produced in the production order.

Step E: Finished Goods Are Received into Inventory from the Production Order

The produced finished goods are entered as a goods receipt from the production order into inventory. The inventory value is updated with the actual quantity produced, multiplied by its standard cost. This goods receipt automatically posts the financial and material documents. In this example, the finished good is valued at standard. Receiving the product into inventory at a moving average cost is possible, but is not discussed in this chapter.

An automatic goods receipt is also possible when the final operation is confirmed. If a production order has been created for more than one unit of the finished good, a goods receipt for a portion of the quantity may be processed. In this example, once the entire production order has been completed, the goods receipt is only posted at the end of period 2.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Production Order

Overhead is applied to the production order, thereby posting additional costs to the production order. This cost is a percentage of the direct costs that have already been posted to the production order during the period. If this step is run many times during the same period, only the overhead difference from the previous run is applied to the production order. The costing sheet that is associated with the production order stores the rules for applying these overhead costs. It is possible to apply an overhead rate based on the quantity of material components that were issued to the production order; this technique is not used in this scenario. Although the overhead design is flexible, and may involve the use of internal orders, the other options are not discussed at this time.

In this example, separate overhead cost centers and separate overhead rates are used for each type of overhead being applied to the production order. The following four manufacturing overhead pool cost centers are used to apply these different overhead types to the production order:

- Material overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the order during the period.

- Machine overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the production order during the period.

- Labor overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as those for the human resources and accounting departments, that are related to production workers. The overhead percentage rate is based on the cost of the labor time that was confirmed for the production order during the period. Based on the assumptions in this scenario, this rate includes setup and normal labor time.

- Administrative overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with the production order that are related to all costs on the production order. The overhead percentage rate is based on all costs posted to the production order during the period.

Series G: Work in Process for the Production Order

In the R/3 System, since the production order costs are tracked on the P&L statement, the balance of all open production orders must be moved to the balance sheet at period-end. This movement ensures that the

materials issued to the production order remain in inventory and are not written off before production is complete. If the open order balance is positive, the P&L is credited and the balance sheet is debited. If this balance is negative, the P&L is debited and the balance sheet is credited.

When displaying production order costs, the WIP posting to the G/L is not displayed. This impact is purely a financial transaction, which does not affect the normal production process or the order balances in a production order. If a production order is open, the balance of the order (costs debited minus standard cost of completed finished goods credited) is calculated to be the WIP amount. Separate cost elements, called results analysis (RA) cost elements, track the WIP amounts so that these amounts are not directly posted to the production order. The RA cost elements are then used to make the entry to the G/L, but not directly to the production order.

If a production order remains open for several periods, the WIP balance is recalculated for each period, and the adjustments are posted to the G/L. Once a production order, which was opened in a previous period is closed, any WIP that was previously moved to the balance sheet is reversed. If a production order is opened and closed in the same period, the WIP process may be run, but no postings are made. The WIP amount is posted to the G/L during the production order settlement.

In this example, the P&L account is a single offsetting account for all postings to the order; this account is not a cost element, so no direct postings to the production order take place. The calculated WIP amount is stored in RA cost elements, which refer to the originating order. The components of the WIP balance are analyzed using these RA cost elements:

- Calculate WIP (posted at settlement)

  When the WIP process is run, WIP is calculated for production orders with a status of Released (REL). In this example, the production order remains open at the end of period 1.

- Cancel WIP (posted at settlement)

  When the WIP process is run, WIP is canceled for production orders with a status of:
  - Finally delivered (DLV)
  - Technically complete (TECO

In this example, WIP is canceled because the production order is closed at the end of period 2. The WIP calculated and posted to the balance sheet at the end of period 1 is canceled.

Series S: Post Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the production cost center's resources. These variances can be cleared by manually posting a financial entry. The side of the journal entry that clears the cost center entry uses a G/L account (also a cost element). The other side of the journal entry uses a G/L account that is not a cost element.

In this example, the cost center variances are manually cleared at the end of each period. The same G/L accounts are used to clear all manufacturing overhead cost centers, and separate accounts are used for the production cost center. These accounts are also different from the accounts used later to close the production order:

- Post manufacturing overhead variances for material overhead

  The manufacturing overhead cost center, which collects indirect costs related to materials, is manually cleared to a zero balance.

- Post manufacturing overhead variances for machine overhead

  The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is manually cleared to a zero balance.

- Post manufacturing overhead variances for labor overhead

  The manufacturing overhead cost center, which collects indirect costs related to the production workers, is manually cleared to a zero balance.

- Post manufacturing overhead variances for administrative overhead

  The manufacturing overhead cost center, which collects indirect costs related to all costs on the production order, is manually cleared to a zero balance.

- Post production cost center variances

  The production cost center, which collects direct costs related to production resources, is manually cleared to a zero balance.

Step T: Calculate Production Order Variances (Posted at Settlement)

Variances are calculated on production orders, so that the difference between the standard cost of the finished product and the actual costs incurred on the production order can be classified and analyzed. The variances calculated determine the reason for the variances, such as a difference in the actual versus planned quantity of materials or resource hours, or a substitution of component materials. Variances are only calculated and stored on a production order when the order's status indicates that it is DLV or TECO.

Variances are posted to the G/L during order settlement. The production order is credited if the variance is unfavorable (positive balance) and debited if the variance is favorable (negative balance). The posting to the P&L statement is based on the product's valuation class in the material master, which determines the G/L accounts that will be used in the journal entry.

In this example, a P&L account, different from the one used to credit the production order for the receipt of finished goods into inventory, is used to post the variance at standard. By doing so, the production order variances can be easily reported in both product costing reports and in the P&L statement. Variances are calculated at the end of period 2, when the entire production order has been completed.

End Period: Run Settlement of Production Orders (Posts G-1, G-2, T)

The WIP and variance processes previously described update secondary cost elements, but these values remain in CO. When a production order settlement is run at the end of each period, the WIP and variance values are posted to the Financial (FI) module, and the appropriate G/L accounts are updated.

Summary of the Sample Scenario

The graphic on the first page illustrates steps A to T. The T-accounts reflect the postings made during the discrete manufacturing process, using:

- One utilities cost center

- Four manufacturing overhead cost centers

- One production cost center

- One production order

Postings were made for two periods. We assumed that the production order was open at the end of the first period, and that no finished products were received into inventory. This assumption means that WIP was calculated and posted when the production order was settled. Since the order remained open, variances were not posted. We also assumed that the production order was closed at the end of the second period, meaning that the finished product was received into inventory. This assumption means that WIP was canceled and posted during settlement. Variances were also calculated and then posted during settlement in the second period.

The steps illustrated by the T-accounts include:

- Period 1: A – B – C – F – G1 – Settlement – S
- Period 2: A – B – C – E – F – G2 – T – Settlement – S

T-Accounts: FI G/L Accounts

BALANCE SHEET

	Raw Mat'l Inv. 131000			Fin Gds Inv. 134000			A/P 211000			WIP Inventory 138000	
Period 1	B	120				A-1 A-3	800 1000		G-1	390	
Period 2	B	50	E	500		A-1 A-3	800 1000		G-2		390

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

	Salary Exp 610000			ProdCCtr Offset 519600			ProdCCtr Vars 532000*			OHCCtr Offset 519700			OHCCtr Vars 533000*	
Period 1	A-1 A-3	800 1000		S-5	880		S-5	880		S-1 S-2 S-3 S-4	170 155 185 140		S-1 S-2 S-3 S-4	170 155 185 140
Period 2	A-1 A-3	800 1000		S-5	880		S-5	880		S-1 S-2 S-3 S-4	187.5 155 185 157.5		S-1 S-2 S-3 S-4	187.5 155 185 157.5

	Raw Mat'l Consum 510000			Mfg Output - Std 519000			Mfg. Output - Var 519500			Production Variance 531000*			WIP Offset 511000*	
Period 1	B	120										G-1		390
Period 2	B	50	E		500	T		175	T	175		G-2	390	

* Cost elements are not created for WIP, production variance (price difference), and cost center variance accounts.

T-Accounts: CO Secondary Cost Elements

CO - SECONDARY COST ELEMENTS

Utilities Assessment 810000

	Debit	Credit
Period 1	A-2 800	
	A-2	800
Period 2	A-2 800	
	A-2	800

Setup Hours 802000

	Debit	Credit
Period 1	C-1 20	
	C-1	20
Period 2		

Labor Hours 801000

	Debit	Credit
Period 1	C-2 40	
	C-2	40
Period 2	C-2 60	
	C-2	60

Machine Hours 800000

	Debit	Credit
Period 1	C-3 60	
	C-3	60
Period 2	C-3 60	
	C-3	60

Material OH 840000

	Debit	Credit
Period 1	F-1 30	
	F-1	30
Period 2	F-1 12.5	
	F-1	12.5

Machine OH 841000

	Debit	Credit
Period 1	F-2 45	
	F-2	45
Period 2	F-2 45	
	F-2	45

Labor OH 842000

	Debit	Credit
Period 1	F-3 15	
	F-3	15
Period 2	F-3 15	
	F-3	15

Admin OH 843000

	Debit	Credit
Period 1	F-4 60	
	F-4	60
Period 2	F-4 42.5	
	F-4	42.5

RA - Valuated 820000

	Debit	Credit
Period 1	G-1 390	
Period 2	G-2	390

RA - Calculated 821000

	Debit	Credit
Period 1	G-1	
Period 2	G-2	

RA - Material 822000

	Debit	Credit
Period 1	G-1	120
Period 2	G-2 120	

RA - Machine 823000

	Debit	Credit
Period 1	G-1	60
Period 2	G-2 60	

RA - Labor 824000

	Debit	Credit
Period 1	G-1	40
Period 2	G-2 40	

RA - Setup 825000

	Debit	Credit
Period 1	G-1	20
Period 2	G-2 20	

RA - OH Material 826000

	Debit	Credit
Period 1	G-1	30
Period 2	G-2 30	

RA - OH Machine 827000

	Debit	Credit
Period 1	G-1	45
Period 2	G-2 45	

RA - OH Labor 828000

	Debit	Credit
Period 1	G-1	15
Period 2	G-2 15	

RA - OH Admin 829000

	Debit	Credit
Period 1	G-1	60
Period 2	G-2 60	

- RA cost elements are updated based on the cost elements that are posted to the production order.

- The "RA – Valuated" cost element tracks all debits to the production order (costs posted during production), while the "RA – Calculated" cost element tracks all credits to the production order (standard cost of product received into inventory). Together, the valuated and calculated cost elements reflect the amount that will be posted to the balance sheet WIP account during order settlement. In this example, no finished product was received at the end of period 1, so there is no value in the calculated RA cost element.

- All other RA cost elements reflect the amount that will be posted to the P&L WIP offset account during order settlement. These RA cost elements were set up to track the detail of the type of costs posted to WIP, so that material, labor, overhead, and so on can be differentiated in reporting. For each period, all

debits to the production order are offset as credits to these accounts, and all credits to the production order are offset as debits to these accounts.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

Period 1

	Utilities CCtr 90100			Mat'l OH CCtr 30250			Mach OH CCtr 30260			Labor OH CCtr 30270			Mfg Admin OH CCtr 30280	
A-1	800		A-2	200		A-2	200		A-2	200		A-2	200	
A-2		800	F-1		30	F-2		45	F-3		15	F-4		60
			S-1		170	S-2		155	S-3		185	S-4		140

Period 2

	Utilities CCtr 90100			Mat'l OH CCtr 30250			Mach OH CCtr 30260			Labor OH CCtr 30270			Mfg Admin OH CCtr 30280	
A-1	800		A-2	200		A-2	200		A-2	200		A-2	200	
A-2		800	F-1		12.5	F-2		45	F-3		15	F-4		42.5
			S-1		187.5	S-2		155	S-3		185	S-4		157.5

Production CCtr 30100

Period 1

	Debit	Credit
A-3	1000	
C-1		20
C-2		40
C-3		60
S-5		880

Period 2

	Debit	Credit
A-3	1000	
C-2		60
C-3		60
S-5		880

Production Order xxxxxxxxx

Period 1

	Debit	Credit	
B	120		Raw material
C-1	20		Set-up hours
C-2	40		Labor hours
C-3	60		Machine hours
F-1	30		Material OH
F-2	45		Machine OH
F-3	15		Labor OH
F-4	60		Admin OH

Period 2

	Debit	Credit	
B	50		Raw material
C-2	60		Labor hours
C-3	60		Machine hours
E		500	Receive fin goods
F-1	12.5		Material OH
F-2	45		Machine OH
F-3	15		Labor OH
F-4	42.5		Admin OH
T		175	Settle variances

Variances: ProdOrd Costs vs. Std.

E	Standard Cost		T	Prod. Ord. Variances	
Material	120		Qty - Matl	50	
Setup	20		Qty - Set	0	
Labor	60		Qty - Lab	40	
Machine	100		Qty - Mch	20	
OH Mat	30	25%	Inpt - Matl	12.5	
OH Mach	75	75%	Inpt - Mch	15	
OH Labor	20	25%	Inpt - Lab	10	
OH Admin	75	25%	Inpt - Adm	27.5	
Total Std	500		Total Vars	175	

Labor OH is based on setup and labor hours.

Variance categories are determined based on the cost elements that make up the standard cost of the product.

FI/CO Reconciliation

FI

FI includes both balance sheet and P&L accounts. Only the P&L accounts can be created as cost elements and posted to both FI and CO. Cost elements determine for which accounts additional details should be tracked with controlling objects such as production orders and cost centers.

Of the accounts in this example, only the following are not created as cost elements in CO:

- The WIP offset account (511000)

- The production variance (price difference) account (531000)

- The cost center variance accounts (532000, 533000)

During the production process, the WIP account is used as a placeholder to move the production costs to the balance sheet. At the end of the production process, the variance accounts contain the net impact on the P&L.

CO

Production costs that flow through a production order, not through a cost center, include:

- Material costs that are directly posted to the production order

- Labor and machine time posted from the production cost center to the production order

- Overhead allocations from the manufacturing pool cost centers

In FI, direct postings made to the service and production cost centers are reflected, but the activity allocation and the overhead applied from the cost centers to the production orders are indirectly reflected. The allocations are reassigning costs originally posted to other expense accounts in the G/L, such as salary accounts. Reconciliation is necessary because the material's standard cost includes the activity rates and the overhead allocations when both the production order and the G/L are credited for this material.

To reconcile the postings that occur during the production process, the original accounts that contain the expense postings to the production and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original postings to FI and CO are included during the reconciliation of the production process, there is no net impact on the P&L other than the written-off variances.

Reconciliation

Due to the nature of the FI/CO functions, where not all CO transactions (such as hourly rates and overhead allocations) are reflected in FI accounts, a reconciliation process must take place. This reconciliation ensures that FI and CO remain balanced for reporting.

The goals of this reconciliation are to determine whether the:

- FI accounts are in balance with the CO postings
  The production process managed by the production order should have a net zero impact on the P&L. The only impact should be on the written-off production order and cost center variance accounts.

- Variances in the CO objects are reflected in the FI variance accounts
  Before the controlling objects are cleared with the production order settlement and the manual clearing of the cost centers, a balance existed on these controlling objects. For analysis, the CO balances must be identical to the balance in FI's variance accounts.

Reconciliation Procedure

All debits and credits to the P&L accounts in the production process are accumulated. The production variance (price difference) and cost center variance accounts are excluded, because they represent a reclassification of the written-off variances. All other accounts zero out for a net zero impact on the P&L. The variance accounts represent the only P&L impact. Also, the variances on the controlling objects equal the variances in the G/L accounts.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process	DR	CR		CO	DR	CR		CO Variances CR to FI	FI Variance Accts
Salary Exp	1800			Util CCtr	800	800			
Raw Mat'l	120			Matl OH CCtr	200	30		170	OH CCtr Var
Mfg CCtr Offset		880		Mach OH CCtr	200	45		155	OH CCtr Var
OH CCtr Offset		650		Labor OH CCtr	200	15		185	OH CCtr Var
MfgOut-Std				Admin OH CCtr	200	60		140	OH CCtr Var
MfgOut-Var				ProdCCtr	1000	120		880	Prod CCtr Var
WIP Offset		390		Prod Ord					Prod Ord Var
	1920	1920		Subtotal	2600	1070		1530	
		0		DR/CR bal for CO		0			

Period 2

FI/Production Process	DR	CR		CO	DR	CR		CO Variances CR to FI	FI Variance Accts
Salary Exp	1800			Util CCtr	800	800			
Raw Mat'l	50			Matl OH CCtr	200	12.5		187.5	OH CCtr Var
Mfg CCtr Offset		880		Mach OH CCtr	200	45		155	OH CCtr Var
OH CCtr Offset		685		Labor OH CCtr	200	15		185	OH CCtr Var
MfgOut-Std		500		Admin OH CCtr	200	42.5		157.5	OH CCtr Var
MfgOut-Var		175		ProdCCtr	1000	120		880	Prod CCtr Var
WIP Offset	390			Prod Ord	675	500		175	Prod Ord Var
	2240	2240		Subtotal	3275	1535		1740	
		0		DR/CR bal for CO		0			

Conclusions:

- There is a net impact of zero on the production process for the production order.

  Only variances have a P&L impact.

- The variances on the controlling objects are depicted in the CO section prior to the clearing of these variances to the P&L.

- The variances on the controlling objects are the same as the variances in the G/L accounts.

  To report on these in CO, the settlement cost elements should not be included in reporting.

- All production order costs, regardless of the period in which they were posted, are only considered at the time that the order is settled.

  Production order costs that were posted in period 1 are handled in FI with the WIP process.

Scrap

During the confirmation of a production order (steps C and D), if one of the finished goods is unusable, the piece may be scrapped. During this process, the system expects to only receive into inventory the remaining number of units (step E). For example, if a production order was created for two units, and one was scrapped, only one unit could then be received into inventory.

The cost of the scrapped unit is categorized as a variance category. The system uses the standard cost of the finished good, on the assumption that the finished good has already received the following items during the manufacturing process:

- Raw materials

- Labor and machine time

- Overhead

Using the finished good from the previous example, a production order is created for two products. Based on the setup costs, there is an expected variance of $30. However, one unit was scrapped. The following graphic displays the production order costs and how the variances would be categorized. In this case, no other variances are assumed.

The cost of the scrapped product is settled to the production variance (price difference) account. The scrap variance of $500 is offset by the setup variance of $30. The portion of the variance that is attributable to scrap is determined with reporting. In this example, the scrap variance is offset by the setup variance.

Scrap

	Actual Costs Two Units	Actual Costs One Unit Scrapped	Variance Categories	
Raw Material	240	240	Rusg - Stp	-20
Setup Time	20	20	Inpt - Lab	-5
Labor Time	120	120	Inpt - Adm	-5
Machine Time	200	200	Scrp - Mat	120
OH Material 25%	60	60	Scrp - Stp	20
OH Labor 25%	35	35	Scrp - Lab	60
OH Machine 75%	150	150	Scrp - Mch	100
OH Admin 25%	145	145	Scrp - OH Mt	30
			Scrp - OH L	20
Total	970	970	Scrp - OH M	75
			Scrp - OH Ad	75
Received into inventory	1000	500		
Variance	30	470	Total	470

Chapter 3: Product Costing Flow for Discrete Manufacturing with Profitability Analysis

Contents

Overview

The following graphic provides an overview of the process:
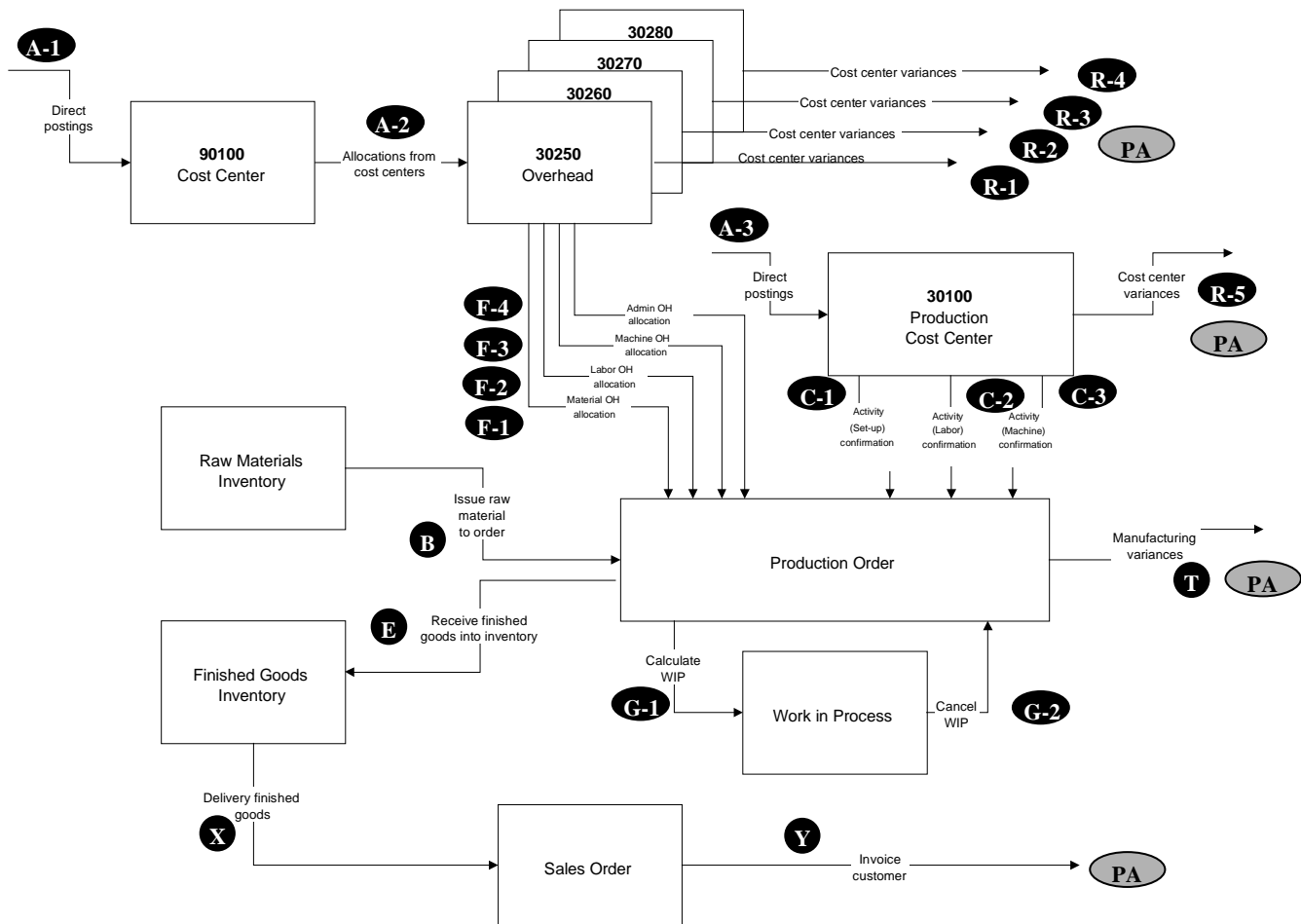
This chapter describes the accounting logic associated with SAP's discrete production process, using production orders and valuing the finished product in inventory with a standard cost. In this process, the following items are documented:

- Production flow with production orders

- Associated T-accounts

- Reconciliation of the T-accounts

The current example uses profitability analysis (CO-PA). The assumptions made during the configuration of CO-PA are discussed in a later section.

The production order is the focus of the direct, controllable costs incurred during the discrete production process. These costs may be incurred during the production of a finished product or a semi-finished product. The indirect costs associated with the product's cost are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to a production order

The differences between SAP's product costing process and most U.S. legacy systems are that:

- In R/3, inventory does not flow through cost centers

  Rather than tracking inventory, the cost centers track total available labor and machine costs and indirect production expenses. Instead of cost centers, our production orders capture the product's total cost.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet

  Production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. In R/3, using the Controlling (CO) module, the production costs associated with an order are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account.

On the following pages, each step in the process is described, followed by the T-accounts used in the Pre-Configured Client. A method of reconciling the general ledger (G/L) accounts with the CO objects used in discrete production is also explained.

TechTalk
The numbering scheme was developed to allow additional processing for product costing using different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Production Orders

Overview

Each step in the discrete production process is described on the next page. Product costing is closely tied to production. The financial and costing entries automatically result from the daily production transactions entered into the system. The month-end processes are necessary to complete the financial picture for product costing. In the following example, we assume that the production order remains open for two periods. In each period, the following process is followed:

1. Costs are posted to the cost centers

2. Material is issued to the production order

3. Resources (activities) are provided from the production cost center to the order

4. The month-end process is executed for production orders and cost centers

This business process may not reflect every manufacturing scenario. For example, in many industries all component materials are issued to the production order up-front and not across periods. There may also be differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, others are manufacturing overhead (indirect) costs (steps A-1 to A-3 are examples of these postings). In this chapter, the cost center design uses separate cost centers for the direct production costs and for each type of manufacturing overhead cost. The cost center design is flexible, but other options are not discussed at this time.

- Posting of costs to service or administrative cost centers

   At a plant-wide level, costs such as utilities and rent must be considered during the production process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products that are produced, but the overall indirect costs and their variances (over and under absorption to products) are not managed at the production order level. In this cost center design, the utilities and services are managed at a cost center level, but these cost centers allocate their costs to the manufacturing overhead pools. The manufacturing overhead pool cost centers, in turn, manage the variances of the indirect costs.

   In this example, actual salaries are posted to a utility cost center in both periods. This is a direct cost for the utility cost center, but an indirect cost for the overall production process. Other costs, such as maintenance, repair, and operations (MRO) materials and supplies may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

- Allocating from service and administrative cost centers to manufacturing overhead pools

   Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers will allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this example, the expenses incurred by the utility cost center are evenly allocated to all manufacturing overhead pool cost centers.

- Posting costs to the production cost center

   Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center will later supply resources, such as labor and machine time, to the production order. The cost center manager will determine a rate for each of these resources, represented by system activities, which are often managed in hours. The hourly rate may be manually entered by the cost center manager or be calculated by the system based on the planned expenses and planned hours available in the cost center.

Step B: Raw Material Is Issued from Inventory to the Production Order

From inventory, raw material is issued to the production order. The system bases the standard quantity of raw materials to be issued on the quantity of finished goods to be produced by the production order and the order's bill of material. The raw materials may be manually updated to reflect actual usage. In this example, raw materials are issued to the production order at their moving average cost.

The raw materials may be issued to the production order in one of the following ways:

- As a manual goods issue

- With backflushing

- Automatically when the first operation is confirmed, if materials are allocated to the operation

In this example, all required components are issued to the production order at the beginning of period 1, and additional raw material components are issued at the beginning of period 2. This process may regularly occur in some industries, and in other industries, only if there is a problem with the quality of a previously issued component.

Series C: Activities Are Allocated from the Production Cost Center to the Production Order

The production cost center supplies value-added resources, such as labor and machine time, to the production order. These resources are represented by system activities, such as labor hours and machine hours, and each activity has a planned rate. The resources (activities) used to produce the finished goods are posted to the production order. The quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed, which is based on the quantity of finished goods to be produced by the production order and the routing used in this order.

For this production order, because confirmation occurs manually at the operation level and not through backflushing, the standard number of hours that default from each operation in the routing can be updated to reflect actual hours. This example assumes that setup time is posted to the production order for period 1, but no additional setup is required in period 2. Setup time is assumed to be labor time. Labor and machine times are posted to the production order for both open periods.

The following list assumes that setup, labor, and machine times are posted to the production order for both open periods:

- Setup labor hours are allocated from the production cost center to the production order

  The standard setup time is developed for a lot size, so it is spread over the entire quantity of finished products that are manufactured with the production order. If there are lot size fluctuations, compared to the lot size used to develop the standard cost, the standard setup time still does not change. (We assume that setup is unrelated to the lot size.) In this example, setup time is assumed to be labor hours.

- Labor hours are allocated from the production cost center to the production order

  The standard number of labor hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units produced in the production order.

- Machine hours are allocated from the production cost center to the production order

  The standard number of machine hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units produced in the production order.

Step E: Finished Goods Are Received into Inventory from the Production Order

The produced finished goods are entered as a goods receipt from the production order into inventory. The inventory value is updated with the actual quantity produced multiplied by its standard cost. This goods receipt automatically posts the financial and material documents. In this example, the finished good is valued at standard. Receiving the product into inventory at a moving average cost is possible, but is not discussed in this chapter.

An automatic goods receipt is also possible when the final operation is confirmed. If a production order has been created for more than one unit of the finished good, a goods receipt for a portion of the quantity may be processed. In this example, once the entire production order has been completed, the goods receipt is only posted at the end of period 2.

Step X: Deliver Product to the Customer

Once production of a finished product has been completed and the product has been received into inventory, it can be delivered to a customer. At this time, the cost of sales is posted to the G/L. Since the finished product is valued at standard, the entry to cost of sales is for its standard value. There is no posting to cost-based CO-PA at this time.

Step Y: Invoice the Customer

In most cases, invoicing only occurs after the finished product has been shipped to the customer. At this time, the revenue is posted to the G/L and to CO-PA. The cost of sales has already been posted to the Financial module (FI) at the time of delivery, and it is posted to cost-based CO-PA with the invoice data so that the cost of the product is matched with the revenue.

In this example, the cost of sales is taken from the standard cost estimate of the finished product. The full detail of the cost components that make up the standard cost can be analyzed in CO-PA when a value field is configured, such as for the fixed and variable portion of each cost component. The cost components can also be combined into fewer value fields in CO-PA, or the value can be taken from the standard cost stored in the material master. Any characteristics that have been configured in CO-PA that are related to the sale, such as product number, product line, customer, customer group, and geographic region, are carried over for analysis.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Production Order

Overhead is applied to the production order, thereby posting additional costs to the production order. This cost is a percentage of the direct costs that have already been posted to the production order during the period. If this step is run many times during the same period, only the overhead difference from the previous run is applied to the production order. The costing sheet associated with the production order stores the rules for applying these overhead costs. It is possible to apply an overhead rate based on the quantity of material components that were issued to the production order; this technique is not used in this scenario. Although the overhead design is flexible, and may involve the use of internal orders, the other options are not discussed at this time.

In this example, separate overhead cost centers and separate overhead rates are used for each type of overhead being applied to the production order. The following four manufacturing overhead pool cost centers are used to apply these different overhead types to the production order:

- Material overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the order during the period.

- Machine overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the production order during the period.

- Labor overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as those for human resources and accounting departments, that are related to production workers. The overhead percentage rate is based on the cost of the labor time that was confirmed for the production order during the period. Based on the assumptions in this scenario, this rate includes setup and normal labor time.

- Administrative overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the production order. The overhead percentage rate is based on all costs posted to the production order during the period.

Series G: Work in Process for Production Orders

In the R/3 System, since the production order costs are tracked on the P&L statement, the balance of all open production orders must be moved to the balance sheet at period-end. This movement ensures that the materials issued to the production order remain in inventory and are not written off before production is complete. If the open order balance is positive, the P&L is credited and the balance sheet is debited. If this balance is negative, the P&L is debited and the balance sheet is credited.

When displaying production order costs, the WIP posting to the G/L is not displayed. This impact is purely a financial transaction and does not affect the normal production process or the order balances in a production order. If a production order is open, the balance of the order (costs debited minus standard cost of completed finished goods credited) is calculated to be the WIP amount. Separate cost elements, called results analysis (RA) cost elements, track the WIP amounts so that these amounts are not directly posted to the production order. The RA cost elements are then used to make the entry to the G/L, not directly to the production order.

If a production order remains open for several periods, the WIP balance is recalculated for each period, and the adjustments are posted to the G/L. Once a production order, which was opened in a previous period, is closed, any WIP that was previously moved to the balance sheet is reversed. If a production order is opened and closed in the same period, the WIP process may be run, but no postings are made. The WIP amount is posted to the G/L during the production order settlement.

The WIP balance cannot be automatically carried over into CO-PA.

In this example, the P&L account is a single offsetting account for all postings to the order; this account is not a cost element, so no direct postings to the production order take place. The calculated WIP amount is stored in RA cost elements, which refer to the originating order. The components of the WIP balance are analyzed using these RA cost elements.

- Calculate WIP (posted at settlement)

  When the WIP process is run, WIP is calculated for production orders with a Released (REL) status. In this example, the production order remains open at the end of period 1.

- Cancel WIP (posted at settlement)

  When the WIP process is run, WIP is canceled for production orders with a status of one of the following:
  - Finally delivered (DLV)
  - Technically complete (TECO)

In this example, WIP is canceled because the production order is closed at the end of period 2. The WIP calculated and posted to the balance sheet at the end of period 1 is canceled, or reversed.

Series R: Assess Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the production cost center's resources. These variances are assessed to CO-PA at the end of the month, where they can be allocated to products, product lines, customers, geography, or other combinations of dimensions (characteristics) tracked in CO-PA. The assessment takes place only in CO, so no posting is made to the G/L.

In this example, the cost center variances are assessed to CO-PA at the end of each period. Optionally, these variances can also be reflected in FI by manually posting a financial entry. However, the assessment to CO-PA already clears the cost center, so if this posting were desired, neither G/L account should be a cost element, and the FI/CO reconciliation would change. This option is not used in this example. The following is a list of these variances:

- Manufacturing overhead variances for material overhead

  The manufacturing overhead cost center, which collects indirect costs related to materials, is assessed to CO-PA.

- Assess manufacturing overhead variances for machine overhead

  The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is assessed to CO-PA.

- Assess manufacturing overhead variances for labor overhead

  The manufacturing overhead cost center, which collects indirect costs related to the production workers, is assessed to CO-PA.

- Assess manufacturing overhead variances for administrative overhead

  The manufacturing overhead cost center, which collects indirect costs related to all costs on the production order, is assessed to CO-PA.

- Assess production cost center variances

  The production cost center, which collects direct costs related to production resources, is assessed to CO-PA.

Step T: Calculate Production Order Variances (Posted at Settlement)

Variances are calculated on production orders, so that the difference between the standard cost of the finished product and the actual costs incurred on the production order can be classified and analyzed. The variances calculated determine the reason for the variances, such as a difference in the actual versus

planned quantity of materials or resource hours, or a substitution of component materials. Variances are only calculated and stored on a production order when the order's status indicates that it is DLV or TECO.

Variances are posted to the G/L during order settlement. The production order is credited if the variance is unfavorable (positive balance) and debited if the variance is favorable (negative balance). The posting to the P&L statement is based on the product's valuation class in the material master, which determines the G/L accounts that will be used in the journal entry.

In this example, a P&L account, different from the one used to credit the production order for the receipt of finished goods into inventory, is used to post the variance at standard. By doing so, the production order variances can be easily reported in both product costing reports and in the P&L statement. Variances are calculated at the end of period 2, when the entire production order has been completed.

During settlement, variances are posted to CO-PA at the same time that they are posted to the G/L. In this example, the fixed and variable portions of the variance are carried over into CO-PA with the same breakdown as the cost component layout that comprises the standard cost. Any characteristics that have been configured in CO-PA that are related to the product number are carried over for analysis, such as product number, product line, plant, and so on. This access allows the matching of variances with the product's cost of sales. The variances are posted to CO-PA in the period when they are incurred, not the period when the product is sold.

End Period: Run Settlement of Production Orders (Posts G-1, G-2, T)

The WIP and variance processes previously described update secondary cost elements, but these values remain in CO. When production order settlement is run at the end of each period, the WIP and variance values are posted to FI, and the appropriate G/L accounts are updated.

Summary of the Sample Scenario

The graphic on the first page illustrates steps A to Y. The T-accounts reflect the postings made during the discrete production process using:

- One utilities cost center

- Four manufacturing overhead cost centers

- One production cost center

- One production order

Postings were made for two periods. We assumed that the production order was open at the end of the first period, and that no finished products were received into inventory. This assumption means that WIP was calculated and posted when the production order was settled. Since the order remained open, variances were not posted. We also assumed that the production order was closed at the end of the second period, meaning that the finished product was received into inventory. This assumption means that WIP was canceled and posted during settlement. Variances were also calculated and then posted during settlement in the second period.

The steps illustrated by the T-accounts include:

- Period 1: A – B – C – F – G1 – Settlement - R

- Period 2: A – B – C – E – F – G2 – T – Settlement – R – X - Y

T-Accounts: FI G/L Accounts

BALANCE SHEET

	Raw Mat'l Inv. 131000	Fin Gds Inv. 134000	A/P 211000	WIP Inventory 138000	A/R 121000
Period 1	B — 120		A-1 — 800 / A-3 — 1000	G1 390	
Period 2	B — 50	E 500 / X — 500	A-1 — 800 / A-3 — 1000	G2 — 390	Y 750

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

	Salary Exp 610000	Raw Mat'l Consum 510000	Revenue 410000	Sales Discounts 420000	Cost of Goods Sold 500000
Period 1	A-1 800 / A-3 1000	B 120			
Period 2	A-1 800 / A-3 1000	B 50	Y — 800	Y 50	X 500

	Mfg Output - Std 519000	Mfg. Output - Var 519500	Production Variance 531000*	WIP Offset 511000*
Period 1				G1 — 390
Period 2	E — 500	T — 175	T 175	G2 390

* Cost elements are not created for WIP and production variance (price difference) accounts.

T-Accounts: CO Secondary Cost Elements

CO - SECONDARY COST ELEMENTS

	Utilities Assessment 810000		Setup Hours 802000		Labor Hours 801000		Machine Hours 800000		CO-PA Assessment 811000	
Period 1	A-2 800		C-1 20		C-2 40		C-3 60		R-1	170
	A-2	800	C-1	20	C-2	40	C-3	60	R-2	155
									R-3	185
									R-4	140
									R-5	880
Period 2	A-2 800				C-2 60		C-3 60		R-1	187.5
	A-2	800			C-2	60	C-3	60	R-2	155
									R-3	185
									R-4	157.5
									R-5	880

	Material OH 840000		Machine OH 841000		Labor OH 842000		Admin OH 843000	
Period 1	F-1 30		F-2 45		F-3 15		F-4 60	
	F-1	30	F-2	45	F-3	15	F-4	60
Period 2	F-1 12.5		F-2 45		F-3 15		F-4 42.5	
	F-1	12.5	F-2	45	F-3	15	F-4	42.5

	RA - Valuated 820000		RA - Calculated 821000		RA - Material 822000		RA - Machine 823000		RA - Labor 824000	
Period 1	G-1 390		G-1		G-1	120	G-1	60	G-1	40
Period 2	G-2	390	G-2		G-2 120		G-2 60		G-2 40	

	RA - Setup 825000		RA - OH Material 826000		RA - OH Machine 827000		RA - OH Labor 828000		RA - OH Admin 829000	
Period 1	G-1	20	G-1	30	G-1	45	G-1	15	G-1	60
Period 2	G-2 20		G-2 30		G-2 45		G-2 15		G-2 60	

- RA cost elements are updated based on the cost elements that are posted to the production order.

- The "RA – Valuated" cost element tracks all debits to the production order (costs posted during production), while the "RA – Calculated" cost element tracks all credits to the production order (standard cost of product received into inventory). Together, the valuated and calculated cost elements reflect the amount that will be posted to the balance sheet WIP account during order settlement. In this example, no finished product was received at the end of period 1, so there is no value in the calculated RA cost element.

- All other RA cost elements reflect the amount that will be posted to the P&L WIP offset account during order settlement. These RA cost elements were set up to track the details for the type of costs posted to WIP so that material, labor, overhead, and so on, can be differentiated in reporting. For each period, all debits to the production order are offset as credits to these accounts, and all credits to the production order are offset as debits to these accounts.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

Utilities CCtr 90100

	Debit	Credit
Period 1	A-1 800	A-2 800
Period 2	A-1 800	A-2 800

Mat'l OH CCtr 30250

	Debit	Credit
Period 1	A-2 200	F-1 30
		R-1 170
Period 2	A-2 200	F-1 12.5
		R-1 187.5

Mach OH CCtr 30260

	Debit	Credit
Period 1	A-2 200	F-2 45
		R-2 155
Period 2	A-2 200	F-2 45
		R-2 155

Labor OH CCtr 30270

	Debit	Credit
Period 1	A-2 200	F-3 15
		R-3 185
Period 2	A-2 200	F-3 15
		R-3 185

Mfg Admin OH CCtr 30280

	Debit	Credit
Period 1	A-2 200	F-4 60
		R-4 140
Period 2	A-2 200	F-4 42.5
		R-4 157.5

Production CCtr 30100

	Debit	Credit	
Period 1	A-3 1000	C-1 20	
		C-2 40	
		C-3 60	
		R-5 880	
Period 2	A-3 1000	C-2 60	
		C-3 60	
		R-5 880	

Production Order xxxxxxxxx

	Debit	Credit	Description
Period 1	B 120		Raw material
	C-1 20		Set-up hours
	C-2 40		Labor hours
	C-3 60		Machine hours
	F-1 30		Material OH
	F-2 45		Machine OH
	F-3 15		Labor OH
	F-4 60		Admin OH
Period 2	B 50		Raw material
	C-2 60		Labor hours
	C-3 60		Machine hours
		E 500	Receive fin goods
	F-1 12.5		Material OH
	F-2 45		Machine OH
	F-3 15		Labor OH
	F-4 42.5		Admin OH
		T 175	Settle variances

Operating Concern 0010

	Debit	Description
Period 1	R-1 170	OH CCtr Ass'mnt
	R-2 155	OH CCtr Ass'mnt
	R-3 185	OH CCtr Ass'mnt
	R-4 140	OH CCtr Ass'mnt
	R-5 880	Prd CCtr Ass'mnt
Period 2	T 175	Variances
	Y 800	Revenue
	Y 50	Discount
	Y 500	COGS
	R-1 187.5	OH CCtr Ass'mnt
	R-2 155	OH CCtr Ass'mnt
	R-3 185	OH CCtr Ass'mnt
	R-4 157.5	OH CCtr Ass'mnt
	R-5 880	Prd CCtr Ass'mnt

Variances: ProdOrd Costs vs. Std. Cost

E Standard Cost			T Prod. Ord. Variances	
Material	120		Qty - Matl	50
Setup	20		Qty - Setup	0
Labor	60		Qty - Lab	20
Machine	100		Qty - Mch	40
OH Mat	30	25%	Inpt - Matl	12.5
OH Mach	75	75%	Inpt - Mch	15
OH Labor	20	25%	Inpt - Lab	10
OH Admin	75	25%	Inpt - Adm	27.5
Total Std	0		Total Vars	175

Variance categories are determined based on the cost elements that make up the standard cost of the product.

FI/CO Reconciliation

FI

FI includes both balance sheet and P&L accounts. Only the P&L accounts can be created as cost elements and posted to FI and CO. Cost elements determine for which accounts additional detail should be tracked with controlling objects, such as production orders and cost centers.

Of the accounts in this example, only the following are not created as cost elements in CO:

- The WIP offset account (511000)

- The production variance (price difference) account (531000)

The WIP account is a placeholder that moves the production costs to the balance sheet during the production process. The variance account contains the net impact on the P&L at the end of the production process.

CO

Production costs that flow through a production order, not through a cost center, include:

- Material costs that are directly posted to the production order

- Labor and machine time posted from the production cost center to the production order

- Overhead allocations from the manufacturing pool cost centers

In FI, direct postings made to the service and production cost centers are reflected, but the activity allocation and the overhead applied from the cost centers to the production orders are only indirectly reflected. The allocations are reassigning costs originally posted to other expense accounts in the G/L, such as salary accounts. Reconciliation is necessary because the material's standard cost includes these reassigned costs, which are the activity rates and the overhead allocations, when both the production order and the G/L are credited for this material.

To reconcile the postings that occur during the production process, the original accounts that contain the expense postings to the production and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original postings to FI and CO are included during the reconciliation of the production process, the production order has no net impact on the P&L other than the written-off variances.

When CO-PA is used, the cost center variances are not directly reflected in variance accounts in FI, but are analyzed in CO or CO-PA. The variances are included in the original expense postings to the cost centers. Although a manual entry to the G/L is possible to reclassify these variances to a cost center variance account, this entry would not be reflected in CO so that the variances would not be double-counted. This manual entry is not used in this example.

Reconciliation

Due to the nature of FI/CO functions, where not all CO transactions (such as hourly activity rates and overhead allocations) are reflected in FI accounts, a reconciliation process must take place. This reconciliation ensures that FI and CO remain balanced for reporting.

The goals of this reconciliation are to determine whether the:

- FI accounts are in balance with the CO postings
  The production process managed by the production order should have a net zero impact on the P&L. The only impact should be on the written-off production variance (price difference) account. Cost center variances are not reclassified in the P&L in this example.

- Variances in the CO objects are consistent with variances reported in CO-PA
  Once the production process is complete, variances in the controlling objects must be cleared using period-end processes. Production order variances are settled to a variance account and to CO-PA analysis. Cost center variances are assessed to CO-PA. The variances reported in CO reporting and in CO-PA reporting are the same.

Reconciliation Procedure

All debits and credits to the P&L accounts in the production process are accumulated. The production variance (price difference) account is initially excluded, because it represents a reclassification of the written-off variances. The other accounts contain only the cost center variances, which are represented in CO-PA, but not on the G/L. The production order variances are the same in product cost reporting and in CO-PA reporting. The cost center variances are the same in cost center reporting and in CO-PA reporting.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process			CO			CO Variances	PA
	DR	CR		DR	CR	CR to CO	Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	120		Matl OH CCtr	200	30	170	OH CCtr Vars
MfgOut-Std			Mach OH CCtr	200	45	155	OH CCtr Vars
MfgOut-Var			Labor OH CCtr	200	15	185	OH CCtr Vars
WIP Offset		390	Admin OH CCtr	200	60	140	OH CCtr Vars
			ProdCCtr	1000	120	880	Prod CCtr Var
			Prod Ord				Prod Ord Var
	1920	390	Subtotal	2600	1070	1530	CCtr Var
CCtr Var	1530		DR/CR bal for CO	0			

Period 2

FI/Production Process			CO			CO Variances	PA
	DR	CR		DR	CR	CR to CO	Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	50		Matl OH CCtr	200	12.5	187.5	OH CCtr Vars
MfgOut-Std		500	Mach OH CCtr	200	45	155	OH CCtr Vars
MfgOut-Var		175	Labor OH CCtr	200	15	185	OH CCtr Vars
WIP Offset	390		Admin OH CCtr	200	42.5	157.5	OH CCtr Vars
			ProdCCtr	1000	120	880	Prod CCtr Var
			Prod Ord	675	500	175	Prod Ord Var
	2240	675	Subtotal	3275	1535	1740	Total Var
CCtr Var	1565		DR/CR bal for CO	0			CCtr + Ord Vars
ProdOrd Var	175						(1565 + 175)
Total Var	1740						

As a result of the T-accounts on the previous page, we concluded that:

- There is a net impact of zero on the production process for the production order.

  Only production order variances have a P&L impact once the order has been completed.

- The variances on the controlling objects are depicted in the CO section prior to the clearing of these variances to CO-PA.

- The variances on the production order are consistent.

  The variances are the same in the G/L account, on the production order, and in CO-PA.

- All production order costs, regardless of the period in which they were posted, are only considered at the time that the order is settled.

  Production order costs that were posted in period 1 are handled in FI with the WIP process. Since there is no FI impact due to the open production order, the WIP amount does not flow into CO-PA.

- Variances, or balances, analyzed on the cost center level cannot be analyzed in "variance" accounts in FI, but must be analyzed in CO or CO-PA.

The object (cost center) variances are not reflected in a FI variance account. The variances are contained in the cost elements that were used to post costs to the cost center (such as salary and supplies expenses posted to the cost center).

- If the cost center variances were to be reflected in FI, a manual journal entry to a cost center offset account and to a cost center variance account would be necessary to reclassify these variances.

  To avoid double counting the cost center variances, neither of these accounts should be created as cost elements, since the cost centers have already been cleared to CO-PA.

Cost-Based Profitability Analysis

CO-PA, a separate module where the cost of sales can be analyzed, captures transactions from the:

- Sales and distribution (SD) module, when an invoice is processed

- FI, with direct journal entries

- CO, from cost center assessments

- Production Planning (PP) module, with the settlement of production orders

Identifying the characteristics that determine how profitability should be analyzed, such as customers, customer groups, products, product hierarchies, geographic regions, and so on, is used to configure CO-PA. Additionally, the values that are captured, such as the quantity of a product that is invoiced, the revenue and discounts applied when the product is sold, variances that are captured in the production order, and other cost allocations must be identified and created in CO-PA.

One CO-PA document is created for each line item in a sales order, for each production order settlement, and for each sender-receiver combination in cost center assessments. The receiver is a profitability segment, which is a unique combination of the values of the characteristics used to measure profitability. For example, different customer numbers result in different profitability segments. Profitability segments are incorporated into CO, so that transactions can be carried out between other controlling objects, such as cost centers and orders, and a profitability segment. Once a value has been posted to CO-PA, the revenue and costs can no longer be allocated out of CO-PA with normal CO processing.

Design Decisions

This example includes the use of CO-PA. Although many different design options exist for CO-PA, this example only illustrates data flows as they pertain to costing this discrete production scenario. CO-PA functionality and implementation outside of this scope will not be discussed here. The following design decisions and configuration options were implemented for the setup of the CO-PA operating concern for this product costing scenario:

- Cost-based CO-PA is used to match the revenues and costs of products so that cost of sales and contribution margin analyses can be carried out.

  Value fields are used to capture cost and revenue data. Cost elements are mapped to value fields in configuration, but cost elements are not available in cost-based CO-PA.

- The cost of a product (cost of sales) is only posted to CO-PA when the revenue is posted or when the invoice is passed to accounting.

The standard cost of the finished product being sold is obtained from the current cost estimate that is generated by product costing. The cost component detail is passed to CO-PA. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to obtain the total standard cost of the material from the material master, which does not allow any detailed breakdown of the standard cost.

- Fixed and variable costs were posted to separate value fields.

  This posting will allow for a more detailed analysis of contribution margins. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to accumulate the existing value fields, either by creating additional summarized valued fields or by summarizing the detailed value fields in reporting.

- Once the order is complete, the production order variances are posted to CO-PA during order settlement.

  The variance detail passed to CO-PA mirrors the cost component detail that make up the standard cost. This step allows a more exact matching of variances with the standard cost of products that are sold. It is possible to combine this detail into fewer value fields, such as a total variance field, or two fields to capture the fixed and variable portions of the variance. It is also possible to split the variance detail into additional value fields, using the variance categories generated during the variance calculation on the production order (quantity variance, resource-usage variance, and so on).

- Variances are posted to CO-PA during the period in which they occur.

  This step may not occur in the same period that the product was sold, or when the cost of sales is recognized for a specific product.

- User-defined characteristics were set up to include fields that are obtained from the material master, the customer master, and the invoice.

  The rules according to which these fields are updated include:
  - Characteristics that are obtained from the material master are updated whenever the material number is passed to CO-PA.
    Examples of this posting include invoicing (the material number is on the line item level of an invoice) and the posting of production order variances (the material number is on the header level of the production order).
  - Characteristics that are obtained from the customer master are updated whenever the customer number is passed to CO-PA.
    This step occurs during invoicing (the customer number is on the header level of an invoice), but not during the posting of production order variances (a production order in the discrete make-to-stock environment has no direct link to a customer).
  - Characteristics that are obtained from the invoice are updated whenever the invoice number is passed to CO-PA.
    This step occurs during invoicing, but not during the posting of production order variances.

- Allocations from the overhead and production cost centers to CO-PA segments may occur based on data that has been captured in CO-PA.

  Data in CO-PA includes revenue, cost of sales, variances, and direct postings. The combination of characteristics to which the assessment is applied is determined in the configuration of the cost center

assessment. If the assessment occurs to a product, all other data related to the material master is also captured; if the assessment occurs to a product and customer, all product and customer-related characteristics will also be populated. However, these types of allocations should typically not be performed to the lowest level of detail, such as product number, but should instead be based on higher-level characteristics, such as product lines or geography.

Issues

Issues that may be encountered in reconciling the production postings into cost-based CO-PA with the G/L include:

- Cost-based CO-PA uses a cost-of-sales approach, where the standard cost of sales is not recognized until a product is sold.

  There is a time lag between the time that the cost of sales is posted to the G/L (when the product is delivered), and when the cost of sales is posted to CO-PA (when the product is invoiced). If the delivery and the invoice occur in different periods, due to timing differences, it is a reconciling item between the G/L and CO-PA.

- The design of CO-PA that provides the most detail is the current standard cost estimate from product costing.

  This cost estimate is updated in the material master to be the standard cost of the product. The timing of product revaluation must be closely monitored so that it does not occur between the delivery and the invoicing. If this occurs, the value of the standard cost posted to the G/L and to CO-PA is a reconciling item. Depending on the CO-PA design, this step may already be considered when inventory is revalued, which must also be reflected in CO-PA.

- WIP is not transferred to CO-PA.

  A profitability segment is viewed as a controlling object to which costs in the CO module are transferred. Since WIP is a background process to ensure that the balance sheet contains the correct values, and no posting is made directly to the production order, the WIP balance cannot be transferred into CO-PA. A reconciliation must take place (as previously described). It is also possible to make a direct entry into CO-PA to account for the WIP offset posting to the P&L, but this option is not used in this example.

- Cost elements and G/L accounts are not available in cost-based CO-PA.

  The reconciliation between CO-PA and the G/L must occur using value fields (categories of expense) and high-level (such as company code and business area) information on the side of CO-PA. The information captured in CO-PA at the lower levels is not available in journal entries in FI.

- Value fields can be freely defined to include more or less detail than the approach used in this example. If the value fields are defined at a detailed level, these fields can be summarized by updating an additional value field that accumulates values from several other value fields, or they can be summarized in reporting. If they are captured at a very high level, drilling down to additional detail is only available in the originating module (SD, CO, CO-PC), not in CO-PA.

The chart on the following page contains sample characteristics and value fields used by the production process. Fixed characteristics are automatically generated when the operating concern is generated. For clarity, the administrative characteristics (time, date, user ID stamps at creation, alternate currencies, fixed

parameters such as client and ledger numbers, and similar data) are not listed. Up to 30 additional user-defined characteristics may be created and populated in CO-PA. All value fields, up to 120, must be defined in cost-based CO-PA. The value fields are updated at the following times:

- Passing an invoice to accounting updates the revenue, discount, freight, and cost of sales value fields.

- Settling production order variances updates the variance fields that are related to the COGS cost components.

- Assessing cost centers updates the cost center variance fields.

CO-PA Fields Updated by an Invoice

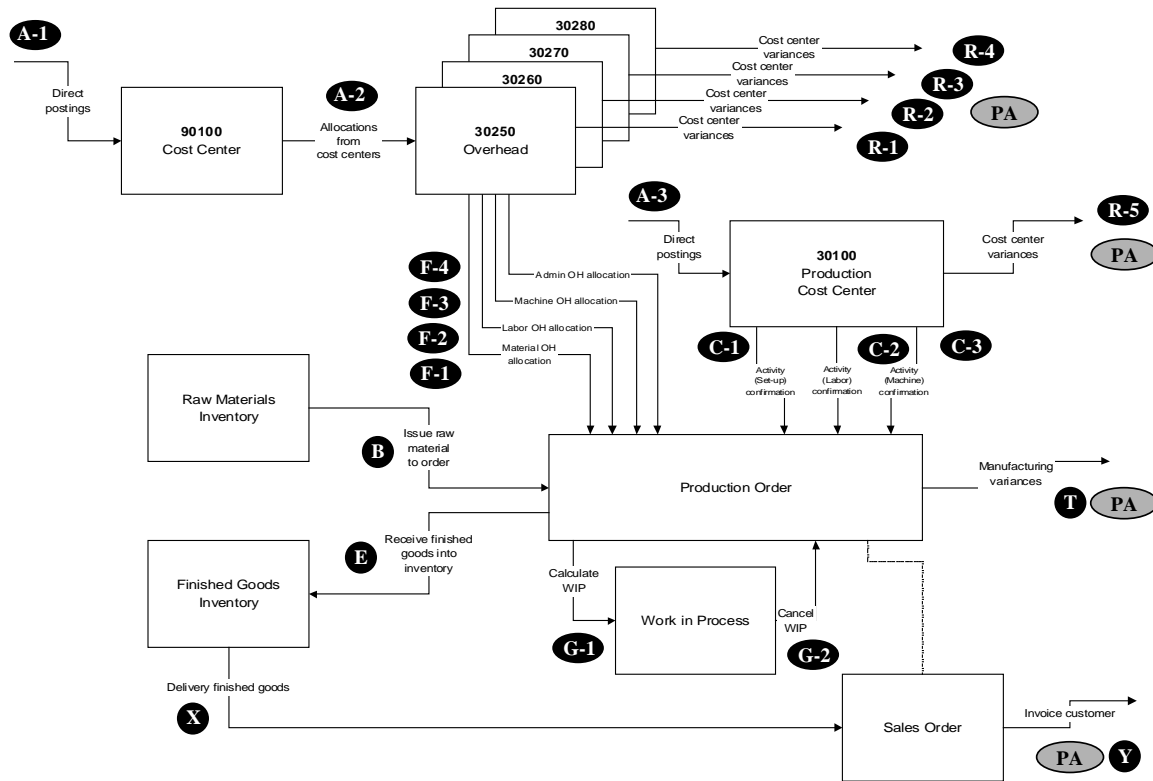| Characteristics	Value Fields — Invoice (Revenue)										Value Fields — Invoice (Standard Cost)																					
	Invoiced quantity	Revenue - Domestic	Revenue - Internat'l	Revenue - Government	Discounts - Domestic	Discounts - Internat'l	Discounts - Government	Freight - Domestic	Freight - Internat'l	Freight - Government	COGS - Raw material (variable)	COGS - Semi-finished goods (fixed)	COGS - Semi-finished goods (variable)	COGS - Prod Setup (fixed)	COGS - Prod Setup (variable)	COGS - Prod labor (fixed)	COGS - Prod labor (variable)	COGS - Prod machine (fixed)	COGS - Prod machine (variable)	COGS - OH Material (fixed)	COGS - OH Material (variable)	COGS - OH Labor (fixed)	COGS - OH Labor (variable)	COGS - OH Machine (fixed)	COGS - OH Machine (variable)	COGS - OH Admin (fixed)	COGS - OH Admin (variable)	COGS - OH Sales/Marketing (fixed)	COGS - OH Sales/Marketing (variable)	COGS - Miscellaneous (fixed)	COGS - Miscellaneous (variable)
Fixed																															
Document number	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Item number																															
Record type	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Version																															
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Company code	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Business area	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Sales organization	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Distribution channel	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Division	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Plant	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Product	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Customer	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Reference document no.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Reference item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Sales order	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Sales order item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Billing type	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Goods issue date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Invoice date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Posting date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Fiscal year	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Period	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Profit center	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
WBS element																															
Order																															
Cost object																															
Sender cost center																															
Tracing factor																															
Cost element																															
User-Defined																															
Product hierarchy - Lvl 1	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Product hierarchy - Lvl 2	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Product hierarchy - Lvl 3	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Customer group	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Sales district	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		
Sales office	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		

- Hidden rows for control data are usually not used for analysis.

- The fields in bold indicate that the field is visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

CO-PA Fields Updated by Period-End Controlling Processes

Characteristics	Variances - Raw material (variable)	Variances - Semi-finished goods (fixed)	Variances - Semi-finished goods (variable)	Variances - Prod Setup (fixed)	Variances - Prod Setup (variable)	Variances - Prod labor (fixed)	Variances - Prod labor (variable)	Variances - Prod machine (fixed)	Variances - Prod machine (variable)	Variances - OH Material (fixed)	Variances - OH Material (variable)	Variances - OH Labor (fixed)	Variances - OH Labor (variable)	Variances - OH Machine (fixed)	Variances - OH Machine (variable)	Variances - OH Admin (fixed)	Variances - OH Admin (variable)	Variances - OH Sales/Marketing (fixed)	Variances - OH Sales/Marketing (variable)	Variances - Miscellaneous (fixed)	Variances - Miscellaneous (variable)	Variances - OH CCtr (fixed)	Variances - OH CCtr (variable)	Variances - Prod CCtr (fixed)	Variances - Prod CCtr (variable)
						Production order settlement																CCtr Assessments			
Fixed																									
Document number	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Item number																						**X**	**X**	**X**	**X**
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**X**	**X**	**X**	**X**
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																									
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Business area	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales organization																									
Distribution channel																									
Division	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Plant	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Product	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Customer																									
Reference document no.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Reference item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Sales order																									
Sales order item																									
Billing type																									
Goods issue date																									
Invoice date																									
Posting date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Fiscal year	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Period	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profit center	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
WBS element																									
Order	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Cost object																									
Sender cost center																						**X**	**X**	**X**	**X**
Tracing factor																						X	X	X	X
Cost element																						**X**	**X**	**X**	**X**
User-Defined																									
Product hierarchy - Lvl 1	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Product hierarchy - Lvl 2	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Product hierarchy - Lvl 3	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Customer group																									
Sales district																									
Sales office																									

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Chapter 4: Product Costing Flow for Make-to-Order Production with Valuated Stock and Profitability Analysis

Contents

The following graphic provides an overview of the process:

This chapter describes the accounting logic associated with SAP's MTO (make-to-order) production process, using sales orders and valuated stock. Since valuated stock is used, the finished product being manufactured is valued using a cost estimate created specifically for the unique options chosen for the product in the sales order. In this process, the following items are documented:

- Production flow with sales orders using valuated stock

- Interaction of sales orders and production orders

- Associated T-accounts

- Reconciliation of the T-accounts

The current example uses profitability analysis (CO-PA). The assumptions made during the configuration of CO-PA are discussed in a later section.

The sales order drives the production process from a logistics point of view. The sales order automatically creates a production order, using MRP processing, which manages the direct resources used to produce a product. With the use of valuated stock, the focus of the direct, controllable costs incurred during the production process is the production order, not the sales order. These manufacturing costs may be incurred during the production of a finished product, or a semi-finished product (subassembly). The indirect costs associated with the product's cost are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to a sales order and to a production order

The differences between SAP's product costing process and most U.S. legacy systems are that:

- In R/3, inventory does not flow through cost centers

  Rather than tracking inventory, the cost centers track total available labor costs, machine costs, and indirect production expenses. In the MTO environment using valuated stock, instead of cost centers, our production orders capture the product's total cost.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet

  In most legacy systems, production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. Using the Controlling (CO) module, the production costs associated with an order are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account.

On the following pages, each step in the process is described, followed by the T-accounts used in the pre-configured client. A method of reconciling the general ledger (G/L) accounts with the CO objects used in MTO manufacturing using valuated stock is also explained.

TechTalk

The MTO manufacturing process using valuated stock is available as of Release 4.x. In Release 3.x, the MTO manufacturing process must be carried out using sales order item controlling. The benefits of MTO using valuated stock include:

- Consistent quantity and value flow.
- Results analysis does not need to be configured or calculated on the sales order item.
- The WIP and variance process is similar to the make-to-stock (discrete) manufacturing process.

TechTalk

The numbering scheme was developed to allow additional processing for product costing using different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Sales Orders with Valuated Stock

Overview

Each step in the MTO (make-to-order) production process using valuated stock is described on the following page. Product costing is closely tied to production, so the financial and costing entries automatically result from the daily manufacturing transactions that are entered into the system. The month-end processes are necessary to complete the financial picture for product costing. In the following example, we assume that the sales and production orders remain open for two periods and that:

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1. Costs are posted to the cost centers.

2. As a sales order is created, the options chosen using variant configuration are used to determine the components that will be required to build the customer-specific product. A cost estimate is saved and marked automatically for the sales order item, using the particular options specified by the customer.

3. MRP is run.

   Based on the sales order, a planned production order is created to manage the manufacturing process for the MTO product.

4. The planned order is converted to a production order.

5. Resources (activities) are provided from the production cost center to the production order.

6. The month-end process is executed for production orders and cost centers. Since the sales order item is not considered a controlling object in this MTO environment using valuated stock, a month-end process does not need to be performed for the sales order item.

The use of configurable materials is illustrated in this scenario. For the valuated stock scenario, it is recommended that a finished good material type, not the configurable material type KMAT, is used. The finished product may have multiple options, each of which could result in a different cost estimate for the product. However, since variances should not be incurred simply because a different option of the finished product was chosen by the customer, no standard cost can be maintained on these configurable materials. A cost estimate is available for each sales order item instead of a standard cost, which acts as a "temporary" standard cost for the options chosen by the customer. This cost estimate is used to value the finished product, and all variances that are incurred compared to this cost estimate are considered to be manufacturing variances.

This business process may not reflect every manufacturing scenario. In many industries, unique component materials may need to be purchased specifically for the finished product being manufactured. Based on the bill of material settings, a purchase requisition may be automatically created by the system when the production order is created, and these component materials are received directly against the production order, not into inventory. In the MTO process using valuated stock, these component materials are received against the production order, not against the sales order, since the production order controls the manufacturing process. Other industry-specific differences include issuing all component materials to the production order at the beginning of the process, in the first period, instead of across periods. There may also be differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, others are manufacturing overhead (indirect) costs. Steps A-1 to A-3 are examples of these postings. In this example, the cost center design uses separate cost centers for the direct production costs and for each type of manufacturing overhead cost. The cost center design is flexible, but other options are not discussed at this time.

- Posting of costs to service or administrative cost centers

   At a plant-wide level, costs such as utilities and rent must be considered during the production process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products that are manufactured, but the overall indirect costs and their variances (over and under absorption to products) are not managed at the production order level. In this cost center design, the utilities and services are managed at a cost center level, but these cost centers allocate their costs to the manufacturing overhead pools. The manufacturing overhead pool cost centers, in turn, manage the variances of the indirect costs.

   In this example, actual salaries are posted to a utility cost center in both periods. This is a direct cost for the utility cost center, but an indirect cost for the overall production process. Other costs, such as maintenance, repair, and operations (MRO) materials and supplies may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

- Allocating from service and administrative cost centers to manufacturing overhead pools

   Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers will allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this example, the expenses incurred by the utility cost center are evenly allocated to all manufacturing overhead pool cost centers.

- Posting costs to the production cost center

   Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center will later supply resources, such as labor and machine time, to the production order. The cost center manager will determine a rate for each of these resources, represented by system activities, which are often managed in hours. The hourly rate may be manually entered by the cost center manager, or be calculated by the system based on the planned expenses and planned hours available in the cost center.

Step B: Raw Material Is Issued from Inventory to the Production Order

From inventory, raw material is issued to the production order. The system bases the standard quantity of raw materials to be issued on the quantity of finished goods to be produced by the production order and the bill of material used in the order. The raw materials may be manually updated to reflect actual usage. In this example, raw materials are issued to the production order at their moving average cost.

The raw materials may be issued to the production order in one of the following ways:

- As a manual goods issue
- Using backflushing
- Automatically when the first operation is confirmed, if materials are allocated to the operation

In this example, all required components are issued to the production order at the beginning of period 1, and additional raw material components are issued at the beginning of period 2. This process may regularly occur in some industries, and in other industries, only if there is a problem with the quality of a previously issued component. The raw materials did not need to be purchased. If an external procurement process were necessary, the raw materials would be received directly to the production order, not to the sales order and not into inventory.

Series C: Activities Are Allocated from the Production Cost Center to the Production Order

The production cost center supplies value-added resources, such as labor and machine time, to the production order. These resources are represented by system activities, such as labor hours and machine hours, and each activity has a planned rate. The resources (activities) used to produce the finished goods are posted to the production order. The quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed, which is based on the quantity of finished goods to be produced by the production order and the routing used in the order.

For this production order, because confirmation occurs manually at the operation level and not through backflushing, the standard number of hours that default from each operation in the routing can be updated to reflect actual hours. This example assumes that setup time is posted to the production order for period 1, but no additional set up is required in period 2. Setup time is assumed to be labor time. Labor and machine times are posted to the production order for both open periods.

- Setup labor hours are allocated from the production cost center to the production order

  The standard setup time is developed for a lot size, so it is spread over the entire quantity of finished products that are manufactured with the production order. If there are lot size fluctuations, compared to the lot size used to develop the standard cost, the standard setup time still does not change. We assume that setup is unrelated to the lot size. In this example, setup time is assumed to be labor hours.

- Labor hours are allocated from the production cost center to the production order

  The standard number of labor hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units produced in the production order.

- Machine hours are allocated from the production cost center to the production order

  The standard number of machine hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units that are produced in the production order.

Step E: Finished Goods Are Received into Inventory from the Production Order

The completed finished goods are entered as a goods receipt from the production order. However, the product is not placed into unrestricted inventory. Since it was produced to a customer's specifications, placing it into unrestricted inventory would allow another customer to purchase the product. The goods receipt places the finished good into sales order stock. It is linked to the sales order that was used to create the production order for the specific finished product. The goods receipt signals the sales order that the manufacturing of the finished product is complete, and that the product may now be delivered to the customer. The inventory value is updated with the actual quantity produced multiplied by the sales order cost estimate developed for the product. This goods receipt automatically posts the financial and material documents. In this example, the finished good is valued at the sales order cost estimate. Receiving the product into inventory using different costing methods is possible, but is not discussed in this scenario.

An automatic goods receipt is also possible when the final operation is confirmed. If a production order has been created for more than one unit of the finished good, a goods receipt for a portion of the quantity may be processed. In this example, once the entire production order has been completed, the goods receipt is only posted at the end of period 2.

Step X: Deliver Product to the Customer

Once production of a finished product has been completed and the product has been received into sales order stock, it can be delivered to a customer. The sales order stock is relieved when the delivery is

processed. At this time, the cost of sales is posted to the G/L. Since the finished product is valued at the sales order item cost estimate, the entry to cost of sales uses this value, which was developed for the unique product. There is no posting to cost-based profitability analysis (CO-PA) at this time.

Step Y: Invoice the Customer

In most cases, invoicing only occurs after the finished product has been shipped to the customer. At this time, the revenue is posted to the G/L and to profitability analysis. The cost of sales has already been posted to FI at the time of delivery, and it is posted to cost-based CO-PA with the invoice data so that the cost of the product is matched with the revenue.

In this example, the cost of sales posting to CO-PA is taken from the sales order item cost estimate of the finished product. The full detail of the cost components that make up the standard cost can be analyzed in CO-PA when a value field is configured, such as for the fixed and variable portion of each cost component. The cost components can also be combined into fewer value fields in CO-PA, or the value can be taken from the standard cost stored in the material master. Any characteristics that have been configured in profitability analysis that are related to the sale, such as product number, product line, customer, customer group, and geographic region, are carried over for analysis.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Production Order

Overhead is applied to the production order, thereby posting additional costs to the production order. This cost is a percentage of the direct costs that have already been posted to the production order during the period. If this step is run many times during the same period, only the overhead difference from the previous run is applied to the production order. The costing sheet associated with the production order stores the rules for applying these overhead costs. It is possible to apply an overhead rate based on the quantity of material components that were issued to the production order; this technique is not used in this scenario. Although the overhead design is flexible, and may involve the use of internal orders, the other options are not discussed at this time.

In this example, separate overhead cost centers and separate overhead rates are used for each type of overhead being applied to the production order. The following four manufacturing overhead pool cost centers are used to apply these different overhead types to the production order:

- Material overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the order during the period.

- Machine overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the production order during the period.

- Labor overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as human resources and accounting department costs, that are related to production workers. The overhead percentage rate is

based on the cost of the labor time that was confirmed for the production order during the period. Based on the assumptions in this scenario, this rate includes setup and normal labor time.

- Administrative overhead to the production order

    For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the production order. The overhead percentage rate is based on all direct costs posted to the production order during the period.

Series G: Work in Process for the Production Order (Posted at Settlement)

In R/3, since the production order costs are tracked on the P&L statement, the balance of all open production orders must be moved to the balance sheet at period-end. This movement ensures that the materials issued to the production order remain in inventory and are not written off before production is complete. If the open order balance is positive, the P&L is credited and the balance sheet is debited. If this balance is negative, the P&L is debited and the balance sheet is credited. This process is possible in the MTO environment when using valuated stock, and when the sales order item is not a controlling object.

When displaying production order costs, the WIP posting to the G/L is not displayed. This impact is purely a financial transaction and does not affect the normal production process or the order balances in a production order. If a production order is open, the balance of the order (costs debited minus standard cost of completed finished goods credited) is calculated to be the WIP amount. Separate cost elements, called results analysis cost elements, track the WIP amounts so that these amounts are not directly posted to the production order. The results analysis cost elements are then used to make the entry to the G/L, but not directly to the production order.

If a production order remains open for several periods, the WIP balance is recalculated for each period, and the adjustments are posted to the G/L. Once a production order, which was opened in a previous period, is closed, any WIP that was previously moved to the balance sheet is reversed. If a production order is opened and closed in the same period, the WIP process may be run, but no postings are made. The WIP amount is posted to the G/L during the production order settlement.

The WIP balance cannot be automatically carried over into profitability analysis (CO-PA).

In this example, the P&L account is a single offsetting account for all postings to the order; this account is not a cost element, so no direct postings to the production order take place. The calculated WIP amount is stored in results-analysis cost elements, which refer to the originating order. The components of the WIP balance are analyzed using these results analysis cost elements.

- Calculate WIP (posted at settlement)

    When the WIP process is run, WIP is calculated for production orders whose status is Released (REL). In this example, the production order remains open at the end of period 1.

- Cancel WIP (posted at settlement)

    When the WIP process is run, WIP is canceled for production orders whose status is:
    - Finally delivered (DLV)
    - Technically complete (TECO)

In this example, WIP is canceled because the production order is closed at the end of period 2. The WIP calculated and posted to the balance sheet at the end of period 1 is canceled, or reversed.

Series R: Assess Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the production cost center's resources. These variances are assessed to profitability analysis at the end of the month, where they can be allocated to products, product lines, customers, geography, or other combinations of dimensions (characteristics) tracked in CO-PA. The assessment takes place only in CO, so no posting is made to the G/L.

In this example, the cost center variances are assessed to profitability analysis at the end of each period. Optionally, these variances can also be reflected in FI by manually posting a financial entry. However, the assessment to profitability analysis already clears the cost center, so if this posting were desired, neither G/L account should be a cost element, and the FI/CO reconciliation would change. This option is not used in this example. The following is a list of these variances:

- Manufacturing overhead variances for material overhead

   The manufacturing overhead cost center, which collects indirect costs related to materials, is assessed to profitability analysis.

- Assess manufacturing overhead variances for machine overhead

   The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is assessed to profitability analysis.

- Assess manufacturing overhead variances for labor overhead

   The manufacturing overhead cost center, which collects indirect costs related to the production workers, is assessed to profitability analysis.

- Assess manufacturing overhead variances for administrative overhead

   The manufacturing overhead cost center, which collects indirect costs related to all costs on the production order, is assessed to profitability analysis.

- Assess production cost center variances

   The production cost center, which collects direct costs related to production resources, is assessed to profitability analysis.

Step T: Calculate Production Order Variances (Posted at Settlement)

Variances are calculated on production orders, so that the difference between the cost estimate of the finished product and the actual costs incurred on the production order can be classified and analyzed. The variances calculated determine the reason for the variances, such as a difference in the actual versus planned quantity of materials or resource hours, or a substitution of component materials. Variances are only calculated and stored on a production order when the order's status indicates that it is finally delivered (DLV) and/or technically complete (TECO). This process is possible in the MTO environment when using valuated stock, and when the sales order item is not a controlling object.

Variances are posted to the G/L during order settlement. The production order is credited if the variance is unfavorable (positive balance) and debited if the variance is favorable (negative balance). The posting to the P&L statement is based on the product's valuation class in the material master, which determines the G/L accounts that will be used in the journal entry.

In this example, a P&L account, different from the one used to credit the production order for the receipt of finished goods into inventory, is used to post the variance at standard. By doing so, the production order variances can be easily reported in both product costing reports and in the P&L statement. Variances are calculated at the end of period 2, when the entire production order has been completed.

During settlement, variances are posted to profitability analysis at the same time that they are posted to the G/L. In this example, the fixed and variable portions of the variance are carried over into CO-PA with the same breakdown as the cost component layout that comprises the sales order cost estimate. Any characteristics that have been configured in profitability analysis that are related to the product number are carried over for analysis, such as product number, product line, plant, etc. This access allows the matching of variances with the product's cost of sales. The variances are posted to CO-PA in the period in which they are incurred, not the period in which the product is sold.

End period: Run Settlement of Production Orders (posts G-1, G-2, T)

The WIP and variance processes previously described update secondary cost elements, but these values remain in the Controlling (CO) module. When production order settlement is run at the end of each period, the WIP and variance values are posted to the Financial (FI) module, and the appropriate G/L accounts are updated.

Summary of the Sample Scenario

The graphic on the first page illustrates steps A to Y. The T-accounts reflect the postings made during the MTO production process with valuated stock, using:

- One utilities cost center
- Four manufacturing overhead cost centers
- One production cost center
- One sales order
- One production order

Postings were made for two periods. No postings are made directly to the sales order, since sales order controlling is not used in this scenario. We assumed that the production order was open at the end of the first period, and that no finished products were received into inventory. This assumption means that WIP was calculated and posted when the production order was settled. Since the order remained open, variances were not posted.

We also assumed that the production order was closed at the end of the second period, meaning that the finished product was received into inventory. This assumption means that WIP was canceled and posted during settlement. Variances were also calculated and then posted during settlement in the second period.

The steps illustrated by the T-accounts include:

- Period 1: A – B – C – F – G1 – Settlement - R
- Period 2: A – B – C – E – F – G2 – T – Settlement – R – X - Y

T-Accounts: FI G/L Accounts

BALANCE SHEET

	Raw Mat'l Inv. 131000		Fin Gds Inv. 134000		A/P 211000		WIP Inventory 138000		A/R 121000	
Period 1	B	120			A-1 / A-3	800 / 1000	G1 390			
Period 2	B	50	E 500 / X	/ 500	A-1 / A-3	800 / 1000		390 (G2)	Y 750	

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

	Salary Exp 610000		Raw Mat'l Consum 510000		Revenue 410000		Sales Discounts 420000		Cost of Goods Sold 500000	
Period 1	A-1 800 / A-3 1000		B 120							
Period 2	A-1 800 / A-3 1000		B 50			800 (Y)	Y 50		X 500	

	Mfg Output - Std 519000		Mfg. Output - Var 519500		Production Variance 531000*		WIP Offset 511000*	
Period 1							G1	390
Period 2		500 (E)		175 (T)	T 175		G2 390	

*Cost elements are not created for WIP and production variance (price difference) accounts.

T-Accounts: CO Secondary Cost Elements

CO - SECONDARY COST ELEMENTS

	Utilities Assessment 810000		Setup Hours 802000		Labor Hours 801000		Machine Hours 800000		CO-PA Assessment 811000	
Period 1	A-2 800 / A-2	/ 800	C-1 20 / C-1	/ 20	C-2 40 / C-2	/ 40	C-3 60 / C-3	/ 60	R-1 / R-2 / R-3 / R-4 / R-5	170 / 155 / 185 / 140 / 880
Period 2	A-2 800 / A-2	/ 800			C-2 60 / C-2	/ 60	C-3 60 / C-3	/ 60	R-1 / R-2 / R-3 / R-4 / R-5	187.5 / 155 / 185 / 157.5 / 880

	Material OH 840000		Machine OH 841000		Labor OH 842000		Admin OH 843000	
Period 1	F-1 30 / F-1	/ 30	F-2 45 / F-2	/ 45	F-3 15 / F-3	/ 15	F-4 60 / F-4	/ 60
Period 2	F-1 12.5 / F-1	/ 12.5	F-2 45 / F-2	/ 45	F-3 15 / F-3	/ 15	F-4 42.5 / F-4	/ 42.5

T-Accounts: CO Secondary Cost Elements

	RA - Valuated 820000		RA - Calculated 821000		RA - Material 822000		RA - Machine 823000		RA - Labor 824000	
Period 1	G-1 390		G-1		G-1	120	G-1	60	G-1	40
Period 2	G-2	390	G-2		G-2 120		G-2 60		G-2 40	

	RA - Setup 825000		RA - OH Material 826000		RA - OH Machine 827000		RA - OH Labor 828000		RA - OH Admin 829000	
Period 1	G-1	20	G-1	30	G-1	45	G-1	15	G-1	60
Period 2	G-2 20		G-2 30		G-2 45		G-2 15		G-2 60	

- Results analysis (RA) cost elements are updated based on the cost elements that are posted to the production order.

- The "RA – Valuated" cost element tracks all debits to the production order (costs posted during production), while the "RA – Calculated" cost element tracks all credits to the production order (standard cost of product received into inventory). Together, the valuated and calculated cost elements reflect the amount that will be posted to the balance sheet WIP account during order settlement. In this example, no finished product was received at the end of period 1, so there is no value in the calculated RA cost element.

- All other RA cost elements reflect the amount that will be posted to the P&L WIP offset account during order settlement. These RA cost elements were set up to track the details for the type of costs posted to WIP so that material, labor, overhead, etc., can be differentiated in reporting. For each period, all debits to the production order are offset as credits to these accounts, and all credits to the production order are offset as debits to these accounts.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

Utilities CCtr 90100
	Debit	Credit
Period 1	A-1 800	
		A-2 800
Period 2	A-1 800	
		A-2 800

Mat'l OH CCtr 30250
	Debit	Credit
Period 1	A-2 200	
		F-1 30
		R-1 170
Period 2	A-2 200	
		F-1 12.5
		R-1 187.5

Mach OH CCtr 30260
	Debit	Credit
Period 1	A-2 200	
		F-2 45
		R-2 155
Period 2	A-2 200	
		F-2 45
		R-2 155

Labor OH CCtr 30270
	Debit	Credit
Period 1	A-2 200	
		F-3 15
		R-3 185
Period 2	A-2 200	
		F-3 15
		R-3 185

Mfg Admin OH CCtr 30280
	Debit	Credit
Period 1	A-2 200	
		F-4 60
		R-4 140
Period 2	A-2 200	
		F-4 42.5
		R-4 157.5

Production CCtr 30100
	Debit	Credit
Period 1	A-3 1000	
		C-1 20
		C-2 40
		C-3 60
		R-5 880
Period 2	A-3 1000	
		C-2 60
		C-3 60
		R-5 880

Production Order xxxxxxxxx
	Debit	Credit	Description
Period 1	B 120		Raw material
	C-1 20		Set-up hours
	C-2 40		Labor hours
	C-3 60		Machine hours
	F-1 30		Material OH
	F-2 45		Machine OH
	F-3 15		Labor OH
	F-4 60		Admin OH
Period 2	B 50		Raw material
	C-2 60		Labor hours
	C-3 60		Machine hours
	E	500	Receive fin goods
	F-1 12.5		Material OH
	F-2 45		Machine OH
	F-3 15		Labor OH
	F-4 42.5		Admin OH
	T	175	Settle variances

Operating Concern 0010
	Debit	Description
Period 1	R-1 170	OH CCtr Ass'mnt
	R-2 155	OH CCtr Ass'mnt
	R-3 185	OH CCtr Ass'mnt
	R-4 140	OH CCtr Ass'mnt
	R-5 880	Prd CCtr Ass'mnt
Period 2	T 175	Variances
	Y 800	Revenue
	Y 50	Discount
	Y 500	COGS
	R-1 187.5	OH CCtr Ass'mnt
	R-2 155	OH CCtr Ass'mnt
	R-3 185	OH CCtr Ass'mnt
	R-4 157.5	OH CCtr Ass'mnt
	R-5 880	Prd CCtr Ass'mnt

Variances: ProdOrd Costs vs. Std. Cost
E Cost Estimate		T Prod. Ord. Variances	
Material	120	Qty - Matl	50
Setup	20	Qty - Setup	0
Labor	60	Qty - Lab	20
Machine	100	Qty - Mch	40
OH Mat	30 25%	Inpt - Matl	12.5
OH Mach	75 75%	Inpt - Mch	15
OH Labor	20 25%	Inpt - Lab	10
OH Admin	75 25%	Inpt - Adm	27.5
Total Std	0	Total Vars	175

Sales Order Cost Estimate
E Option 1 (selected)		Option 2 (not selected)
Material	120	200
Setup	20	20
Labor	60	60
Machine	100	100
OH Mat	30 25%	50
OH Mach	75 75%	75
OH Labor	20 25%	20
OH Admin	75 25%	95
Total Std	500	620

- Variance categories are determined based on the cost elements that make up the standard cost of the product.
- The cost estimate on the sales order can be viewed as the "standard" cost of this particular product. Although two different sales order cost estimates are possible, the cost estimate used is based on the customer selections chosen using variant configuration, which in this scenario is option 1.

FI/CO Reconciliation

FI

The FI module includes both balance sheet and P&L accounts. Only the P&L accounts can be created as cost elements and posted to both the FI and the CO modules. Cost elements determine for which accounts additional detail should be tracked with controlling objects, such as production orders and cost centers.

Of the accounts in this example, only the following are not created as cost elements in the CO module:

- The WIP offset account (511000)

- The production variance (price difference) account (531000)

The WIP account is a placeholder that moves the production costs to the balance sheet during the production process. The variance account contains the net impact on the P&L at the end of the production process.

CO

Production costs that flow through a production order, not through a cost center, include:

- Material costs that are directly posted to the production order

- Labor and machine time posted from the production cost center to the production order

- Overhead allocations from the manufacturing pool cost centers

In FI, direct postings made to the service and production cost centers are reflected, but the activity allocation and the overhead applied from the cost centers to the production orders are only reflected indirectly. The allocations are reassigning costs originally posted to other expense accounts in the G/L, such as salary accounts. Reconciliation is necessary because the material's standard cost includes these reassigned costs, which are the activity rates and the overhead allocations, when both the production order and the G/L are credited for this material.

To reconcile the postings that occur during the production process, the original accounts that contain the expense postings to the production and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original postings to FI and CO are included during the reconciliation of the production process, the production order has no net impact on the P&L other than the written-off variances.

When profitability analysis is used, the cost center variances are not directly reflected in variance accounts in FI, but are analyzed in CO or CO-PA. The variances are included in the original expense postings to the cost centers. Although a manual entry to the G/L is possible to reclassify these variances to a cost center variance account, this entry would not be reflected in CO so that the variances would not be double-counted. This manual entry is not used in this example.

Reconciliation

Due to the nature of the FI/CO module functions, where not all CO transactions (such as hourly activity rates and overhead allocations) are reflected in FI accounts, a reconciliation process must take place. This reconciliation ensures that the FI and CO modules remain balanced for reporting.

The goals of this reconciliation are to determine whether the:

- FI accounts are in balance with the CO postings
  The production process managed by the production order should have a net zero impact on the P&L. The only impact should be on the written-off production variance (price difference) account. Cost center variances are not reclassified in the P&L in this example.

- Variances in the CO objects are consistent with variances reported in CO-PA
  Once the production process is complete, variances in the controlling objects must be cleared using period-end processes. Production order variances are settled to a variance account and to profitability analysis. Cost center variances are assessed to profitability analysis. The variances reported in CO reporting and in profitability analysis reporting are the same.

Reconciliation Procedure

All debits and credits to the P&L accounts in the production process are accumulated. The production variance (price difference) account is initially excluded, because it represents a reclassification of the written-off variances. The other accounts contain only the cost center variances, which are represented in CO-PA, but not on the G/L. The production order variances are the same in product cost reporting and in profitability analysis reporting. The cost center variances are the same in cost center reporting and in profitability analysis reporting.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process	DR	CR	CO	DR	CR	CO Variances CR to CO	PA Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	120		Matl OH CCtr	200	30	170	OH CCtr Vars
MfgOut-Std			Mach OH CCtr	200	45	155	OH CCtr Vars
MfgOut-Var			Labor OH CCtr	200	15	185	OH CCtr Vars
WIP Offset		390	Admin OH CCtr	200	60	140	OH CCtr Vars
			ProdCCtr	1000	120	880	Prod CCtr Var
			Prod Ord				Prod Ord Var
	1920	390	Subtotal	2600	1070	1530	CCtr Var
CCtr Var	1530		DR/CR bal for CO	0			

Period 2

FI/Production Process	DR	CR	CO	DR	CR	CO Variances CR to CO	PA Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	50		Matl OH CCtr	200	12.5	187.5	OH CCtr Vars
MfgOut-Std		500	Mach OH CCtr	200	45	155	OH CCtr Vars
MfgOut-Var		175	Labor OH CCtr	200	15	185	OH CCtr Vars
WIP Offset	390		Admin OH CCtr	200	42.5	157.5	OH CCtr Vars
			ProdCCtr	1000	120	880	Prod CCtr Var
			Prod Ord	675	500	175	Prod Ord Var
	2240	675	Subtotal	3275	1535	1740	Total Var
CCtr Var	1565		DR/CR bal for CO	0			CCtr + Ord Vars
ProdOrd Var	175						(1565 + 175)
Total Var	1740						

As a result of the T-accounts on the previous page, we concluded that:

- There is a net impact of zero on the manufacturing process for the production order. Only production order variances have a P&L impact once the order has been completed.

- The variances on the controlling objects are depicted in the CO section prior to the clearing of these variances to profitability analysis.

- The variances on the production order are consistent. The variances are the same in the G/L account, on the production order, and in CO-PA.

- Since the sales order item is not a controlling object, no postings were made directly to the sales order item. For this reason, the sales order does not need to be included in the reconciliation process.

- All production order costs, regardless of the period in which they were posted, are only considered at the time that the order is settled. Production order costs that were posted in period 1 are handled in FI with the WIP process. Since there is no FI impact due to the open production order, the WIP amount does not flow into CO-PA.

- Variances, or balances, analyzed on the cost center level cannot be analyzed in "variance" accounts in FI, but must be analyzed in CO or CO-PA. The object (cost center) variances are not reflected in a FI variance account. The variances are contained in the cost elements that were used to post costs to the cost center (i.e. salary and supplies expenses posted to the cost center).

- If the cost center variances were to be reflected in FI, a manual journal entry to a cost center offset account and to a cost center variance account would be necessary to reclassify these variances. To avoid double-counting the cost center variances, neither of these accounts should then be created as cost elements, since the cost centers have already been cleared to CO-PA.

Cost-Based Profitability Analysis

Overview

Profitability analysis (CO-PA) is a separate module where the cost of sales can be analyzed.

CO-PA captures transactions from the:

- Sales and Distribution (SD) module when an invoice is processed

- Financial (FI) module with direct journal entries

- Controlling (CO) module from cost center assessments

- Production Planning (PP) module with the settlement of production orders

Identifying the characteristics that determine how profitability should be analyzed, such as customers, customer groups, products, product hierarchies, geographic regions, etc., is used to configure CO-PA. Additionally, the values that are captured, such as the quantity of a product that is invoiced, the revenue and discounts applied when the product is sold, variances that are captured in the production order, and other cost allocations must be identified and created in CO-PA.

One CO-PA document is created for each line item invoiced in a sales order, for each production order settlement, and for each sender-receiver combination in cost center assessments. The receiver is a profitability segment, which is a unique combination of the values of the characteristics used to measure

profitability. For example, different customer numbers result in different profitability segments. Profitability segments are incorporated into the CO module, so that transactions can be carried out between other controlling objects, such as cost centers and orders, and a profitability segment. Once a value has been posted to CO-PA, the revenue and costs can no longer be allocated out of CO-PA via normal CO processing.

Design Decisions

This example includes the use of profitability analysis (CO-PA). Although many different design options exist for CO-PA, this example only illustrates data flows as they pertain to costing this MTO with valuated stock production scenario. CO-PA functionality and implementation outside of this scope will not be discussed here. The following design decisions and configuration options were implemented for the set up of the CO-PA operating concern for this product costing scenario:

- Cost-based CO-PA is used to match the revenues and costs of products so that cost of sales and contribution margin analyses can be carried out.

  Value fields are used to capture cost and revenue data. Cost elements are mapped to value fields in configuration, but cost elements are not available in cost-based CO-PA.

- The cost of a product (cost of sales) is only posted to CO-PA at the time that the revenue is posted, or when the invoice is passed to accounting.

  Since the finished product is a configurable product, a standard cost is not maintained. A "temporary" standard cost based on the unique options chosen in the sales order, using variant configuration, is captured in the sales order item cost estimate. The cost component detail is passed to CO-PA. It is possible to combine this detail into fewer value fields than used in this example.

- Fixed and variable costs were posted to separate value fields.

  This will allow for a more detailed analysis of contribution margins. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to accumulate the existing value fields, either by creating additional summarized valued fields or by summarizing the detailed value fields in reporting.

- Once the order is complete, the production order variances are posted to CO-PA at the time of production order settlement.

  The variance detail passed to CO-PA mirrors the cost component detail that makes up the sales order item cost estimate. This step allows a more exact matching of variances with the sales order item cost estimate of products that are sold. Since not costs are posted directly to the sales order when valuated stock is used, the sales order also does not need to be settled to CO-PA. It is possible to combine this detail into fewer value fields, such as a total variance field, or two fields to capture the fixed and variable portions of the variance. It is also possible to split the variance detail into additional value fields, using the variance categories generated during the variance calculation on the production order (quantity variance, resource-usage variance, and so on).

- Variances are posted to profitability analysis (CO-PA) during the period in which they occur.

  This step may not occur in the same period that the product was sold, or when the cost of sales is recognized for a specific product.

- User-defined characteristics were set up to include fields that are obtained from the material master, the customer master, and the invoice.

  The rules according to which these fields are updated include:
  - Characteristics that are obtained from the material master are updated whenever the material number is passed to CO-PA. Examples of this posting include invoicing (the material number is on the line item level of an invoice) and the posting of production order variances (the material number is on the header level of the production order).
  - Characteristics that are obtained from the customer master are updated whenever the customer number is passed to CO-PA. An example of this posting is invoicing (the customer number is on the header level of an invoice).
  - Characteristics that are obtained from the invoice are updated whenever the invoice number is passed to CO-PA. This occurs during invoicing, but not during the posting of production order variances.

- Allocations from the overhead and production cost centers to profitability analysis segments may occur based on data that has been captured in CO-PA.

  Data in CO-PA includes revenue, cost of sales, variances, and direct postings. The combination of characteristics to which the assessment is applied is determined in the configuration of the cost center assessment. If the assessment occurs to a product, all other data related to the material master is also captured; if the assessment occurs to a product and customer, all product and customer-related characteristics will also be populated. However, these types of allocations should typically not be performed to the lowest level of detail, such as product number, but should instead be based on higher-level characteristics, such as product lines or geography.

Issues

Issues that may be encountered in reconciling the production postings into cost-based profitability analysis with the G/L include:

- Cost-based CO-PA uses a cost of sales approach, where the standard cost of sales is not recognized until a product is sold. There is a time lag between the time that the cost of sales is posted to the G/L (when the product is delivered), and when the cost of sales is posted to CO-PA (when the product is invoiced). If the delivery and the invoice occur in different periods, it is a reconciling item between the G/L and CO-PA due to timing differences.

- WIP is not transferred to profitability analysis. A profitability segment is viewed as a controlling object to which costs in the Controlling (CO) module are transferred. Since WIP is a background process to ensure that the balance sheet contains the correct values, and no posting is made directly to the production order, the WIP balance cannot be transferred into CO-PA. A reconciliation must take place (as previously described). It is also possible to make a direct entry into CO-PA to account for the WIP offset posting to the P&L, but this option is not used in this example.

- Cost elements and G/L accounts are not available in cost-based CO-PA. The reconciliation between CO-PA and the G/L must occur using value fields (categories of expense) and high-level (such as company code and business area) information on the side of CO-PA. The information captured in CO-PA at the lower levels is not available in journal entries in FI.

- Value fields can be freely defined to include more or less detail than the approach used in this example. If the value fields are defined at a detailed level, they can be summarized by updating an additional value field that accumulates values from several other value fields, or they can be summarized in reporting. If they are captured at a very high level, drill-down to additional detail is only available in the originating module (SD, CO, CO-PC), not in profitability analysis (CO-PA).

The chart on the following page contains sample characteristics and value fields used by the production process. Fixed characteristics are automatically generated when the operating concern is generated. For clarity, the administrative characteristics (time, date, user ID stamps at creation, alternate currencies, fixed parameters such as client and ledger numbers, and similar data) are not listed. Up to 30 additional user-defined characteristics may be created and populated in CO-PA. All value fields, up to 120, must be defined in cost-based CO-PA. The value fields are updated at the following times:

- Passing an invoice to accounting updates the revenue, discount, freight, and cost of sales value fields.

- Settling production order variances updates the variance fields that are related to the COGS cost components.

- Assessing cost centers updates the cost center variance fields.

CO-PA Fields Updated by an Invoice

Characteristics	Invoiced quantity	Revenue - Domestic	Revenue - Internat'l	Revenue - Government	Discounts - Domestic	Discounts - Internat'l	Discounts - Government	Freight - Domestic	Freight - Internat'l	Freight - Government	COGS - Raw material (variable)	COGS - Semi-finished goods (fixed)	COGS - Semi-finished goods (variable)	COGS - Prod Setup (fixed)	COGS - Prod Setup (variable)	COGS - Prod labor (fixed)	COGS - Prod labor (variable)	COGS - Prod machine (fixed)	COGS - Prod machine (variable)	COGS - OH Material (fixed)	COGS - OH Material (variable)	COGS - OH Labor (fixed)	COGS - OH Labor (variable)	COGS - OH Machine (fixed)	COGS - OH Machine (variable)	COGS - OH Admin (fixed)	COGS - OH Admin (variable)	COGS - OH Sales/Marketing (fixed)	COGS - OH Sales/Marketing (variable)	COGS - Miscellaneous (fixed)	COGS - Miscellaneous (variable)
Fixed																															
Document number	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Item number																															
Record type	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																															
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Business area	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales organization	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Distribution channel	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Division	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Plant	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Product	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Customer	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Reference document no.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Reference item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales order	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales order item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Billing type	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Goods issue date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Invoice date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Posting date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Fiscal year	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Period	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profit center	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
WBS element																															
Order																															
Cost object																															
Sender cost center																															
Tracing factor																															
Cost element																															
User-Defined																															
Product hierarchy - Lvl 1	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Product hierarchy - Lvl 2	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Product hierarchy - Lvl 3	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Customer group	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales district	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales office	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

(Columns 1–10 are grouped under **Value Fields — Invoice (Revenue)**; columns 11–31 are grouped under **Value Fields — Invoice (Standard Cost)**.)

- Hidden rows for control data is usually not used for analysis.

- The fields in bold indicate that the field is visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

CO-PA Fields Updated by Period-End Controlling Processes

Characteristics	Value Fields — Production order settlement																					Value Fields — CCtr Assessments			
	Variances - Raw material (variable)	Variances - Semi-finished goods (fixed)	Variances - Semi-finished goods (variable)	Variances - Prod Setup (fixed)	Variances - Prod Setup (variable)	Variances - Prod labor (fixed)	Variances - Prod labor (variable)	Variances - Prod machine (fixed)	Variances - Prod machine (variable)	Variances - OH Material (fixed)	Variances - OH Material (variable)	Variances - OH Labor (fixed)	Variances - OH Labor (variable)	Variances - OH Machine (fixed)	Variances - OH Machine (variable)	Variances - OH Admin (fixed)	Variances - OH Admin (variable)	Variances - OH Sales/Marketing (fixed)	Variances - OH Sales/Marketing (variable)	Variances - Miscellaneous (fixed)	Variances - Miscellaneous (variable)	Variances - OH CCtr (fixed)	Variances - OH CCtr (variable)	Variances - Prod CCtr (fixed)	Variances - Prod CCtr (variable)
Fixed																									
Document number	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Item number																						**X**	**X**	**X**	**X**
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**X**	**X**	**X**	**X**
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																									
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Business area	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales organization																									
Distribution channel																									
Division	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Plant	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Product	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Customer																									
Reference document no.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Reference item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Sales order	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Sales order item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Billing type																									
Goods issue date																									
Invoice date																									
Posting date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Fiscal year	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Period	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Profit center	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
WBS element																									
Order	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Cost object																									
Sender cost center																						**X**	**X**	**X**	**X**
Tracing factor																						X	X	X	X
Cost element																						**X**	**X**	**X**	**X**
User-Defined																									
Product hierarchy - Lvl 1	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Product hierarchy - Lvl 2	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Product hierarchy - Lvl 3	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Customer group																									
Sales district																									
Sales office																									

- Hidden rows for control data is usually not used for analysis.

- The fields in bold indicate that the field is visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

Special Topics

Make-to-Order Controlling Options

In Release 4.x of SAP, there are three options for product costing in the make-to-order environment:

• Make-to-order without sales order controlling, using valuated stock

• Make-to-order with sales order controlling, using valuated stock

• Make-to-order with sales order controlling, without valuated stock

Sales order controlling means that the sales order item is the controlling object for product costing. When sales order controlling is used, month-end processing takes place on the sales order item instead of the production order.

Using valuated sales order stock allows quantities and financial values to be posted consistently during inventory transactions in a MTO environment. This allows the flow of material to be tracked both in finance and in inventory management at the same time. Using unvaluated sales order stock tracks the inventory management flow, but all costs related to the manufacturing process are controlled and posted separately (later) through the sales order item settlement.

Make-to-Order Without Sales Order Controlling

This scenario illustrates MTO manufacturing without the use of sales order controlling, and with the use of valuated stock. The sales order item is not a controlling object, so no month-end processing takes place against the sales order, only against the production order. Additionally, the cost of sales entries are made in a consistent manner with the make-to-stock process. This option should be used when:

• Controlling is focused on products, not on sales orders.

• Production volumes are high.

• Variability of the product is low, for example the product is assembled or has few variations that can be chosen by the customer.

• Consistency with a make-to-stock process is desired.

• A simple controlling process for the MTO environment is desired.

• Inventory (quantity) and financial (value) flows should be kept consistent.

• No additional sales-related costs, such as marketing overhead allocations or creation of reserves, must be calculated on an order-by-order basis.

Make-to-Order with Sales Order Controlling Without Valuated Stock

For this type of environment, the sales order item is a controlling object, so month-end processes are carried out on the sales order item level. During the inventory movements that are posted for the finished product, no financial entries are made. All financial entries are calculated by the sales order, and are posted as part of the month-end process of the sales order. This option should be used when:

- The value of the MTO product is high, and needs to be controlled by each individual sales order. This allows margin analysis to be performed on a sales order item before data is transferred to CO-PA, so that action can be taken earlier in the MTO manufacturing process.

- The volume of production is low.

- The complexity of the finished product, or the number of options available, is high.

- Special sales and marketing costs need to be assigned at the sales order level.

- Costs for reserves and goods in transit must be calculated on the sales order.

- Variance categories on the production order are not required for analysis.

- You are using Release 3.x of SAP.

Make-to-Order with Sales Order Controlling with Valuated Stock

This type of environment is a hybrid between the previous two options. The sales order item is a controlling object, so month-end processes are carried out on the sales order item level. Since valuated stock is used, financial entries are made at the same time as the inventory movements of the finished product. In such a scenario, extreme care must be taken to ensure that values calculated using the month-end processes for a sales order item are consistent with the financial postings that are made during the inventory movements. This option should be used when:

- Inventory (quantity) and financial (value) flows should be kept consistent.

- The value of the MTO product is high, and needs to be controlled by each individual sales order. This allows margin analysis to be performed on a sales order item before data is transferred to CO-PA, so that action can be taken earlier in the MTO manufacturing process.

- Special sales and marketing costs need to be assigned at the sales order level.

- Costs for reserves and goods in transit must be calculated on the sales order.

- The volume of production is low.

- The complexity of the finished product, or the number of options available, is high.

- Variance categories on the production order are not required for analysis.

Chapter 5: Product Costing Flow for Make-to-Order Production with Profitability Analysis

Contents

The following graphic provides an overview of the make-to-order (MTO) process:

This chapter describes the accounting logic associated with SAP's MTO production process, using sales orders and valuing the cost of sales of the finished product with actual production costs. In this process, the following items are documented:

- Production flow with sales orders

- Interaction of sales orders and production orders

- Associated T-accounts

- Reconciliation of the T-accounts

The current example uses profitability analysis (CO-PA). The assumptions made during the configuration of CO-PA are discussed in a later section.

The sales order is the focus of the direct, controllable costs incurred during the MTO production process. In this example, based on the MRP requirements configuration, the material costs are handled directly on the sales order. This order automatically creates a production order with MRP processing to manage the direct resources used to produce a unique product. These manufacturing costs may be incurred during the production of a finished, or a semi-finished product (subassembly). The indirect costs associated with the product's cost are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to a sales order and to a production order

The differences between SAP's product costing process and most U.S. legacy systems are that:

- In R/3, inventory does not flow through cost centers

  Rather than tracking inventory, the cost centers track total available labor costs, machine costs, and indirect production expenses. In the MTO environment, instead of cost centers, our sales orders capture the product's total cost.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet

  In most legacy systems, production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. Using the Controlling (CO) module, the production costs associated with an order are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account.

On the following pages, each step in the process is described, followed by the T-accounts used in the pre-configured client. A method of reconciling the general ledger (G/L) accounts with the CO objects used in MTO manufacturing is also explained. This chapter describes the only method available to do MTO costing in Release 3.x. Chapter 4, *Product Costing Flow for Make-to-Order Production with Valuated Stock and Profitability Analysis,* offers additional choices that result in a simplified process.

TechTalk

> The numbering scheme was developed to allow additional processing for product costing using different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Sales Orders

Overview

Each step in the MTO production process is described on the following page. Product costing is closely tied to production, so the financial and costing entries automatically result from the daily manufacturing transactions that are entered into the system. The month-end processes are necessary to complete the financial picture for product costing. In the following example, we assume that the sales and production orders remain open for two periods and that:

1. Costs are posted to the cost centers.

2. During creation of a sales order, the options chosen using variant configuration are used to determine the components that will be required to build the customer-specific product.

3. MRP is run.

   Based on the sales order, a purchase requisition is created for all non-stock components, and a planned production order is created to manage the manufacturing process for the MTO product.

4. The purchase requisition is converted to a purchase order.

5. The components are received directly to the sales order with the purchase order.

6. The planned order is converted to a production order.

7. Resources (activities) are provided from the production cost center to the production order.

8. The month-end process is executed for sales orders, production orders, and cost centers.

The sales order is used to manage the external costs and resources, and the production order is used to manage the internal costs and resources. The sales order combines all product costing resources and costs. The use of configurable materials is illustrated in this chapter. The finished product may have multiple options, each of which could result in a different standard cost of the product. However, since variances should not be incurred simply because a different option of the finished product was chosen by the customer, no standard cost can be maintained on these configurable materials. A planned cost is available for each sales order item instead of a standard cost, but the total actual costs incurred in the manufacturing process for the finished good are considered to be the cost of sales.

This business process may not reflect every manufacturing scenario. In many industries, some component materials are received against the sales order across periods, and not only at the beginning of the manufacturing process. Other industries may receive goods against a production order. There may also be differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, others are manufacturing overhead (indirect) costs (steps A-1 to A-3 are examples of these postings). In this example, the cost center design uses separate cost centers for the direct production costs and for each type of manufacturing overhead cost. The cost center design is flexible, but other options are not discussed at this time.

The following cost center structure and transactions illustrate the design used for this chapter:

• Post costs to service or administrative cost centers

At a plant-wide level, utilities and rent must be considered during the production process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products being produced, but the overall indirect costs and their variances are not managed at the product (sales or production order) level. In this cost center design, the utilities and services are managed at a cost center level, but these cost centers allocate their costs to the manufacturing overhead pools. These cost centers, in turn, manage the variances of the indirect costs.

In this example, actual salaries are posted to a utility cost center in both periods. Salaries are a direct cost for the utility cost center, but an indirect cost for the overall production process. Other costs, such as maintenance, repair, and operations (MRO) materials and supplies may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

• Allocate from service and administrative cost centers to manufacturing overhead pools

Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers will allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this example, the expenses incurred by the utility cost center are allocated to all manufacturing overhead pool cost centers, with the

material and administrative cost centers receiving three-fourths of the allocation, and labor and machine overhead cost centers receiving the remaining fourth.

- Post costs to the production cost center

  Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center will later supply resources, such as labor and machine time, to the production order. The cost center manager will determine a rate for each of these resources, represented by system activities, which are often managed in hours. The hourly rate may be manually entered by the cost center manager or be calculated by the system based on the planned expenses and planned hours available in the cost center.

Step B: Raw Material Is Directly Received by the Sales Order from a Purchase Order

Material components may be received against either the production order or directly against the sales order. This process is determined by the configuration of the MRP requirements for each component. For non-stock items, a purchase requisition is created, either by the sales or production order. For stock items, the goods issue may occur directly to the sales order or to the production order. For components that are unique to a customer order, the goods issue takes place directly to a sales order. The unique items that are directly issued or received to the sales order are considered to be sales order stock. For common items taken out of unreserved inventory, the components may be directly issued to the production order. Once it is complete, the unique finished product is considered to be sales order stock. The discussion below only concentrates on the example used in this chapter.

When the sales order is saved, a purchase requisition is automatically created for each non-stock item on the bill of material (BOM). In this example, since different options are available for a typical finished product all components are non-stock items, these components are not stocked but rather are acquired based on demand. Variant configuration in the sales order is used to select the appropriate components for which the purchase requisitions are automatically created.

Each purchase requisition must undergo normal processing by the purchasing department, which may involve approvals and online releases, before it is converted to a purchase order. When the components are received against the purchase order, they are not placed into inventory. Rather, they are physically received directly onto the production floor, referencing the sales order in the system. Any additional charges for these items, which are recorded during invoice verification, are also directly posted to the sales order.

In this example, raw materials are received against the sales order at their moving average cost. All required components are received to the sales order at the beginning of period 1, and no additional components are received during period 2. This process may regularly occur in some industries, and in other industries, the receipt of the components occur across periods based on a production schedule.

Series C: Activities Are Allocated from the Production Cost Center to the Production Order

After the sales order is saved, MRP is run against the new requirement that is created by the sales order. A planned order is automatically created, which manages the internal resources required to produce the product that was ordered by the customer. The planned order is then converted to a production order, so that the finished product can be manufactured.

The production cost center supplies value-added resources, such as labor and machine time, to the production order. From a production perspective, the resources are represented by work centers. From a costing perspective, the resources are represented as activities (such as labor hours and machine hours)

and each activity has a planned rate. The activities are linked to the work center in the master data. The resources (activities) used to produce the finished goods are posted to the production order. The quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed. These hours are based on the quantity of finished goods to be produced by the production order and the routing used in this order.

For this production order, because confirmation occurs manually at the operation level (and not through backflushing), the standard number of hours that default from each operation in the routing can be updated to reflect actual hours.

The following list assumes that setup, labor, and machine times are posted to the production order for both open periods:

- Setup labor hours are allocated from the production cost center to the production order

   The standard setup time is developed for a certain lot size, so it is spread over the entire quantity of finished products that are manufactured using the production order. If there are lot size fluctuations, the standard setup time still does not change. (We assume that setup is independent of the lot size.) In this example, setup time is assumed to be labor hours.

- Labor hours are allocated from the production cost center to the production order

   The standard number of labor hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units produced in the production order.

- Machine hours are allocated from the production cost center to the production order

   The standard number of machine hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units that are produced in the production order.

Step E: Finished Goods Are Received into Inventory from the Production Order

The completed finished goods are entered as a goods receipt from the production order. However, the product is not placed into inventory. Since it was produced to a customer's specifications, placing it into inventory would allow another customer to purchase the product. The goods receipt places the finished good into sales order stock. It is linked to the sales order that was used to manage the overall production of the finished product. The goods receipt signals the sales order that the manufacturing of the finished product is complete, and that the product may now be delivered to the customer. Since the product is not placed into inventory, no accounting entries take place at this time. All costs that are incurred during the production of the finished product have been posted to the sales and production orders and continue to reside on the P&L in various accounts (material consumption, salary expense, and so on).

An automatic goods receipt is also possible when the final operation is confirmed. If a production order has been created for more than one unit of the finished good, a goods receipt for a portion of the quantity may be processed. This portion of the ordered product is then available for delivery to the customer. In this example, once the entire production order has been completed, the goods receipt is only posted at the end of period 2.

Step X: Deliver Product to the Customer

Once production of a finished product has been completed and the product has been received into sales order stock, it can be delivered to a customer. Since the product was not received into inventory, it is also not taken out of inventory. The sales order stock is relieved when the delivery is processed. Again, no

accounting entries take place at this time. All costs that are incurred in the production of the finished product still remain on the P&L.

Step Y: Invoice the Customer

In most cases, invoicing only occurs after the finished product has been shipped to the customer. At this time, the revenue is posted to the G/L and to the sales order. In MTO production, the controlling object for the revenue posting is the sales order. For any one transaction only one "real" controlling object (the sales order) can be referenced, and this is the sales order; therefore, no posting to CO-PA occurs at this time.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Sales and Production Order

Overhead is applied to the sales and production orders, thereby posting additional costs to each of these orders. The overhead application is split between the sales and production orders because the direct costs posted during the manufacturing process are also separated between these two controlling objects.

The applied overhead cost is a percentage of the direct costs that have already been posted to the sales and production orders during the period. If overhead processing is run more than once in the same period, only the difference in the overhead from the previous run is applied to each of the orders. A costing sheet is associated with the sales and production orders, and stores the rules to apply these overhead costs. In this example, the same overhead costing sheet is used for the sales and production orders. It is possible to limit the overhead costing sheet in the sales order to apply overhead only to material components issued directly to the sales order and not to material issued to the production order; since no material components are issued to the production order, this topic is not addressed. It is possible to apply an overhead rate based on the quantity of material components that were issued to the sales and production orders; this technique is not used in this chapter. Although the overhead design is flexible and may involve the use of internal orders, the other options are not discussed at this time.

In this example, separate overhead cost centers and separate overhead rates are used for each type of overhead being applied. A different process must be run in the system to apply overhead to the production order, then to the sales order. The following four manufacturing overhead pool cost centers are used to apply these different overhead types:

- Machine overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the production order during the period.

- Labor overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as human resources and accounting department costs, that are related to production workers. The overhead percentage rate is based on the cost of the labor time that was confirmed for the production order during the period. Based on the assumptions in this chapter, this rate includes setup and normal labor time.

- Administrative overhead to the production order

For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the production order. The overhead percentage rate is based on all costs posted to the production order during the period. The portion of the administrative costs that result from direct postings to the production order is applied.

- Material overhead to the sales order

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the sales order during the period. Since material is only issued to the sales order in the first period, material overhead is only applied in the first period.

- Administrative overhead to the sales order

  For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the sales order. The overhead percentage rate is based on all costs posted to the sales order during the period. The portion of the administrative costs that result from direct postings to the sales order is applied. In this example, the same overhead cost center is used to apply the overhead to the sales order that was also used to apply overhead to the production order. Since material is only issued to the sales order in the first period, administrative overhead for that material is only applied in the first period.

Series G: Results Analysis for Sales Order

In SAP, since the manufacturing costs are tracked on the P&L statement, the balance of all open sales orders must be moved to the balance sheet at the end of the period. This movement ensures that the materials issued to the sales order remain in inventory and are not written off before production is complete. If the open order balance is positive, the P&L is credited and the balance sheet is debited. If this balance is negative, the P&L is debited and the balance sheet is credited. The manufacturing costs are split between the sales and production order, but the sales order is used as the controlling object for month-end processing in the MTO environment.

When calculating results analysis (RA) and displaying sales order costs, production order costs are included in the sales order processing and reporting under two conditions. The first is that the production order is in the same company code as the sales order, and the second is that all costs have been settled to the highest level of a collective order. The WIP posting to the G/L is not displayed when displaying sales order costs. This impact is purely a financial transaction and does not affect the normal manufacturing process or the order balances in the sales and production orders.

A sales order is considered open when revenue has not yet been posted to it. As long as the sales order remains open, the costs that are incurred in producing the finished goods are calculated to be the WIP amount. Separate RA cost elements track the WIP amounts so that these amounts are not directly posted to the sales order. These elements are then used to make the entry to the G/L, but not directly to the sales order. If a sales order remains open for several periods, the WIP balance is recalculated for each period, and the adjustments are posted to the G/L. The WIP balance cannot be automatically carried over into CO-PA.

Once a product has been completely manufactured, it is delivered to the customer. At this point, invoicing takes place. Since all associated costs are already on the P&L during product delivery, no postings to the G/L are made. However, these costs are not classified as cost of sales; instead, the cost of sales resides in the material consumption account, the salary expense account (the source of the activity rates), and so on.

Once revenue has been posted to the sales order, the RA calculates the product's total manufacturing cost, and posts this amount to a cost of sales account with an offset to a manufacturing output account.

In this example, the P&L account is a single offsetting account for all postings to the P&L in the manufacturing process, either to the sales or to the production order. This account is not a cost element, so no direct postings to the sales or production orders take place. The calculated WIP amount is stored in RA cost elements, which refer to the originating sales order. The components of the WIP balance are analyzed using these RA cost elements. Once revenue has been received for the product, the cost of sales is calculated and posted to the G/L. Since no standard exists for configurable materials, the cost of sales is the actual cost of production. The material in this example is a configurable material, which can have several options. Choosing a different option should not result in a variance, so the actual costs are posted to the G/L.

To complete WIP processing:

1. Calculate WIP (posted at settlement)

   When the RA process is run, WIP is calculated for sales orders for which revenue has not been posted. In this example, the sales order remains open at the end of period 1.

2. Cancel WIP (posted at settlement) and calculate cost of sales (posted at settlement)

   When the RA process is run, WIP is canceled for sales orders that are completely invoiced, or for which a final billing (FNBL) status has been manually set. This step reverses all WIP that has been posted to the G/L and calculates the actual cost of sales for the finished product.

   In this example, WIP is canceled because revenue has been posted to the sales order and final invoicing has taken place. The WIP that was calculated and posted to the balance sheet at the end of period 1 is canceled (or reversed), and the cost of sales account is updated with the actual, total cost of manufacturing the product.

Series R: Assess Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the production cost center's resources. These variances are assessed to CO-PA at the end of the month, where they can be allocated to products, product lines, customers, geography, or other combinations of dimensions (characteristics) tracked in CO-PA. The assessment takes place only in CO, so no posting is made to the G/L.

In this example, the cost center variances are assessed to CO-PA at the end of each period. Optionally, these variances can also be reflected in FI by manually posting a financial entry. However, the assessment to CO-PA already clears the cost center, so if this posting were desired, neither G/L account should be a cost element, and the FI/CO reconciliation would change. This option is not used in this example. The following is a list of these variances:

- Manufacturing overhead variances for material overhead

  The manufacturing overhead cost center, which collects indirect costs related to materials, is assessed to CO-PA.

- Assess manufacturing overhead variances for machine overhead

  The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is assessed to CO-PA.

- Assess manufacturing overhead variances for labor overhead

  The manufacturing overhead cost center, which collects indirect costs related to the production workers, is assessed to CO-PA.

- Assess manufacturing overhead variances for administrative overhead

  The manufacturing overhead cost center, which collects indirect costs related to plant operations that are not specific to a product, is assessed to CO-PA.

- Assess production cost center variances

  The production cost center, which collects direct costs related to production resources, is assessed to CO-PA.

End Period: Run Settlement of Production Orders

Production orders must usually not be settled, since the sales order automatically reads the production order balances. All production orders that were automatically created with the sales order demand have a settlement rule that links them to the sales order. If settlement were to take place, the costs would be credited on the production order and debited to the sales order. There are two exceptions where settlement of production orders must take place:

- The production order that is created by the sales order is a collective order, which is a hierarchy of production orders.

  The settlement process should then be run to settle the lower-level production orders to the highest level of the collective order, so that the sales order RA process picks up all of the manufacturing costs that were posted to the collective production order.

- The production order is linked to a different company code than the sales order.

  For the sales order to include the production order costs, the production order must be settled to the sales order.

Step Z: Settle Sales Order (Posts G-1, G-2)

The RA process previously described updates secondary cost elements, but these values remain in CO. When sales order settlement is run at the end of each period, the RA values are posted to the Financial (FI) module, and the appropriate G/L accounts are updated. Although RA calculates additional values, such as revenue accruals based on actual costs, these values are not posted to the G/L in this chapter. Only the WIP and the final cost of sales are posted to the G/L.

In MTO manufacturing, settlement is used to post values related to the sales order to CO-PA. Once the sales order is finally billed, the revenue and the actual cost of sales (all costs involved in the manufacturing process) are posted to CO-PA. The cost of sales and the revenue are matched in CO-PA, and there are no timing differences between the time that the cost of sales is posted to the G/L and the time it is posted to CO-PA. The actual cost is updated in CO-PA using the cost elements used in the manufacturing process. The cost elements can also be combined into fewer value fields in CO-PA. Any characteristics that have been configured in CO-PA that are related to the sale, such as product number, product line, customer, customer group, and geographic region, are carried over for analysis.

Summary of the Sample Scenario

The graphic on the first page illustrates steps A to Y. The T-accounts reflect the postings made during the discrete production process using:

- One utilities cost center

- Four manufacturing overhead cost centers

- One production cost center

- One sales order

- One production order

Postings were made for two periods. We assumed that the sales order was open at the end of the first period, and that no finished products were completed, delivered, or invoiced. This assumption means that WIP was calculated and posted when the sales order was settled. We also assumed that the sales order was finally billed at the end of the second period, meaning that revenue was received for the finished product. This assumption means that WIP was canceled and posted during settlement. Variances cannot be calculated or posted since the finished product is unique to customer specifications, so that no standard cost can be developed.

The steps illustrated by the T-accounts include:

- Period 1: A – B – C – F – G1 – Settlement - R

- Period 2: A – B – C – E – F – G2 – Settlement – R – X – Y – Z

T-Accounts: FI G/L Accounts

BALANCE SHEET

A/P 211000

	Debit	Credit
Period 1		
A-1		40000
A-3		5000
Period 2		
A-1		4000
A-3		5000

GR/IR 211005

	Debit	Credit
Period 1		
B		52000

WIP Inventory 138000

	Debit	Credit
Period 1		
G1	79400	
Period 2		
G2		79400

A/R 121000

	Debit	Credit
Period 1		
Period 2		
Y	100000	

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

Salary Exp 610000

	Debit	Credit
Period 1		
A-1	40000	
A-3	5000	
Period 2		
A-1	4000	
A-3	5000	

Raw Mat'l Consum 510001

	Debit	Credit
Period 1		
B	52000	
Period 2		
B		

Revenue 410001

	Debit	Credit
Period 1		
Period 2		
Y		125000

Sales Discounts 420001

	Debit	Credit
Period 1		
Period 2		
Y	25000	

Cost of Goods Sold 500001*

	Debit	Credit
Period 1		
Period 2		
Z	84300	

Mfg. Output - Act 519200*

	Debit	Credit
Period 1		
Period 2		
Z		84300

WIP Offset 511000*

	Debit	Credit
Period 1		
G1		79400
Period 2		
G2	79400	

Cost elements are not created for WIP, COGS, and manufacturing output accounts. All of these accounts are posted during settlement.

T-Accounts: CO Secondary Cost Elements

CO - SECONDARY COST ELEMENTS (EXCLUDING RESULTS ANALYSIS)

		Utilities Assessment 810000			Setup Hours 802000			Labor Hours 801000			Machine Hours 800000			CO-PA Assessment 811000	
Period 1	A-2	40000		C-1	600		C-2	200		C-3	100		R-1		2000
	A-2		40000	C-1		600	C-2		200	C-3		100	R-2		4925
													R-3		4800
													R-4		1775
													R-5		4100
Period 2	A-2	4000		C-1	200		C-2	1600		C-3	1100		R-1		1500
	A-2		4000	C-2		200	C-2		1600	C-3		1100	R-2	325	
													R-3		50
													R-4		775
													R-5		2100

		Material OH 840000			Machine OH 841000			Labor OH 842000			Admin OH 843000	
Period 1	F-5	13000		F-2	75		F-3	200		F-4	225	
	F-5		13000	F-2		75	F-3		200	F-4		225
										F-6	13000	
										F-6		13000
Period 2				F-2	825		F-3	450		F-4	725	
				F-2		825	F-3		450	F-4		725

RA cost elements are also secondary cost elements that are used to create the WIP and the cost of sales postings. Due to the number of RA cost elements, these secondary cost elements will be described in the section after the controlling objects.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

Utilities CCtr 90100

		Debit	Credit
Period 1	A-1	40000	
	A-2		40000
Period 2	A-1	4000	
	A-2		4000

Mat'l OH CCtr 30250

		Debit	Credit
Period 1	A-2	15000	
	F-5		13000
	R-1		2000
Period 2	A-2	1500	
	R-1		1500

Mach OH CCtr 30260

		Debit	Credit
Period 1	A-2	5000	
	F-2		75
	R-2		4925
Period 2	A-2	500	
	F-2		825
	R-2	325	

Labor OH CCtr 30270

		Debit	Credit
Period 1	A-2	5000	
	F-3		200
	R-3		4800
Period 2	A-2	500	
	F-3		450
	R-3		50

Mfg Admin OH CCtr 30280

		Debit	Credit
Period 1	A-2	15000	
	F-4		225
	F-6		13000
	R-4		1775
Period 2	A-2	1500	
	F-4		725
	R-4		775

Production CCtr 30100

		Debit	Credit
Period 1	A-3	5000	
	C-1		600
	C-2		200
	C-3		100
	R-5		4100
Period 2	A-3	5000	
	C-1		200
	C-2		1600
	C-3		1100
	R-5		2100

Production Order xxxxxxxxx

		Debit	Credit	
Period 1	C-1	600		Set-up hours
	C-2	200		Labor hours
	C-3	100		Machine hours
	F-2	75		Machine OH
	F-3	200		Labor OH
	F-4	225		Admin OH
Period 2	C-1	200		Set-up hours
	C-3	1600		Labor hours
	C-3	1100		Machine hours
	F-2	825		Machine OH
	F-3	450		Labor OH
	F-4	725		Admin OH

Sales Order xxxxxxxxx

		Debit	Credit	
Period 1	B	52000		Raw material
	F-5	13000		Material OH
	F-6	13000		Admin OH
Period 2	Y		125000	Revenue
	Y	25000		Discounts
	Z	125000		Settle revenue
	Z		25000	Settle discounts
	Z		84300	Settle COGS

Sales Order Planned Costs

E	Option 1 (selected)		Option 2 (not selected)
Material	52000		50000
Setup	800		800
Labor	1200		1200
Machine	1000		1000
OH Mat	13000	25%	12500
OH Mach	750	75%	750
OH Labor	500	25%	500
OH Admin	13750	25%	13250
Total Std	83000		80000

Operating Concern 0010

		Debit	Credit	
Period 1	R-1	2000		OH CCtr Ass'mnt
	R-2	4925		OH CCtr Ass'mnt
	R-3	4800		OH CCtr Ass'mnt
	R-4	1775		OH CCtr Ass'mnt
	R-5	4100		Prd CCtr Ass'mnt
Period 2	R-1	1500		OH CCtr Ass'mnt
	R-2		325	OH CCtr Ass'mnt
	R-3	50		OH CCtr Ass'mnt
	R-4	775		OH CCtr Ass'mnt
	R-5	2100		Prd CCtr Ass'mnt
	Z		125000	Revenue
	Z	25000		Sales Discounts
	Z	84300		COGS

- Since the product options are configured during order entry with variant configuration, there is no standard set of options that can be used as a basis for the standard cost. For this reason, the actual cost of the product is the cost of sales. Since there is no standard cost, variances cannot be calculated.
- The planned costs on the sales order can be viewed as the "standard" cost of this particular product (option 1 is a convertible with a soft top and option 2 has a hard top). However, since actual costing is used, the total cost (not just the planned costs in the sales order) are considered the cost of sales.

T-Accounts: CO Results Analysis Cost Elements

WIP/Debits RA - Mat Crtn 822001
	Debit	Credit
Period 1 G-1	52000	
Period 2 G-2	52000	

WIP/Credits RA - Mat Usg 822002
	Debit	Credit
Period 1		
Period 2 G-2		52000

WIP/Debits RA - Mach Crtn 823001
	Debit	Credit
Period 1 G-1	100	
Period 2 G-2	1200	

WIP/Credits RA - Mach Usg 823002
	Debit	Credit
Period 1		
Period 2 G-2		1200

WIP/Debits RA - Lab Crtn 824001
	Debit	Credit
Period 1 G-1	200	
Period 2 G-2	1800	

WIP/Credits RA - Lab Usg 824002
	Debit	Credit
Period 1 G-1		
Period 2 G-2		1800

WIP/Debits RA - Setup Crtn 825001
	Debit	Credit
Period 1 G-1	600	
Period 2 G-2	800	

WIP/Credits RA - Setup Usg 825002
	Debit	Credit
Period 1		
Period 2 G-2		800

WIP/Debits RA - OH Mat Crtn 826001
	Debit	Credit
Period 1 G-1	13000	
Period 2 G-2	13000	

WIP/Credits RA - OH Mat Usg 826002
	Debit	Credit
Period 1 G-1		
Period 2 G-2		13000

WIP/Debits RA - OH Mach Crtn 827001
	Debit	Credit
Period 1 G-1	75	
Period 2 G-2	900	

WIP/Credits RA - OH Mach Usg 827002
	Debit	Credit
Period 1 G-1		
Period 2 G-2		900

WIP/Debits RA - OH Lab Crtn 828001
	Debit	Credit
Period 1 G-1	200	
Period 2 G-2	650	

WIP/Credits RA - OH Lab Usg 828002
	Debit	Credit
Period 1 G-1		
Period 2 G-2		650

WIP/Debits RA - OH Admin Crtn 829001
	Debit	Credit
Period 1 G-1	13225	
Period 2 G-2	13950	

WIP/Credits RA - OH Admin Usg 829002
	Debit	Credit
Period 1 G-1		
Period 2 G-2		13950

Cost of Sales RA - COS Mat 822005
	Debit	Credit
Period 1		
Period 2 G-2	52000	

Cost of Sales RA - COS Mach 823005
	Debit	Credit
Period 1		
Period 2 G-2	1200	

Cost of Sales RA - COS Lab 824005
	Debit	Credit
Period 1		
Period 2 G-2	1800	

Cost of Sales RA - COS Setup 825005
	Debit	Credit
Period 1		
Period 2 G-2	800	

Cost of Sales RA - COS OH Mat 826005
	Debit	Credit
Period 1		
Period 2 G-2	13000	

Cost of Sales RA - COS OH Mach 827005
	Debit	Credit
Period 1		
Period 2 G-2	900	

Cost of Sales RA - COS OH Lab 828005
	Debit	Credit
Period 1		
Period 2 G-2	650	

Cost of Sales RA - COS OH Admin 829005
	Debit	Credit
Period 1		
Period 2 G-2	13950	

Cost of Sales RA - COS Rev 830005
	Debit	Credit
Period 1		
Period 2 G-2	125000	

Cost of Sales RA - COS Dsnt 831005
	Debit	Credit
Period 1		
Period 2 G-2		25000

COS: Actual Costs RA - Calc Costs 831005
	Debit	Credit
Period 1		
Period 2 G-2	84300	

Calculated Revenue RA - Calc Rev 821200
	Debit	Credit
Period 1 G-1		95662.65
Period 2 G-2		100000

Calculated Actual Costs RA - Valutd Act Costs 820000
	Debit	Credit
Period 1 G-1		79400
Period 2 G-2		84300

Calculated Profit RA - Cap Profit 821100
	Debit	Credit
Period 1 G-1		16262.65
Period 2 G-2		

- RA is calculated on the sales order, and its cost elements are updated based on the cost elements that are posted to the sales and the production orders.

  (Production order costs roll up to the sales order.)

- For illustrative purposes, the postings to the RA cost elements in the above example are interpreted differently than the "normal" T-accounts.

  The postings to the RA cost elements reflected above refer to the balances of the cost elements at the end of each period. For example, RA cost element 822001 represents the cost of the product that results from a material posting to the sales order. At the end of period 1, the balance posted 52,000. Since no additional material postings were made in period 2, the balance of the RA cost element remains at 52,000. This approach helps illustrate the calculations performed by the system.

- Different RA cost elements are set up for different purposes.

  The RA cost elements set up include:
  - RA cost elements for the creation of the MTO product.

    These elements are categorized according to the original cost elements posted to the production and sales orders, such as the material, labor, overhead, and other costs, and represent the current cost of the material as it is being produced. These cost elements are used to calculate the debits to the current WIP balance.
  - RA cost elements for the usage of the MTO product.

    These are also categorized according to the original cost elements posted to the production and sales orders, and represent the current cost of the material as it is being used or sold. These cost elements are used to calculate the credits to the current WIP balance.
  - RA cost elements for the cost of goods sold (COGS).

    These RA cost elements contain the COGS data of the product, which is the COGS value that is later posted to the G/L to represent the delivered product. According to the configuration used for this example, revenue-based RA is used, so the COGS is not calculated until revenue has been posted to the sales order during billing. The COGS RA elements track the actual postings for the revenue, the discounts, and cost of the product.
  - RA cost elements for the calculated values, which may be used to post accruals to the balance sheet for the expected revenue that will be received for the sale of the product. These RA elements are not used for G/L postings in this example.

    These cost elements include the calculated revenue, calculated costs, valuated costs, and calculated profit.

- At the end of period 1, the following postings to the RA cost elements are made:
  - The RA cost elements that record debits to WIP contain all costs posted to the production and sales order.
  - Since the MTO product has not yet been used (sold), the RA cost elements that record credits to WIP do not contain data.
  - Since no revenue has been posted to the sales order, the RA cost elements that record the COGS are not updated.
  - The RA cost element that records the calculated cost of the product does not contain data.

Since actual costs have been posted, but no actual revenue has been posted, no calculation takes place.

- The RA cost element that contains the total valuated actual cost also contains the total current actual cost of the product.
- The RA cost element that contains the calculated revenue is updated based on the following ratio:
planned revenue / planned cost = calculated revenue / valuated actual cost,
where "calculated revenue" is the variable.

   Since the overall cycle of the MTO product is still considered to be shorter than for an engineer-to-order product, and although these accruals are calculated, they are not posted to the balance sheet.

- The RA cost element that contains the calculated profit is updated based on the following formula:
calculated revenue – valuated actual cost = calculated profit

- At the end of period 2, the following postings to the RA cost elements are made:
- The RA cost elements that record debits to WIP contain the additional costs posted to the production and sales orders.
- The RA cost elements that record credits to WIP contain the offsetting postings to the debits.

   This step occurs because revenue has been posted to the sales order and the MTO product has been delivered, so there should be no costs in WIP.

- The RA cost elements that record the COGS are updated with the actual cost of producing the MTO product.

   This cost is based on postings to the sales and production orders and the actual revenue and sales discounts posted to the sales order.

- The RA cost element that contains the calculated cost is updated with the total cost of producing the product.
- The RA cost element that contains the valuated actual cost is updated with the total cost of producing the product.
- The RA cost element that contains the total calculated revenue based on the actual billing document posted to the sales order is updated based on the following formula:
revenue – discounts = calculated revenue
- The RA cost element that contains the calculated profit is cleared, since the profit can now be analyzed in the G/L and in CO-PA, not with RA cost elements and accruals.

FI/CO Reconciliation

FI

FI includes a balance sheet and P&L accounts. Only the P&L accounts can be created as cost elements and posted to FI and CO. Cost elements determine for which accounts additional detail should be tracked with controlling objects, such as sales orders, production orders, and cost centers.

Of the accounts in this example, only the following are not created as cost elements in CO:

- The WIP offset account (511000)

- The cost of sales account (500001)

- The manufacturing output account (519200)

The WIP account is a placeholder that moves the manufacturing costs collected on the sales and production orders to the balance sheet during the production process. In MTO processing using variant configuration, a standard cost for the product does not exist. All costs are captured as actual costs and reside on the P&L in various accounts. The posting to the COGS account and its offset, the manufacturing output account, reclassify these costs only in FI, not on the controlling objects in CO. The detailed breakdown of the COGS is still available in CO.

CO

Production costs that flow through a sales order and its corresponding production order, not through a cost center, include:

- Material costs that are directly posted to the sales or production order

- Labor and machine time posted from the production cost center to the production order

- Overhead allocations to the sales and production orders from the manufacturing pool cost centers

In FI, direct postings made to the service and production cost centers are reflected, but the activity allocation and the overhead applied from the cost centers to the sales and production orders are only indirectly reflected. The allocations reassign costs originally posted to other expense accounts in the G/L, such as salary accounts. Reconciliation is necessary because the actual cost of producing the material includes these reassigned costs, which are the activity rates and the overhead allocations. The total actual costs that are posted to the COGS and manufacturing offset accounts when the sales order item is finally settled include these secondary cost elements.

To reconcile the postings that occur during the production process, the original accounts that contain the expense postings to the production and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original postings to FI and CO are included during the reconciliation of the production process, the sales and production orders have no net impact on the P&L. Since there is no standard cost, all costs incurred in the manufacturing process are cost of sales; no costs are written off in variance accounts.

When CO-PA is used, the cost center variances are not directly reflected in variance accounts in FI, but are analyzed in CO or CO-PA. The variances are included in the original expense postings to the cost centers. Although a manual entry to the G/L is possible to reclassify these variances to a cost center variance account, to avoid double-counting variances, this entry would not be reflected in CO. (This manual entry is not used in this example.)

Reconciliation

Due to the nature of FI/CO's functions, where not all CO transactions (such as hourly activity rates and overhead allocations) are reflected in FI accounts, a reconciliation process must take place. This process ensures that FI and CO remain balanced for reporting.

The goals of this reconciliation are to determine whether the:

- FI accounts are in balance with the CO postings

  The production process managed by the sales and production orders should have a net zero impact on

the P&L. Cost center variances are not reclassified in the P&L in this example, and production variances are not calculated.

- Variances in the CO objects are consistent with variances reported in CO-PA

  When the production process is complete, variances in the controlling objects must be cleared using period-end processes. Since the finished product does not have a standard cost, variances are not calculated for the manufacturing process. Cost center variances are assessed to CO-PA. The variances reported in CO and CO-PA reporting are the same.

Reconciliation Procedure

All debits and credits to the P&L accounts in the production process are accumulated. The expense accounts contain only the cost center variances, which are represented in CO-PA, but not on the G/L. The cost center variances are the same in cost center and CO-PA reporting.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process	DR	CR		CO	DR	CR		CO Variances CR to CO	PA Value Fields
Salary Exp	45000			Util CCtr	40000	40000			
Raw Mat'l	52000			Matl OH CCtr	15000	13000		2000	OH CCtr Vars
MfgOut-Std				Mach OH CCtr	5000	75		4925	OH CCtr Vars
MfgOut-Var				Labor OH CCtr	5000	200		4800	OH CCtr Vars
WIP Offset		79400		Admin OH CCtr	15000	13225		1775	OH CCtr Vars
				ProdCCtr	5000	900		4100	Prod CCtr Var
				Prod Ord					Prod Ord Var
	97000	79400		Subtotal	85000	67400		17600	CCtr Var
CCtr Var	17600			DR/CR bal for CO	0				

Period 2

FI/Production Process	DR	CR		CO	DR	CR		CO Variances CR to CO	PA Value Fields
Salary Exp	9000			Util CCtr	4000	4000			
Raw Mat'l				Matl OH CCtr	1500	0		1500	OH CCtr Vars
MfgOut-Std		84300		Mach OH CCtr	500	825		-325	OH CCtr Vars
MfgOut-Var				Labor OH CCtr	500	450		50	OH CCtr Vars
WIP Offset	79400			Admin OH CCtr	1500	725		775	OH CCtr Vars
				ProdCCtr	5000	2900		2100	Prod CCtr Var
				Prod Ord	6300			6300	Prod Ord ActCst
				Sales Ord	78000			78000	Sls Ord ActCst
	88400	84300		Subtotal	97300	8900		88400	CCtr Vars + ProdCst
CCtr Var	4100			DR/CR bal for CO	0				(4100 + 84300)

As a result of the T-accounts on the previous page, we concluded that:

- There is a net impact of zero on the production process for the sales and production orders.

  Variances are not calculated on the sales orders, so all costs incurred in the manufacturing process are considered COGS. Since the finished product is considered to be unique, a standard cost cannot be developed.

- The variances on the controlling objects are depicted in the CO section prior to the clearing of these variances to CO-PA.

- Revenue and sales discounts, although collected on the sales order, are not considered in the reconciliation, since these accounts do not reflect manufacturing costs.

- All sales and production order costs, regardless of the period in which they were posted, are only considered at the time that the sales order is finally settled to CO-PA.

  Sales and production order costs that were posted in period 1 are handled in FI with the WIP process. Since there is no FI impact due to the open production order, the WIP amount does not flow into CO-PA.

- Variances, or balances, analyzed on the cost center level cannot be analyzed in "variance" accounts in FI, but must be analyzed in CO or CO-PA.

  The object (cost center) variances are not reflected in a FI variance account. The variances are contained in the cost elements that were used to post the original costs to the cost center (that is, salary and supplies expenses posted to the cost center).

- If the cost center variances were to be reflected in FI, a manual journal entry to a cost center offset account and to a cost center variance account would be necessary to reclassify these variances. To avoid double-counting the cost center variances, neither of these accounts should then be created as cost elements, since the cost centers have already been cleared to CO-PA.

Cost-Based Profitability Analysis

Overview

CO-PA, a separate module where the cost of sales can be analyzed, captures transactions from:

- Sales and Distribution (SD) module, when a sales order is settled

- FI, with direct journal entries

- CO, from cost center assessments

Identifying the characteristics that determine how profitability should be analyzed, such as customers, customer groups, products, product hierarchies, geographic regions, etc., is used to configure CO-PA. Additionally, the values that are captured, such as the quantity of a product that is invoiced, the revenue and discounts applied when the product is sold, the cost of goods sold of the product, and other cost allocations must be identified and created in CO-PA.

One CO-PA document is created for each line item in a sales order and for each sender-receiver combination in cost center assessments. The receiver is a profitability segment, which is a unique combination of the values of the characteristics used to measure profitability. For example, different customer numbers result in different profitability segments. These segments are incorporated into the CO module, so that transactions can be carried out between other controlling objects, such as cost centers and orders, and a profitability segment. Once a value has been posted to CO-PA, the revenue and costs can no longer be allocated out of CO-PA with normal CO processing.

Design Decisions

This example includes the use of CO-PA. Although many different design options exist for CO-PA, this example only illustrates data flows as they pertain to costing this MTO manufacturing scenario. CO-PA functionality and implementation outside this scope will not be discussed.

The following design decisions and configuration options were implemented to set up the CO-PA operating concern for this product costing chapter:

- Cost-based CO-PA is used to match product revenues and costs so that cost of sales and contribution margin analyses can be carried out.

  Value fields are used to capture cost and revenue data. Cost elements are mapped to value fields in configuration, but cost elements are not available for reporting or analysis in cost-based CO-PA.

- The cost of a product (cost of sales) is posted to CO-PA when the sales order is settled.

  Since the finished product is a configurable product, a standard cost cannot be maintained. For this reason, all costs during MTO production are captured as actual costs. These actual cost elements are passed to CO-PA in the same detail that can be used to capture a standard cost estimate, that is, the fixed and variable portions of the material, labor, machine, and overhead costs. In the MTO environment, this process is based on cost elements, not a cost component layout or cost estimate. It is possible to combine this detail into fewer value fields than used in this example. Fixed and variable costs are posted to separate value fields.

  This step allows for a more detailed analysis of contribution margins. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to accumulate the existing value fields, either by creating additional summarized valued fields or by summarizing the detailed value fields in reporting.

- User-defined characteristics were set up to include fields that are obtained from the material master, the customer master, and the invoice.

  The rules according to which these fields are updated include:
  - Characteristics that are obtained from the material master are updated whenever the material number is passed to CO-PA.
    An example of this posting is the settlement of the sales order (the material number is on the line item level of the sales order and in the header of the production order to which it is linked).
  - Characteristics that are obtained from the customer master are updated whenever the customer number is passed to CO-PA.
    An example is again the settlement of the sales order (the customer number is on the header level of the sales order).

- Allocations from the overhead and production cost centers to CO-PA segments may occur based on data that has already been captured in CO-PA.

  CO-PA data includes revenue, cost of sales, variances, and direct postings. The combination of characteristics to which the assessment is applied is determined in the configuration of the cost center assessment. If the assessment occurs to a product, all other data related to the material master is also captured; if the assessment occurs to a product and customer, all product and customer-related characteristics will also be populated. However, these types of allocations should typically not be

performed to the lowest level of detail, such as product number, but should instead be based on higher-level characteristics, such as product lines or geography.

Issues

Issues that may be encountered in reconciling the production postings into cost-based CO-PA with the G/L include:

- Cost-based CO-PA in the MTO environment uses a cost of sales approach, where the actual cost of sales is recognized at the same time as the revenue.

  There is a time lag between the time the revenue is recognized in the G/L (when the product is invoiced), when the revenue is posted to CO-PA, and the actual cost of sales are posted to the G/L and to CO-PA (when the sales order is settled). Due to timing differences, if invoicing and settlement occur in different periods, it is a reconciling item between the G/L and CO-PA.

- Since a standard cost does not exist for the finished product, variances cannot be posted into CO-PA.

  The variances are included in the actual costs that are posted to CO-PA as part of the actual COGS. If a product is unique enough that it must be configured during sales order processing, a standard cannot be developed. If variances against a standard could be calculated, it would be unclear whether they are due to choosing a different set of options or whether there was a problem in the manufacturing process.

- WIP is not transferred to CO-PA.

  A profitability segment is viewed as a controlling object to which costs in CO are transferred. WIP is a background process to ensure that the balance sheet contains the correct values, and the resulting G/L entry ensures that the production process has no P&L impact for the period. No posting is made directly to the sales order, so the WIP balance cannot be transferred into CO-PA in a balanced controlling transaction. As previously described, a reconciliation must take place. It is also possible to make a direct entry into CO-PA to account for the WIP offset posting to the P&L, but this option is not used in this example.

- Cost elements and G/L accounts are not available in cost-based CO-PA.

  The reconciliation between CO-PA and the G/L must occur using value fields (categories of expense) and high-level (company code and business area) information on the side of CO-PA. The information captured in CO-PA at the lower levels is not available in FI's journal entries.

- Value fields can be freely defined to include more or less detail than the approach used in this example. If the value fields are defined at a detailed level, they can be summarized in two ways:
  - By updating an additional value field that accumulates other value fields
  - By summarizing the detailed value fields in reporting

  If the value fields are captured at a very high level, additional detail is only available in the originating module (SD, CO, CO-PC), not in CO-PA.

The chart on the following page contains sample characteristics and value fields used by the production process. Fixed characteristics are automatically generated when the operating concern is generated. For clarity, the administrative characteristics (time, date, user ID stamps at creation, alternate currencies, fixed parameters such as client and ledger numbers, and similar data) are not listed. Up to 30 additional user-

defined characteristics may be created and populated in CO-PA. All value fields, up to 120, must be defined in cost-based CO-PA.

The value fields are updated at the following times:

- Settling a sales order updates the revenue and COGS value fields
- Assessing cost centers updates the cost center variance fields

CO-PA Fields Updated by Period-End Controlling Processes

OPERATING CONCERN

Characteristics	Value Fields — Settlement (Revenue)											Value Fields — Settlement (Actual Cost)																						Value Fields — CCtr Assessment			
	Invoiced quantity	Revenue - Domestic	Revenue - Internat'l	Revenue - Government	Discounts - Domestic	Discounts - Internat'l	Discounts - Government	Freight - Domestic	Freight - Internat'l	Freight - Government	COGS - Raw material (variable)	COGS - Semi-finished goods (fixed)	COGS - Semi-finished goods (variable)	COGS - Prod Setup (fixed)	COGS - Prod Setup (variable)	COGS - Prod labor (fixed)	COGS - Prod labor (variable)	COGS - Prod machine (fixed)	COGS - Prod machine (variable)	COGS - OH Material (fixed)	COGS - OH Material (variable)	COGS - OH Labor (fixed)	COGS - OH Labor (variable)	COGS - OH Machine (fixed)	COGS - OH Machine (variable)	COGS - OH Admin (fixed)	COGS - OH Admin (variable)	COGS - OH Sales/Marketing (fixed)	COGS - OH Sales/Marketing (variable)	COGS - Miscellaneous (fixed)	COGS - Miscellaneous (variable)	Variances - OH CCtr (fixed)	Variances - OH CCtr (variable)	Variances - Prod CCtr (fixed)	Variances - Prod CCtr (variable)
Fixed																																			
Document number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Item number																																X	X	X	X
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Version																																			
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Company code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Business area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Sales organization	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Distribution channel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Division	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Plant	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Product	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Customer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Reference document no.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Reference item	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Sales order	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Sales order item	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Billing type																																			
Goods issue date																																			
Invoice date																																			
Posting date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Fiscal year	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Period	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Profit center	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
WBS element																																			
Order																																			
Cost object																																			
Sender cost center																																X	X	X	X
Tracing factor																																X	X	X	X
Cost element																																X	X	X	X
User-Defined																																			
Product hierarchy - Lvl 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Product hierarchy - Lvl 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Product hierarchy - Lvl 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Customer group	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Sales district	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Sales office	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						

- Hidden rows for control data are usually not used for analysis.

- The fields in bold indicate that these fields are visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

Options for Using "Standard Costing" in the Make-to-Order Environment

Using Planned Sales Order Costs as the Standard

When a sales order is created in a MTO environment, the sales order item is a controlling object. Based on this item, it is possible to create a cost estimate for the product that will be sold and manufactured. This sales order item cost estimate can be saved, using the same cost component structure that is usually used for the standard cost of a material.

During the RA calculation, after the sales order item has been delivered and has a "finally invoiced" status, it is possible to use the planned cost of the sales order item as the "standard" cost of the product. Since this planned cost is based on the options chosen in the variant configuration of the item, all cost differences between the planned sales order item costs and the actual costs incurred can be attributed to manufacturing process variances. During the settlement of the sales order, the difference between the planned and actual sales order item costs can be posted to a different G/L account, such as an MTO variance account. At the same time, this "variance" can be posted to a different value field in CO-PA. The standard and variances are only one number, with no detailed cost breakdown.

Tips & Tricks

> Variance categories cannot be calculated using this approach. In Release 4.x, it is possible to transfer the detailed sales order item cost estimate to CO-PA.

Using a Material Variant to Reference the Configurable Material

A variant material master that references a configurable product can be created. For this variant, a particular set of characteristics is chosen and saved. For such a variant material, a standard cost can be developed the same as for a normal finished product. During the settlement of the sales order, the difference between the standard cost and the actual sales order item costs can be posted to a different G/L account and to a different value field in CO-PA. Again, variance categories cannot be calculated using this approach. Variant material master records should only be used if a specific set of options is frequently ordered.

Chapter 6:   Product Costing Flow for Assemble-to-Order Production with Profitability Analysis

Contents

This graphic provides an overview of the assemble-to-order (ATO) process:
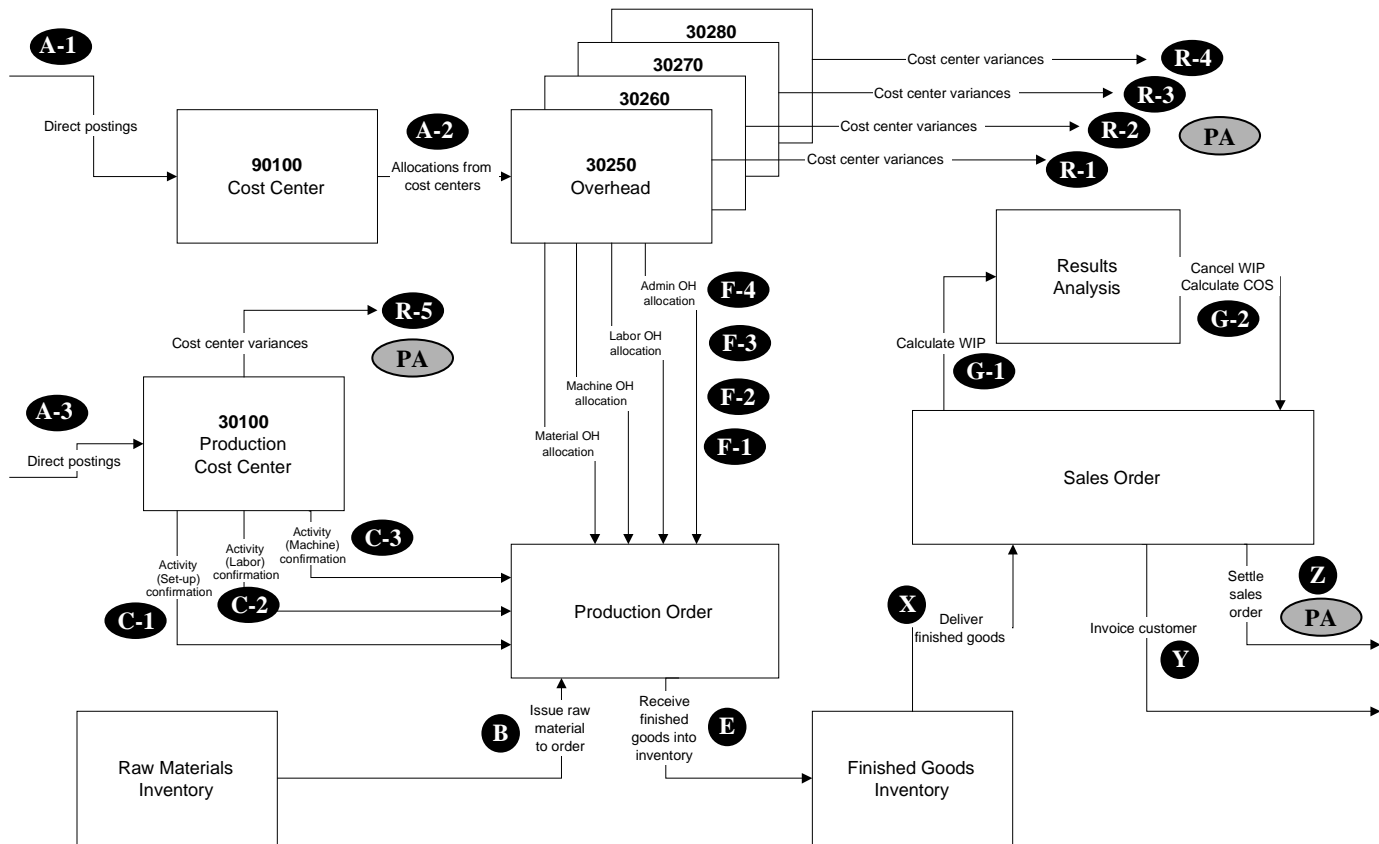
This chapter describes the accounting logic associated with SAP's ATO production process, using sales orders and valuing the cost of sales of the finished product using the standard cost of the product.

In this process, the following items are documented:

- Production flow with sales orders

- Interaction of sales orders and production orders

- Associated T-accounts

- Reconciliation of the T-accounts

The current chapter uses profitability analysis (CO-PA). The assumptions made during the configuration of CO-PA are discussed in a later section.

The sales order is the focus of the direct, controllable costs incurred during the ATO production process. The sales order automatically creates a production order to manage the direct resources used to produce a standard product. This product is normally not carried in inventory and is only assembled based on a customer order. In this chapter, all production costs are handled directly on the production order, based on the MRP requirements configuration. No production costs are posted directly to the sales order. The direct manufacturing costs may be incurred during the production of a finished or a semi-finished product (subassembly).

The indirect costs associated with the product's cost are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to the production order

The differences between SAP's product costing process and most U.S. legacy systems are that:

- In R/3, inventory does not flow through cost centers

   Rather than tracking inventory, the cost centers track total available labor costs, machine costs, and indirect production expenses. Instead of cost centers, our sales orders capture the product's total cost.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet

   In most legacy systems, production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. In R/3, using the Controlling (CO) module, the production costs associated with an order are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account.

On the following pages, each step in the process is described, followed by the T-accounts used in the Pre-Configured Client. A method of reconciling the general ledger (G/L) accounts with the controlling (CO) objects used in ATO manufacturing is also explained.

Tips & Tricks

> The numbering scheme was developed to allow additional processing for product costing with different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Sales Orders

Each step in the ATO production process is described below. Product costing is closely tied to production. The financial and costing entries automatically result from the daily manufacturing transactions entered in the system. The month-end processes are necessary to complete the financial picture for product costing.

We assume that the production order remains open for two periods, and the process is as follows:

1. Costs are posted to the cost centers.

2. Based on the creation of a sales order, a production order is immediately created so that the product can be assembled.

3. Material components are issued from inventory to the production order.

4. Resources (activities) are provided from the production cost center to the production order.

5. The month-end process is executed for sales orders, production orders, and cost centers.

The sales order is used to manage the external costs and resources and unique components, and the production order is used to manage the internal costs and resources and common components. The sales order combines all resources and costs for product costing. In this chapter, the finished product does not

allow the selection of different options, so a standard cost can be developed. Either because of its size, or because several subassemblies are carried in inventory to be used in multiple finished products that cannot be accurately forecast, the finished product in this chapter is not carried in inventory and is assembled based on the demand created by the sales order.

This business process may not reflect every manufacturing scenario. For example, in many industries, some component materials are issued to the production order across periods, not only at the beginning of the manufacturing process. Other industries may directly purchase components to the sales or production order or directly issue components against the sales order. There may also be differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, others are manufacturing overhead (indirect) costs. (Steps A-1 to A-3 are examples of these postings.) In this chapter, the cost center design uses separate cost centers for direct production costs and for each type of manufacturing overhead cost. The cost center design is flexible, but other options are not discussed at this time.

The following cost center structure and transactions illustrate the design used for this chapter:

- Post costs to service or administrative cost centers

  At a plant-wide level, utilities and rent must be considered during the production process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products that are produced, but the overall indirect costs and their variances (over and under absorption to products) are not managed at the product (sales or production order) level. In this cost center design, utilities and services are managed at a cost center level, but these cost centers allocate their costs to the manufacturing overhead pools. The manufacturing overhead pool cost centers, in turn, manage the variances of the indirect costs.

  In this chapter, actual salaries are posted to a utility cost center in both periods. Salaries are a direct cost for the utility cost center, but an indirect cost for the overall production process. Other costs, such as maintenance, repair, and operations materials and supplies may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

- Allocate from service and administrative cost centers to manufacturing overhead pools

  Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers will allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this chapter, the expenses incurred by the utility cost center are evenly allocated to all manufacturing overhead pool cost centers.

- Post costs to the production cost center

  Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center later supplies resources, such as labor and machine time, to the production order. The cost center manager determines a rate for each of these resources, represented by system activities, which can be managed in hours. The hourly rate may be

manually entered by the cost center manager or be calculated by the system based on the planned expenses and planned hours available in the cost center.

Step B: Raw Material Is Issued from Inventory to the Production Order

From inventory, raw material is issued to the production order. The system bases the standard quantity of raw material to be issued on the quantity of finished goods to be produced by the production order and the order's bill of material (BOM). The raw materials may be manually updated to reflect actual usage. In this chapter, raw materials are issued to the production order at their moving average cost.

The raw materials may be issued to the production order in one of the following ways:

- As a manual goods issue

- Using backflushing

- Automatically when the first operation is confirmed, if materials are allocated to the operation

Other alternatives are possible but are not demonstrated in this chapter. For example, if components are unique and must be specifically reserved for a customer, they are stock items that can be directly issued to the sales order. When components are directly issued to the production order, as in this chapter, the materials are assumed to be common items.

Another alternative is to trigger a purchase requisition to be automatically created for material components that are on the BOM as non-stock items. These material components may be received against either the production order or directly against the sales order. This process is determined by the configuration of the MRP requirements for each component. For these non-stock items, a purchase requisition is created, either by the sales or production order. Before it is converted to a purchase order, each purchase requisition must undergo normal processing by the purchasing department, which may involve approvals and online releases. When the components are received against the purchase order, they are not placed in inventory but are directly physically received on the production floor by referencing the sales or production order in the system. The cost of the components is directly posted to the sales or production order. Additional charges for these items, which are recorded during invoice verification, are also directly posted to the sales or production order to which they are allocated.

In this chapter, all required components are issued to the production order at the beginning of period 1, and additional raw material components are issued at the beginning of period 2. This process may regularly occur in some industries, and in other industries, only if there is a problem with the quality of a previously issued component.

Series C: Activities Are Allocated from the Production Cost Center to the Production Order

The production cost center supplies value-added resources, such as labor and machine time, to the production order. From a production perspective, these resources are represented by work centers. From a costing perspective, the resources are represented as activities (such as labor and machine hours) and each activity has a planned rate. The activities for the production cost center are linked to the work center in the master data. The resources (activities) used to produce the finished goods are posted to the production order, and the quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed, which is based on the quantity of finished goods to be produced by the production order and the routing used in this order.

For this production order, because confirmation does not occur through backflushing but manually at the operation level, the standard number of hours that default from each operation in the routing can be updated to reflect actual hours.

The following example assumes that setup time is posted only in the first period, and labor and machine times are posted to the production order for both open periods:

- Setup labor hours are allocated from the production cost center to the production order

  The standard setup time is developed for a certain lot size, so it is spread over the entire quantity of finished products that are manufactured using the production order. If there are lot size fluctuations, compared to the lot size used to develop the standard cost, the standard setup time still does not change. (We assume that setup is independent of the lot size.) In this chapter, setup time is assumed to be labor hours.

- Labor hours are allocated from the production cost center to the production order

  The standard number of labor hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units produced in the production order.

- Machine hours are allocated from the production cost center to the production order

  The standard number of machine hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units that are produced in the production order.

Step E: Finished Goods Are Received into Inventory from the Production Order

The completed finished goods are entered as a goods receipt from the production order, but the product is not placed into inventory. Since it was produced based on a specific customer's request for assembly, placing it into inventory would allow another customer to purchase the product. The goods receipt places the finished good into sales order stock. The finished product is linked to the sales order item that was used to manage the overall production. The goods receipt signals to the sales order that the manufacturing of the finished product is complete, and that the product may now be delivered to the customer. Since the product is not placed into inventory, no accounting takes place at this time. All costs that are incurred in the production of the finished product have been posted to the production order and continue to reside on the P&L in various accounts (material consumption, salary expense, and so on).

An automatic goods receipt is also possible when the final operation is confirmed. If a production order has been created for more than one unit of the finished good, a goods receipt for a portion of the quantity may be processed. This portion is then available for delivery to the customer. In this chapter, once the entire production order has been completed, the goods receipt is only posted at the end of period 2.

Step X: Deliver Product to the Customer

Once production of a finished product has been completed and the product has been received into sales order stock, it can be delivered to a customer. Since the product was not received into inventory, it is also not taken out of inventory. The sales order stock is relieved when the delivery is processed. Again, no accounting takes place at this time. All costs that are incurred in the production of the finished product still remain on the P&L.

Step Y: Invoice the Customer

In most cases, invoicing only occurs after the finished product has been shipped to the customer. At this time, the revenue is posted to the G/L and sales order. In ATO production, the controlling object for the

revenue posting is the sales order item. For any one transaction only one "real" controlling object can be referenced (sales order item); therefore, no postings to CO-PA occur at this time.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Production Order

Overhead is applied to the production order, thereby posting additional costs to the production order. If any direct costs posted during the manufacturing process were posted to the sales order, the overhead application can be split between the sales and production order. Applying overhead in that case would occur using two month-end processes, one for the sales order and one for the production order. In this chapter, all direct costs are posted to the production order, so all overhead costs are also posted there.

The applied overhead cost is a percentage of the direct costs that have already been posted to the production order during the period. If overhead processing is run more than once in the same period, only the difference in the overhead from the previous run is applied to the order. A costing sheet associated with the production order stores the rules for applying these overhead costs. It is possible to apply an overhead rate based on the quantity of material components that were issued to the production order, but this technique is not used in this chapter. Although the overhead design is flexible and may involve the use of internal orders, the other options are not discussed at this time.

In this chapter, separate overhead cost centers and separate overhead rates are used for each type of overhead being applied.

The following manufacturing overhead pool cost centers are used to apply these different overhead types:

- Material overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the production order during the period. Since material is issued to the production order in both periods, material overhead is applied in both periods.

- Machine overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the production order during the period.

- Labor overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as human resources and accounting that are related to production workers. The overhead percentage rate is based on the cost of the labor time that was confirmed for the production order during the period. Based on the assumptions in this chapter, this rate includes setup and normal labor time.

- Administrative overhead to the production order

  For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the production order. The overhead percentage rate is based on all costs posted to the production order during the period. The portion of the administrative costs that result from direct postings to the production order is applied.

Series G: Results Analysis for Sales Order

In R/3, since the manufacturing costs are tracked on the P&L statement, the balance of all open sales orders must be moved to the balance sheet at period-end. The costs that have been directly posted to the production order are included in the month-end process for the sales order. This movement ensures that the material components issued to the production order remain in inventory and are not written off before production is complete. If the open order balance is positive, the P&L is credited and the balance sheet is debited. If this balance is negative, the P&L is debited and the balance sheet is credited. In this and other chapters where the manufacturing costs are split between the sales and the production order, the sales order item is used as the controlling object for month-end processing.

When displaying sales order costs, the costs that have been posted to the production order are included in the sales order reports, as long as two conditions are met. The first condition is that the production order is in the same company code as the sales order, or that cross-company code production orders have been settled to the sales order. The second condition is that all costs have been settled to the highest level of a collective production order. The WIP posting to the G/L is not displayed when reporting on sales order costs. This impact is purely a financial transaction and does not affect the normal manufacturing process or the order balances in the sales and production orders.

A sales order is considered open when revenue has not yet been posted to it. As long as the sales order remains open, the costs that are incurred in producing the finished goods are calculated to be the WIP amount. Separate cost elements, called results analysis (RA) cost elements, track the WIP amounts so that these amounts are not directly posted to the sales order. The RA cost elements are then used to make the entry to the G/L but not directly to the sales order. If a sales order remains open for several periods, the WIP balance is recalculated for each period, and the adjustments are posted to the G/L. The WIP balance cannot be automatically carried over to CO-PA.

Once a product has been manufactured it is delivered to the customer and invoiced. During the product delivery, since all manufacturing costs are already on the P&L, no postings are made to the G/L for the cost of sales (not classified as cost of sales). Instead, the cost of sales resides in the material consumption account, the salary expense account (the source of the activity rates), and so on.

Once revenue has been posted, RA calculates the total manufacturing cost of the product. In this chapter, the finished product has a standard cost that is used to post to the cost of sales account. Differences between the standard cost and the actual costs incurred in the production process are posted to a variance account. The offset to the cost of sales and variance accounts is to a manufacturing output account. Since the calculation takes place on the sales order level, the variance amount is a single value. The variance categories that are used for the month-end process for cost objects (production orders, run schedules, and so on) are not available for sales orders.

In this chapter, the manufacturing output account is a single offsetting account for all postings to the P&L in the manufacturing process. This account is not a cost element, so no direct postings to the sales or production orders take place. The calculated WIP amount is stored in RA cost elements, which refers to the originating sales order. The WIP balance components are analyzed using these RA cost elements. Once revenue has been posted for the product during invoicing, the cost of sales is calculated and posted to the G/L. The cost of sales is the standard cost of production, taken from the released standard cost estimate. Variances between the standard and the actual cost of production are posted to a separate variance account. The cost of sales and the variance accounts are also not created as cost elements.

The following steps illustrate WIP procedure:

1. Calculate WIP (posted at settlement) .

   When the RA process is run, WIP is calculated for sales orders for which revenue has not been posted. In this example, the sales order remains open at the end of period 1.

2. Cancel WIP (posted at settlement) and calculate the cost of sales and variances (posted at settlement)

   When the RA process is run, WIP is canceled for sales orders that are completely invoiced or for which a final billing (FNBL) status has been manually set. This step reverses all WIP that have been posted to the G/L and calculates the actual cost of sales for the finished product.

   In this example, WIP is canceled because revenue has been posted to the sales order and final invoicing has taken place. The WIP that was calculated and posted to the balance sheet at the end of period 1 is canceled (or reversed) the cost of sales account is updated with the standard cost of manufacturing the product, and the variances are posted to a separate account.

Series R: Assess Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the production cost center's resources. These variances are assessed to CO-PA at the end of the month, where they can be allocated to products, product lines, customers, geography, or other combinations of dimensions (characteristics) tracked in CO-PA. The assessment takes place only in CO, so no posting is made to the G/L.

In this chapter, the cost center variances are assessed to CO-PA at the end of each period. Optionally, these variances can also be reflected in the Financial module (FI) by manually posting a financial entry. However, the assessment to CO-PA clears the cost center, so if this posting were desired, neither G/L account should be a cost element, and the FI/CO reconciliation would change. (This option is not used in this chapter.)

The following is a list of these variances that are assessed to CO-PA:

- Manufacturing overhead variances for material overhead

  The manufacturing overhead cost center, which collects indirect costs related to materials, is assessed to CO-PA.

- Manufacturing overhead variances for machine overhead

  The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is assessed to CO-PA.

- Manufacturing overhead variances for labor overhead

  The manufacturing overhead cost center, which collects indirect costs related to the production workers, is assessed to CO-PA.

- Manufacturing overhead variances for administrative overhead

  The manufacturing overhead cost center, which collects indirect costs related to plant operations that are not specific to a product, is assessed to CO-PA.

- Production cost center variances

  The production cost center, which collects direct costs related to production resources, is assessed to CO-PA.

End Period: Run Settlement of Production Orders

Production orders must usually not be settled, since the sales order automatically reads the production order balances. All production orders that were automatically created, using the sales order, have a settlement rule that links them to the sales order. If settlement were to take place, the costs would be credited on the production order and debited to the sales order.

There are two exceptions when the settlement of production orders must take place:

- The production order created by the sales order is a collective order (a hierarchy of production orders).

  The settlement process should then be run to settle the lower-level production orders to the highest level of the collective order, so that the sales order RA process picks up all of the manufacturing costs that were posted to the collective production order.

- The production order is linked to a different company code than the sales order.

  For the sales order to include the production order costs, the production order must be settled to the sales order.

Step Z: Settle Sales Order (Posts G-1, G-2)

The previously described RA process updates secondary cost elements, but these values remain in CO. When sales order settlement is run at the end of each period, the RA values are posted to FI, and the appropriate G/L accounts are updated. Although additional values are calculated by RA, such as accruals to revenue based on actual costs, these values are not posted to the G/L in this chapter. Only the WIP and final cost of sales (standard and variances) are posted to the G/L.

In ATO manufacturing, settlement is used to post values related to the sales order to CO-PA. Once the sales order is finally billed, the revenue and the actual cost of sales (all costs involved in the manufacturing process) are posted to CO-PA. The cost of sales and the revenue are matched in CO-PA, and there are no timing differences between the time that the cost of sales is posted to the G/L and when it is posted to CO-PA. The standard cost and the variances are updated in CO-PA using the RA cost elements that mirror the cost elements used in the manufacturing process.

In this chapter, the detail that is available for the standard cost and the variances is captured consistently in CO-PA. Variances can only be captured as one value field (variable costs), so the standard cost in CO-PA is only captured in two value fields, fixed and variable costs. It is possible to obtain additional detail for the standard cost estimate, based on the cost component layout that was used to develop the standard, but the detail is not available for the variances incurred in ATO production. Any characteristic configured in CO-PA that is related to the sale, such as product number, product line, customer, customer group, and geographic region, are carried over for analysis.

Summary of the Sample Scenario

The graphic on the second page illustrates steps A to Y. The T-accounts reflect the postings made during the discrete production process using:

- One utilities cost center

- Four manufacturing overhead cost centers

- One production cost center

- One sales order

- One production order

Postings were made for two periods. We assumed that the sales order was open at the end of the first period and that no finished products were completed, delivered, or invoiced. This assumption means that WIP was calculated and posted when the sales order was settled. We also assumed that the sales order was finally billed at the end of the second period, which means that revenue was posted to the sales order for the finished product. This assumption means that WIP was canceled and posted during settlement. The standard cost and a variance amount are calculated and posted to the G/L. Variance categories that are available when the month-end process is run on cost objects in manufacturing (production orders, run schedules, and so on) cannot be calculated or posted. It is assumed that the finished product is usually not assembled and stored in inventory unless an order is placed.

The steps illustrated by the T-accounts include:

- Period 1: A – B – C – F – G1 – R – Settlement (Z)

- Period 2: A – B – C – E – F – G2 – R – X –Y – Settlement (Z)

T-Accounts: FI G/L Accounts

BALANCE SHEET

	Raw Mat'l Inv. 131000		A/P 211000		WIP Inventory 138000		A/R 121000
Period 1	B	120	A-1	800	G1	390	
			A-3	1000			
Period 2	B	50	A-1	800	G2	390	Y 1000
			A-3	1000			

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

	Salary Exp 610000	Raw Mat'l Consum 510000	Revenue 410000	Sales Discounts 420000
Period 1	A-1 800	B 120		
	A-3 1000			
Period 2	A-1 800	B 50	Y 1200	Y 200
	A-3 1000			

	Cost of Goods Sold 500001*	COGS Variance 531000*	Mfg. Output - Act 519200*	WIP Offset 511000*
Period 1				G1 390
Period 2	Z 500	Z 175	Z 675	G2 390

Cost elements are not created for WIP, cost of goods sold, its variance, and manufacturing output accounts. All of these accounts are posted during sales order settlement.

T-Accounts: CO Secondary Cost Elements

CO - SECONDARY COST ELEMENTS (EXCLUDING RESULTS ANALYSIS)

	Utilities Assessment 810000		Setup Hours 802000		Labor Hours 801000		Machine Hours 800000		CO-PA Assessment 811000	
Period 1	A-2 800		C-1 20		C-2 40		C-3 60		R-1	170
	A-2	800	C-1	20	C-2	40	C-3	60	R-2	155
									R-3	185
									R-4	140
									R-5	880
Period 2	A-2 800				C-2 60		C-3 60		R-1	187.5
	A-2	800			C-2	60	C-3	60	R-2	155
									R-3	185
									R-4	157.5
									R-5	880

	Material OH 840000		Machine OH 841000		Labor OH 842000		Admin OH 843000	
Period 1	F-1 30		F-2 45		F-3 15		F-4 60	
	F-1	30	F-2	45	F-3	15	F-4	60
Period 2	F-1 12.5		F-2 45		F-3 15		F-4 42.5	
	F-1	12.5	F-2	45	F-3	15	F-4	42.5

RA cost elements are also secondary cost elements that are used to create the WIP and the cost of sales postings. Due to the number of RA cost elements, a description for these elements is provided in the section after the controlling objects.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

Utilities CCtr 90100

Period		Debit	Credit
Period 1	A-1	800	
	A-2		800
Period 2	A-1	800	
	A-2		800

Mat'l OH CCtr 30250

Period		Debit	Credit
Period 1	A-2	200	
	F-1		30
	R-1		170
Period 2	A-2	200	
	F-1		12.5
	R-1		187.5

Mach OH CCtr 30260

Period		Debit	Credit
Period 1	A-2	200	
	F-2		45
	R-2		155
Period 2	A-2	200	
	F-2		45
	R-2		155

Labor OH CCtr 30270

Period		Debit	Credit
Period 1	A-2	200	
	F-3		15
	R-3		185
Period 2	A-2	200	
	F-3		15
	R-3		185

Mfg Admin OH CCtr 30280

Period		Debit	Credit
Period 1	A-2	200	
	F-4		60
	R-4		140
Period 2	A-2	200	
	F-4		42.5
	R-4		157.5

Production CCtr 30100

Period		Debit	Credit
Period 1	A-3	1000	
	C-1		20
	C-2		40
	C-3		60
	R-5		880
Period 2	A-3	1000	
	C-2		60
	C-3		60
	R-5		880

Production Order xxxxxxxxx

Period		Debit	Credit	Description
Period 1	B	120		Raw material
	C-1	20		Set-up hours
	C-2	40		Labor hours
	C-3	60		Machine hours
	F-1	30		Material OH
	F-2	45		Machine OH
	F-3	15		Labor OH
	F-4	60		Admin OH
Period 2	B	50		Raw material
	C-2	60		Labor hours
	C-3	60		Machine hours
	F-1	12.5		Material OH
	F-2	45		Machine OH
	F-3	15		Labor OH
	F-4	42.5		Admin OH

Sales Order xxxxxxxxx

	Debit	Credit	Description
Y		1200	Revenue
Y	200		Discounts
Z	1200		Settle revenue
Z		200	Settle discounts
Z		500	Settle COGS
Z		175	Settle COGS variance

Z Standard Cost

Material	120	
Setup	20	
Labor	60	
Machine	100	
OH Mat	30	25%
OH Mach	75	75%
OH Labor	20	25%
OH Admin	75	25%
Total Std	500	

Operating Concern 0010

Period		Debit	Credit	Description
Period 1	R-1	170		OH CCtr Ass'mnt
	R-2	155		OH CCtr Ass'mnt
	R-3	185		OH CCtr Ass'mnt
	R-4	140		OH CCtr Ass'mnt
	R-5	880		Prd CCtr Ass'mnt
Period 2	R-1	187.5		OH CCtr Ass'mnt
	R-2	155		OH CCtr Ass'mnt
	R-3	185		OH CCtr Ass'mnt
	R-4	157.5		OH CCtr Ass'mnt
	R-5	880		Prd CCtr Ass'mnt
	Z		1200	Revenue
	Z	200		Sales Discounts
	Z	500		COGS
	Z	175		COGS Variance

The assembled product has a standard cost. However, calculation of the variance categories is not available using sales order-based RA. The variance is posted and analyzed as one lump sum. Cost element reporting

may be used to determine the type of posting, such as material postings, labor, and so on, that resulted in the variance.

T-Accounts: CO Results Analysis Cost Elements

CO - RESULTS ANALYSIS COST ELEMENTS

WIP/Debits RA - Mat Crtn 822001

	Debit	Credit
Period 1	G-1 120	
Period 2	G-2 120	

WIP/Credits RA - Mat Usg 822002

	Debit	Credit
Period 1		
Period 2		G-2 120

WIP/Debits RA - Mach Crtn 823001

	Debit	Credit
Period 1	G-1 60	
Period 2	G-2 100	

WIP/Credits RA - Mach Usg 823002

	Debit	Credit
Period 1		
Period 2		G-2 100

WIP/Debits RA - Lab Crtn 824001

	Debit	Credit
Period 1	G-1 40	
Period 2	G-2 60	

WIP/Credits RA - Lab Usg 824002

	Debit	Credit
Period 1		
Period 2		G-2 60

WIP/Debits RA - Setup Crtn 825001

	Debit	Credit
Period 1	G-1 20	
Period 2	G-2 20	

WIP/Credits RA - Setup Usg 825002

	Debit	Credit
Period 1		
Period 2		G-2 20

WIP/Debits RA - OH Mat Crtn 826001

	Debit	Credit
Period 1	G-1 30	
Period 2	G-2 30	

WIP/Credits RA - OH Mat Usg 826002

	Debit	Credit
Period 1	G-1	
Period 2		G-2 30

WIP/Debits RA - OH Mach Crtn 827001

	Debit	Credit
Period 1	G-1 45	
Period 2	G-2 75	

WIP/Credits RA - OH Mach Usg 827002

	Debit	Credit
Period 1	G-1	
Period 2		G-2 75

WIP/Debits RA - OH Lab Crtn 828001

	Debit	Credit
Period 1	G-1 15	
Period 2	G-2 20	

WIP/Credits RA - OH Lab Usg 828002

	Debit	Credit
Period 1	G-1	
Period 2		G-2 20

WIP/Debits RA - OH Admin Crtn 829001

	Debit	Credit
Period 1	G-1 60	
Period 2	G-2 75	

WIP/Credits RA - OH Admin Usg 829002

	Debit	Credit
Period 1	G-1	
Period 2		G-2 75

WIP/Debits RA - Variance Crtn 832001

	Debit	Credit
Period 1	G-1	
Period 2	G-2 175	

WIP/Credits RA - Variance Usg 832002

	Debit	Credit
Period 1	G-1	
Period 2		G-2 175

WIP/Credits RA - COS Variance 832005

	Debit	Credit
Period 1	G-1	
Period 2	G-2 175	

Cost of Sales RA - COS Mat 822005

	Debit	Credit
Period 1		
Period 2	G-2 120	

Cost of Sales RA - COS Mach 823005

	Debit	Credit
Period 1		
Period 2	G-2 100	

Cost of Sales RA - COS Lab 824005

	Debit	Credit
Period 1		
Period 2	G-2 60	

Cost of Sales RA - COS Setup 825005

	Debit	Credit
Period 1		
Period 2	G-2 20	

Cost of Sales RA - COS OH Mat 826005

	Debit	Credit
Period 1		
Period 2	G-2 30	

Cost of Sales RA - COS OH Mach 827005

	Debit	Credit
Period 1		
Period 2	G-2 75	

Cost of Sales RA - COS OH Lab 828005

	Debit	Credit
Period 1		
Period 2	G-2 20	

Cost of Sales RA - COS OH Admin 829005

	Debit	Credit
Period 1		
Period 2	G-2 75	

	Cost of Sales RA - COS Rev 830005 (Dr / Cr)	Cost of Sales RA - COS Dsnt 831005 (Dr / Cr)	COS: Actual Costs RA - Calc Costs 831005 (Dr / Cr)
Period 1			
Period 2	G-2 1200	G-2 200	G-2 675

	Calculated Revenue RA - Calc Rev 821200 (Dr / Cr)	Calculated Actual Costs RA - Valutd Act Costs 820000 (Dr / Cr)	Calculated Profit RA - Cap Profit 821100 (Dr / Cr)
Period 1	G-1 780	G-1 390	G-1 390
Period 2	G-2 1000	G-2 675	G-2

- RA is calculated on the sales order.

  The RA cost elements are updated based on the cost elements that are posted to both the sales and production orders. Production order costs roll up to the sales order. In this chapter, all manufacturing costs were posted to the production order, while revenue and sales discounts were posted to the sales order.

- For illustrative purposes, the postings to the RA cost elements in the above example are interpreted differently than the "normal" T-accounts.

  The postings above refer to the balances of the cost elements at the end of each period. For example, RA cost element 825001 represents the cost of the product that results from the set up labor posting to the production order. At the end of period 1, the balance posted is 20. Since no additional set up was posted in period 2, the balance of the RA cost element remains at 20. This approach will help illustrate the calculations performed by the system.

- Different RA cost elements are set up for different purposes. The RA cost elements set up include:
  - RA cost elements to create the ATO product.

    These cost elements are categorized according to the original cost elements posted to the production and sales orders, such as the material, labor, overhead, and other costs, and represent the current cost of the material as it is produced. These cost elements are used to calculate the debits to the current WIP balance.
  - RA cost elements to use the ATO product.

    These cost elements are also categorized according to the original cost elements posted to the production and sales orders and represent the current cost of the material as it is used or sold. These cost elements are used to calculate the credits to the current WIP balance.
  - RA cost elements for the COGS.

    These cost elements contain the COGS data of the product, which is the COGS value that is later posted to the G/L to represent the delivered product. According to the configuration used for this example, since revenue-based RA is used, the COGS is not calculated until revenue has been posted to the sales order during billing. The COGS RA elements track the actual postings for the revenue, the discounts, and the cost of the product.

- RA cost elements for the calculated values, which may be used to post accruals to the balance sheet for the expected revenues that will be received from the sale of the product.

  These cost elements include the calculated revenue, calculated costs, valuated costs, and calculated profit.

- At the end of period 1, the following postings to the RA cost elements are made:
  - The RA cost elements that record debits to WIP contain all costs posted to the production order.
  - Since the ATO product has not yet been used (sold), the RA cost elements that record credits to WIP do not contain data.
  - Since no revenue has been posted to the sales order, the RA cost elements that record the COGS are not updated.
  - The RA cost element that records the calculated cost of the product does not contain data.

    Since actual costs have been posted, and no actual revenue has been posted (not vice versa), no calculation takes place.
  - The RA cost element that contains the total valuated actual cost also contains the total current actual cost of the product.
  - The RA cost element that contains the calculated revenue is updated based on the following ratio: planned revenue / planned cost = calculated revenue / valuated actual cost, where "calculated revenue" is the variable.

    Although these accruals are calculated, since the overall cycle of the ATO product is still considered to be short (shorter than for an engineer-to-order product), they are not posted to the balance sheet.
  - The RA cost element that contains the calculated profit is updated based on the following formula: calculated revenue – valuated actual cost = calculated profit

- At the end of period 2, the following postings to the RA cost elements are made:
  - The RA cost elements that record debits to WIP now contain the additional costs posted to the production order.
  - The RA cost elements that record credits to WIP contain the offsetting postings to the debits. This occurs because revenue has been posted to the sales order and the ATO product has been delivered, so there should be no costs in WIP.
  - The RA cost elements that record the COGS are updated with the actual cost of producing the ATO product.

    The cost is based on expense postings to the production order, and the revenue is based on the actual revenue and sales discounts posted to the sales order. Each line ID contains the standard cost of the product, based on the released standard cost estimate. A separate line ID (VAR) contains the total variance between the standard and actual cost of the product.
  - The RA cost element that contains the calculated cost is updated with the total actual cost to produce the product.
  - The RA cost element that contains the valuated actual cost is updated with the total actual cost to produce the product.
  - The RA cost element that contains the calculated revenue, based on the actual billing document posted to the sales order, is updated based on the following formula: revenue – discounts = calculated revenue.
  - Since the profit can now be analyzed in the G/L and in CO-PA, not using RA cost elements and accruals, the RA cost element that contains the calculated profit is cleared.

- At the end of period 2, if the variance is favorable (less than the standard cost), the following changes occur in the postings (the postings for this example are not shown here) :
  - The RA cost element that contains the calculated cost is updated with the standard cost of the product.
  - The RA cost element that contains the total calculated revenue based on the actual billing document posted to the sales order is updated based on the following formula: calculated revenue/actual cost = (revenue – discounts) / standard cost.
  - The category under which the variance (line ID VAR) is updated is the cost of sales with an option, rather with a requirement to capitalize. This variance is used for the financial and CO-PA postings. For favorable variances, the variance line ID VAR is updated with a user exit. In Release 4.x, the system will update this line ID with a favorable variance without a user exit.
  - Reserves for unrealized costs are calculated for each line ID, using additional RA cost elements (not listed here).

    The total reserves are equal to the amount of the variance, and since reserves cannot be transferred to CO-PA, they are not used for the financial postings.
  - Since reserves for loss have been calculated, calculated profit is not updated.

FI/CO Reconciliation

FI

FI includes both the balance sheet and P&L accounts. Only the P&L accounts can be created as cost elements and posted to FI and CO. Cost elements determine for which accounts additional detail should be tracked with controlling objects such as sales orders, production orders, and cost centers.

Of the accounts in this example, only the following accounts are not created as cost elements in CO:

- WIP offset (511000)

- Cost of sales (500001)

- Cost of sales variance (500002)

- Manufacturing output (519200)

The WIP account is a placeholder that, during production, moves the production costs to the balance sheet. At the end of the production process, the variance account contains the net impact on the P&L. The posting to the COGS account, the COGS variance account, and the manufacturing output account (their offset), reclassify these costs only in FI's, and not in CO's, controlling objects.

CO

Production costs that flow through a sales order and the corresponding production order, not through a cost center, include:

- Material costs that are directly posted to the production order

- Labor and machine time posted from the production cost center to the production order

- Overhead allocations to the production order from the manufacturing pool cost centers

In FI, direct postings made to the service and production cost centers are reflected, while the activity allocation and the overhead applied from the cost centers to the production order is only indirectly reflected. The allocations reassign costs that were originally posted to other expense accounts in the G/L, such as the salary account. Reconciliation is necessary because the actual cost of producing the material includes these reassigned costs, which are the activity rates and overhead allocations. The total actual costs that are posted to the COGS and manufacturing offset accounts when the sales order item is finally settled include these secondary cost elements.

To reconcile the postings that occur during the production process, the original accounts that contain the expense postings to the production and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original FI and CO postings are included in the reconciliation of the production process, the written-off variances represent the only net impact on the P&L.

When CO-PA is used, the cost center variances are not directly reflected in FI's variance accounts, but are analyzed in CO or CO-PA. The variances are included in the original expense postings to the cost centers. Although a manual entry to the G/L is possible to reclassify these variances to a cost center variance account, this entry would not be reflected in CO and variances will not be double-counted. This manual entry is not used in this chapter.

Reconciliation

Due to the nature of FI/CO's functions, where not all CO transactions (such as hourly activity rates and overhead allocations) are reflected in FI accounts, a reconciliation process must take place. This reconciliation ensures that the FI and CO remain balanced for reporting.

The goals of this reconciliation are to determine whether:

- FI accounts are in balance with the CO postings
  The production process managed by the sales order should have a net zero impact on the P&L. The only impact should be on the written-off production variance calculated by RA. In this chapter, cost center variances are not reclassified in the P&L.

- Variances in the CO objects are consistent with variances reported in CO-PA
  Once the production process is complete, variances in the controlling objects must be cleared using period-end processes. Variances calculated on the sales order are settled to a variance account and to CO-PA. Cost center variances are assessed to CO-PA. The variances in CO reporting and in CO-PA reporting are identical.

Reconciliation Procedure

All debits and credits to the P&L accounts in the production process are accumulated. The manufacturing variance account is initially excluded, because it represents a reclassification of the written-off variances. The other accounts contain only the cost center variances, which are represented in CO-PA, but not on the G/L. The sales/production order variances are the same in product cost reporting and CO-PA reporting. The cost center variances are the same in cost center reporting and in CO-PA reporting.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process	DR	CR	CO	DR	CR	CO Variances CR to CO	PA Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	120		Matl OH CCtr	200	30	170	OH CCtr Vars
COGS - Std			Mach OH CCtr	200	45	155	OH CCtr Vars
COGS - Var			Labor OH CCtr	200	15	185	OH CCtr Vars
WIP Offset		390	Admin OH CCtr	200	60	140	OH CCtr Vars
			ProdCCtr	1000	120	880	Prod CCtr Var
			Prod Ord				Prod Ord Var
	1920	390	Subtotal	2600	1070	1530	CCtr Var
CCtr Var	1530		DR/CR bal for CO	0			

Period 2

FI/Production Process	DR	CR	CO	DR	CR	CO Variances CR to CO	PA Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	50		Matl OH CCtr	200	12.5	187.5	OH CCtr Vars
COGS - Std		500	Mach OH CCtr	200	45	155	OH CCtr Vars
COGS - Var		175	Labor OH CCtr	200	15	185	OH CCtr Vars
WIP Offset	390		Admin OH CCtr	200	42.5	157.5	OH CCtr Vars
			ProdCCtr	1000	120	880	Prod CCtr Var
			Prod Ord	675	500	175	Prod Ord ActCst
			Sales Ord				Sls Ord ActCst
	2240	675	Subtotal	3275	1535	1740	Total Var
CCtr Var	1565		DR/CR bal for CO	0			CCtr + Ord Vars (1565 + 175)

As a result of the T-accounts above, we concluded that:

- There is a net impact of zero on the production process for the sales and production orders.

  Once the sales order has been settled, only manufacturing variances have a P&L impact.

- The variances on the controlling objects are depicted in the CO section before these variances are cleared to CO-PA.

- The variances on the sales order are consistent.

  The variances are the same in the G/L account, on the sales order, and in CO-PA.

- Since revenue and sales discounts do not reflect manufacturing costs and are collected on the sales order, these accounts are not considered in the reconciliation.

- All sales and production order costs, regardless of when they were posted, are only considered at the time the sales order is settled.

  Sales and production order costs that were posted in period 1 are handled in FI with the WIP process. Due to the open sales order item, there is no FI impact and the WIP amount does not flow into CO-PA.

- Variances or balances analyzed on the cost center level cannot be analyzed in "variance" accounts in FI but must be analyzed in CO or CO-PA.

  The object (cost center) variances are not reflected in a FI variance account. The variances are contained in the cost elements that were used to post costs to the cost center (such as salary and supplies expenses posted to the cost center).

- If the cost center variances were to be reflected in FI, a manual journal entry to a cost center offset account and to a cost center variance account is necessary to reclassify these variances.

  To avoid double-counting the cost center variances, since the cost centers have already been cleared to CO-PA neither of these accounts should then be created as cost elements.

Cost-Based Profitability Analysis

Overview

CO-PA, a separate module where the cost of sales can be analyzed, captures transactions from:

- Sales and Distribution (SD), when a sales order is settled

- FI, with direct journal entries

- CO, from cost center assessments

Identifying characteristics, such as customers, customer groups, products, product hierarchies, geographic regions, etc. that determine how profitability should be analyzed are used to configure CO-PA. Additionally, the values that are captured, such as the quantity of a product that is invoiced, the revenue and discounts applied when the product is sold, variances that are captured in the sales and production orders, and other cost allocations must be identified and created in CO-PA.

One CO-PA document is created for each line item in a sales order and for each sender-receiver combination in cost center assessments. The receiver is a profitability segment, which is a unique combination of the values of the characteristics used to measure profitability. For example, different customer numbers result in different profitability segments. These segments are incorporated into the CO module, so that transactions can be carried out between other controlling objects, such as cost centers and orders, and profitability segments. Once a value has been posted to CO-PA, the revenue and costs can no longer be allocated out of CO-PA with normal CO processing.

Design Decisions

Although many different design options exist for CO-PA, this example only illustrates data flows as they pertain to costing this ATO manufacturing scenario. CO-PA functionality and implementation outside this scope will not be discussed. The following design decisions and configuration options were implemented to set up the CO-PA operating concern for this product costing chapter:

- Cost-based CO-PA is used to match product revenues and costs so that cost of sales and contribution margin can be analyzed.

  Value fields are used to capture cost and revenue data. Cost elements are mapped to value fields in configuration, but cost elements are not available for reporting or analysis in cost-based CO-PA.

- The cost of a product (cost of sales) is posted to CO-PA when the sales order is settled.

  The finished product is a standard product for which a standard cost has been maintained. The manufacture of the product is controlled using the sales order. The product is not usually kept in stock but is assembled when an order has been placed. It is possible to pass these cost elements to CO-PA with the same detail used to develop the standard cost estimate. That is, the fixed and variable portions of the material, labor, machine, and overhead costs, based on the cost component layout or cost estimate. Variances are not available at the same detailed level, only as one lump sum categorized as a variable cost. In this example, this detail was combined into fewer value fields (the fixed and variable portions of the standard cost). It is also possible to obtain the total standard cost of the material from the material master, which does not allow a detailed breakdown of the standard cost.

- Fixed and variable costs are posted to separate value fields.

  This option allows for a more detailed analysis of contribution margins. It is possible to break out this information into more value fields than was used in this chapter. It is also possible to accumulate the existing value fields by creating additional summarized valued fields or, in reporting, by summarizing the detailed value fields. The variance calculated on the sales order is transferred to CO-PA as a single value field (variable cost).

- User-defined characteristics were set up to include fields obtained from the material master, the customer master, and the invoice.

  The rules that regulate how these fields are updated include:
  - Characteristics that are obtained from the material master are updated whenever the material number is passed to CO-PA.
    An example of this posting is the settlement of the sales order. (The material number is on the line item level of the sales order and in the production order to which it is linked.)
  - Characteristics obtained from the customer master are updated whenever the customer number is passed to CO-PA.
    This process re-occurs during settlement of the sales order. (The customer number is on the header level of the sales order.)

- Allocations from the overhead and production cost centers to CO-PA segments may occur based on data that has been captured in CO-PA.

  CO-PA data includes revenue, cost of sales, variances, and direct postings. The combination of characteristics to which the assessment is applied is determined during the configuration of the cost center assessment. If the assessment occurs to a product, all other data related to the material master is also captured; if the assessment occurs to a product and a customer, all product and customer-related characteristics will also be populated. However, these types of allocations should typically not be performed to the lowest level of detail, such as product number, but should be based on higher-level characteristics, such as product lines or geography.

- Variances are posted to CO-PA at the same time as the revenue and cost of sales.

  The variances are matched with the standard cost of sales, which help analyze "actual" costs in CO-PA. In this ATO approach, it is possible to see customer detail for these manufacturing variances.

Issues

Issues that may be encountered in reconciling the production postings into cost-based CO-PA with the G/L include:

- Cost-based CO-PA in the ATO environment uses a cost-of-sales approach, where the actual cost of sales (standard plus variance) is recognized at the same time as the revenue.

    There is a lag between the time the revenue is recognized in the G/L (when the product is invoiced) and when it is posted to CO-PA; the actual cost of sales are posted to the G/L and to CO-PA when the sales order is settled. Due to timing differences, if invoicing and settlement occur in different periods, it is a reconciling item between the G/L and CO-PA.

- The variance between the standard and actual costs of the assembled product is available.

    However, RA on the sales order item level does not provide the detailed variance categories that are available for other cost objects (production orders, run schedules, and so on). The variance is passed to CO-PA as one variable value.

- WIP is not transferred to CO-PA.

    A profitability segment is viewed as a controlling object to which costs in CO are transferred. WIP is a background process, which ensures that the balance sheet contains the correct values. The resulting G/L entry also ensures that the production process has no P&L impact for the period. No posting is made directly to the sales order, so the WIP balance cannot be transferred into CO-PA in a balanced controlling transaction. The reconciliation addresses this issue. It is also possible to make a direct entry into CO-PA to account for the WIP offset posting to the P&L, but this option is not used in this chapter.

- Cost elements and G/L accounts are not available in cost-based CO-PA.

    The reconciliation between CO-PA and the G/L must occur using value fields (categories of expense) and high-level information (such as company code and business area) on the side of CO-PA. The information captured in CO-PA at the lower levels is not available in journal entries in FI.

- Value fields can be freely defined to include more (or less) detail than the approach used in this example.

    If the value fields are defined at a detailed level, they can be summarized by updating an additional value field, which accumulates values from several other value fields, or they can be summarized in reporting. If they are captured at a high level, drill-down to additional detail is only available in the originating module (SD, CO, CO-PC), not in CO-PA.

The chart on the following page contains sample characteristics and value fields used by the production process. Fixed characteristics are automatically generated when the operating concern is generated. For clarity, the administrative characteristics (time, date, user ID stamps at creation, alternate currencies, fixed parameters such as client and ledger numbers, and similar data) are not listed. Up to 30 additional user-defined characteristics may be created and populated in CO-PA. All value fields, up to 120, must be defined in cost-based CO-PA.

The value fields are updated when:

- Settling a sales order updates the revenue, COGS, and COGS variance value fields.

- Assessing cost centers updates the cost center variance fields.

CO-PA Fields Updated by Period-End Controlling Processes

OPERATING CONCERN	Value Fields — Settlement (Revenue)										Value Fields — Settlement (Actual Cost)			Value Fields — CCtr Assessments			
Characteristics	Invoiced quantity	Revenue - Domestic	Revenue - Internat'l	Revenue - Government	Discounts - Domestic	Discounts - Internat'l	Discounts - Government	Freight - Domestic	Freight - Internat'l	Freight - Government	COGS - Fixed Costs	COGS - Variable costs	COGS - Variances (variable)	Variances - OH CCtr (fixed)	Variances - OH CCtr (variable)	Variances - Prod CCtr (fixed)	Variances - Prod CCtr (variable)
Fixed																	
Document number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Item number														X	X	X	X
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																	
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Business area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales organization	X	X	X	X	X	X	X	X	X	X	X	X	X				
Distribution channel	X	X	X	X	X	X	X	X	X	X	X	X	X				
Division	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plant	X	X	X	X	X	X	X	X	X	X	X	X	X				
Product	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Customer	X	X	X	X	X	X	X	X	X	X	X	X	X				
Reference document no.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reference item	X	X	X	X	X	X	X	X	X	X	X	X	X				
Sales order	X	X	X	X	X	X	X	X	X	X	X	X	X				
Sales order item	X	X	X	X	X	X	X	X	X	X	X	X	X				
Billing type																	
Goods issue date																	
Invoice date																	
Posting date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fiscal year	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Period	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profit center	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WBS element																	
Order																	
Cost object																	
Sender cost center														X	X	X	X
Tracing factor														X	X	X	X
Cost element														X	X	X	X
User-Defined																	
Product hierarchy - Lvl 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product hierarchy - Lvl 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product hierarchy - Lvl 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Customer group	X	X	X	X	X	X	X	X	X	X	X	X	X				
Sales district	X	X	X	X	X	X	X	X	X	X	X	X	X				
Sales office	X	X	X	X	X	X	X	X	X	X	X	X	X				

- Hidden rows for control data are usually not used for analysis.

- The fields in bold indicate that the field is visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

Chapter 7: Product Costing Flow for Repetitive Manufacturing with Profitability Analysis

Contents

The following graphic is an overview of the process:
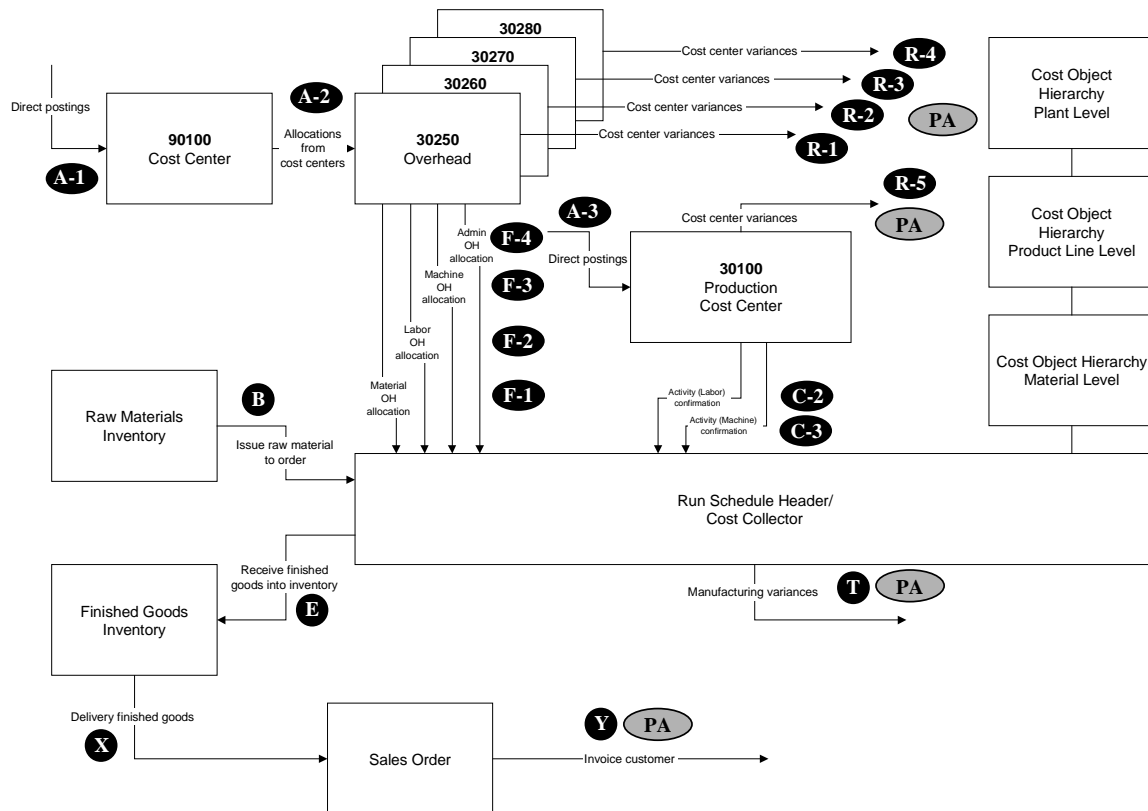
This chapter describes the accounting logic associated with SAP's repetitive manufacturing process, using product cost collectors and valuing the finished product in inventory with a standard cost. In this process, the following items are documented:

- Production flow with production cost collectors and the cost object hierarchy

- Associated T-accounts

- Reconciliation of these T-accounts

The current example uses profitability analysis (CO-PA). The assumptions made during the CO-PA configuration are discussed in a later section.

The production cost collector is the focus of the direct, controllable costs incurred during the repetitive manufacturing process. The run schedule header created to manage this process automatically creates a production cost collector. The cost collector is a Controlling (CO) production order that is linked to the run schedule header. Direct manufacturing costs, such as materials and resources, are incurred during the production of a finished product or a semi-finished product (subassembly). The indirect costs associated with the product's cost are:

1. Collected using the system's overhead costing capabilities

2. Allocated to the production cost center

3. Allocated (in direct proportion) to the direct costs posted to the production cost collector

The differences between SAP's product costing process and most U.S. legacy systems are that:

- In R/3, inventory does not flow through cost centers

  Rather than tracking inventory, the cost centers track total available labor and machine costs and indirect production expenses. Instead of cost centers, our production cost collectors capture the product's total cost in the repetitive environment.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet

  In most legacy systems, production costs are moved from the raw materials inventory account to the work in process (WIP) balance sheet account to the finished goods inventory account. In R/3, using CO, the production costs associated with an order are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account. In the repetitive environment in this example, backflushing is used so no WIP balances need to be processed.

On the following pages, each step in the process is described, followed by the T-accounts used in the Pre-Configured Client. A method of reconciling the general ledger (G/L) accounts with the CO objects used in repetitive manufacturing is also explained.

TechTalk

The numbering scheme was developed to allow additional processing for product costing using different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Cost Collectors

Each step in the repetitive manufacturing process is described on the next page. Product costing is closely tied to production. The financial and costing entries automatically result from the daily manufacturing transactions entered into the system. The month-end processes are necessary to complete the financial picture for product costing. In the following example, we assume that the production cost collector remains open for one period and that the cost object hierarchy is only used for collectively processing cost collectors and for summarized reporting, not for collecting and managing product costs.

The process comprises the following steps:

1. Costs are posted to the cost centers.

2. During the creation of a run schedule header, a production cost collector is created to simultaneously capture the manufacturing costs.

3. During backflushing, the following steps occur simultaneously:
   - Material components are issued from inventory to the production cost collector using actual quantities.
   - Resources (activities) are provided from the production cost center to the production cost collector at the standard quantities.
   - The finished product is received into inventory.

4. The month-end process is executed for cost centers and for the cost object hierarchy to which the production cost collectors are linked.

In this example, since backflushing is used and all goods issues, activity confirmations, and receipts into inventory occur in one step, all remaining balances on the cost collector are calculated as variances. WIP does not need to be calculated, since there is no timing difference between debits (goods issues and activity confirmations) and credits (goods receipts) to the production cost collector. For this reason, only one period will be examined in this chapter.

All material/production version combinations are linked to the cost object hierarchy. In this chapter, the cost object hierarchy is used to collectively process all cost collectors at month-end, for reporting and rollup purposes. Costs are not directly posted to the cost objects, so no costs are distributed down from the cost objects to the production cost collectors.

This business process may not reflect every manufacturing scenario. For example, backflushing may not always be used, so material components are issued to the production cost collector as they are used, which requires a WIP calculation. There may also be differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, while others are manufacturing overhead (indirect) costs. (Steps A-1 to A-3 are examples of these postings.) In this example, the cost center design uses separate cost centers for the direct production costs and for each type of manufacturing overhead cost. Although the cost center design is flexible, other options are not discussed at this time.

The following cost center structure and transactions illustrate the design used for this chapter:

- Post costs to service or administrative cost centers

  At a plant-wide level, utilities and rent must be considered during the manufacturing process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products that are produced, but the overall indirect costs and their variances (over and under absorption to products) are not managed at the product (production cost collector) level. In this cost center design, the utilities and services are managed at a cost center level, but these cost centers allocate their costs to the manufacturing overhead pools. The cost centers for these pools, in turn, manage the variances of the indirect costs.

  In this example, actual salaries are posted to a utility cost center in both periods. Salaries are a direct cost for the utility cost center, but an indirect cost for the overall manufacturing process. Other costs, such as maintenance, repair, and operations materials and supplies, may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

- Allocate costs from service and administrative cost centers to manufacturing overhead pools

  Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers will allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this example, the expenses incurred by the utility cost center are evenly allocated to all manufacturing overhead pool cost centers.

- Post costs to the production cost center

  Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center later supplies resources, such as labor and machine time, to the production cost collector. The cost center manager will determine a rate for each of these resources, which are represented by system activities and are managed in hours. The hourly rate may be manually entered by the cost center manager, or be calculated by the system based on the planned expenses and hours available in the cost center.

Step B: Raw Material Is Issued from Inventory to the Run Schedule/Production Cost Collector

From inventory, raw material is issued to the production cost collector. The system bases the standard quantity of raw materials to be issued on the quantity of finished goods produced by the run schedule and its bill of material. The raw materials may be manually updated to reflect actual usage. In this example, raw materials are issued to the production cost collector at their moving average cost.

The raw materials may be issued to the run schedule/production cost collector in one of the following ways:

- As a manual goods issue

- Using backflushing

- Automatically when the first operation is confirmed, if materials are allocated to the operation

In this example, all required components are issued to the run schedule using backflushing. As the quantity of finished goods is confirmed, raw material is updated to reflect actual usage and is issued to the run schedule. The goods issue occurs at the same time that resources (activities) are confirmed and posted, and the finished goods are received into inventory. The production cost collector captures the costs associated with the run schedule header.

Series C: Activities Are Allocated from the Production Cost Center to the Run Schedule/Production Cost Collector

The production cost center supplies value-added resources, such as labor and machine time, to the run schedule. From a production perspective, the resources are represented by work centers. From a costing perspective, the resources are represented as activities (labor and machine hours), and each activity has a planned rate. The activities for the production cost center are linked to the work center in the master data. The resources (activities) used to produce the finished goods are posted to the production cost collector. The quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed, based on the quantity of finished goods confirmed in the run schedule and the standard number of hours in the routing used to calculate the standard cost estimate.

For this production cost collector, because confirmation occurs during backflushing at the run schedule header, and not at the operation level, the standard number of hours used to develop the released cost estimate is automatically posted to the cost collector, using the current activity rate. The actual number of hours cannot be updated during backflushing. This example assumes that no setup time was estimated on a per-unit basis in the cost estimate, so no setup costs are included in the standard cost or the resource (activity) posting. The activity allocation occurs at the same time that material components are issued to the run schedule, and the finished goods are received into inventory. The production cost collector captures the costs associated with the run schedule header.

The following allocations are made from the production cost center to the production cost collector:

- Labor hours

   The standard number of labor hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units confirmed for the run schedule.

- Machine hours

   The standard number of machine hours is developed on a per-unit basis, so the standard hours required for one unit is multiplied by the number of units that are confirmed for the run schedule.

Step E: Finished Goods Are Received into Inventory from the Run Schedule/Production Cost Collector

The completed finished goods are entered as a goods receipt from the run schedule into inventory. The inventory value is updated with the actual quantity produced multiplied by its standard cost. This goods receipt automatically posts the financial and material documents. In this example, the finished goods are valued at standard. Receiving the product into inventory at a moving average cost is possible but is not discussed in this chapter.

In this example, an automatic goods receipt into inventory is used when the final operation is confirmed. As the finished products are completed, backflushing takes place throughout the period. The goods issue occurs at the same time that material components are issued and the resources (activities) are confirmed and posted to the run schedule. The production cost collector captures the costs associated with the run schedule header.

Step X: Deliver Product to the Customer

Once a finished product is manufactured and received into inventory, it can be delivered to a customer. At this time, the cost of sales is posted to the G/L. Since the finished product is valued at standard, the entry to cost of sales is for its standard value. There is no posting to cost-based CO-PA at this time.

Step Y: Invoice the Customer

In most cases, invoicing only occurs after the finished product has been shipped to the customer. At this time, the revenue is posted to the G/L and to CO-PA. At the time of delivery, the cost of sales has already been posted to FI. It is now posted to cost-based CO-PA with the invoice data, so that the cost of the product is matched with the revenue.

In this example, the cost of sales is taken from the standard cost estimate of the finished product. The full detail of the cost components that make up the standard cost can be analyzed in CO-PA when a value field is configured, such as for the fixed and variable portion of each cost component. This cost component can also be combined into fewer value fields in CO-PA, or the value can be taken from the standard cost stored in the material master. Sales-related characteristics configured in CO-PA, such as product number, product line, customer, customer group, and geographic region, are carried over for analysis.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Production Cost Collector

Overhead is applied to the production cost collector, thereby posting additional costs to the production cost collector. The applied overhead cost is a percentage of the direct costs that have already been posted to the production cost collector during the period. If overhead processing is run more than once during the

same period, only the difference in overhead from the previous run is applied to the cost collector. A costing sheet, associated with the order type of the production cost collector, stores the rules to apply these overhead costs. An overhead rate can be applied based on the quantity of material components issued to the production cost collector, but this technique is not used in this chapter. Although the overhead design is flexible, and may involve the use of internal orders, the other options are not discussed at this time. In this example, separate overhead cost centers and overhead rates are used for each type of overhead applied.

The following manufacturing overhead pool cost centers are used to apply these overhead types:

- Material overhead to the production cost collector

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the production cost collector during the period.

- Machine overhead to the production cost collector

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the production cost collector during the period.

- Labor overhead to the production cost collector

  For example, a manufacturing overhead cost center collects indirect costs, such as human resources and accounting that are related to production workers. The overhead percentage rate is based on the cost of the labor time that was confirmed for the production cost collector during the period.

- Administrative overhead to the production cost collector

  For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the production cost collector. The overhead percentage rate is based on all costs posted to the production cost collector during the period. Administrative overhead is not applied to other overhead postings.

Series R: Assess Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the production cost center's resources. These variances are assessed to CO-PA at the end of the month where they can be allocated to products, product lines, customers, geography, or other combinations of dimensions (characteristics) tracked in CO-PA. The assessment takes place only in CO, so no posting is made to the G/L.

In this example, the cost center variances are assessed to CO-PA at the end of each period. Optionally, these variances can also be reflected in FI by manually posting a financial entry. However, the assessment to CO-PA already clears the cost center, so if this posting were desired, neither G/L account should be a cost element, and the FI/CO reconciliation would change. This option is not used in this chapter.

The following is a list of these variances that are assessed to CO-PA:

- Manufacturing overhead variances for material overhead

  The manufacturing overhead cost center, which collects indirect costs related to materials, is assessed to CO-PA.

- Manufacturing overhead variances for machine overhead

  The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is assessed to CO-PA.

- Manufacturing overhead variances for labor overhead

  The manufacturing overhead cost center, which collects indirect costs related to plant operations that are not specific to a product, is assessed to CO-PA.

- Manufacturing overhead variances for administrative overhead

  The manufacturing overhead cost center, which collects indirect costs related to all costs on the production cost collector, is assessed to CO-PA.

- Production cost center variances

  The production cost center, which collects direct costs related to production resources, is assessed to CO-PA.

Step T: Calculate Production Cost Collector Variances with the Cost Object Hierarchy (Posted at Settlement)

Variances are calculated on the cost object hierarchy. All material/version combinations are linked to cost objects in this hierarchy. All production cost collectors created for the material/version combinations are thereby automatically linked to this hierarchy. Performing the period-end process on the cost object hierarchy is a method of collectively processing the production cost collectors. Variance keys should not be defaulted into the production cost collectors from the material master, and all variance keys must be maintained at the cost object level. The variance process calculates the difference between the standard cost of the finished product and the actual costs incurred on the production cost collector, so these differences can be classified and analyzed. The calculated variances determine the reason for the variances, such as a difference in the actual versus planned quantity of material components that were issued to the cost collector, or a substitution of component materials. Since all activities are posted at their standard quantity, their variances are calculated only if the activity rate has changed. Variances on the quantities of activities will be calculated only if a manual activity allocation from the production cost center to the production cost collector is performed outside the normal backflush process.

Variances are posted to the G/L during settlement of the cost object hierarchy. The actual financial transactions still occur at the production cost collector level. The production cost collector is credited if the variance is unfavorable (positive balance) and debited if the variance is favorable (negative balance). The posting to the P&L statement is based on the product's valuation class in the material master, which determines the G/L accounts that will be used in the journal entry.

In this example, a P&L account, different from the one used to credit the production cost collector for the receipt of finished goods into inventory, is used to post the variance at standard. By doing so, the production cost collector variances can be easily reported in both product costing reports and in the P&L statement. Variances are calculated at the end of each period for the products that have been completed and received into inventory (confirmed).

During settlement, variances are posted to CO-PA when they are posted to the G/L. In this example, the fixed and variable portions of the variance are carried into CO-PA with the same breakdown as the cost component layout that comprises the standard cost. Any characteristics, such as product number, product line, plant, etc., that have been configured in CO-PA related to the product number are carried over for analysis. This information allows variances to be matched with the product's cost of sales. The variances are posted to CO-PA when they are incurred, not when the product is sold.

End Period: Run Settlement of the Cost Object Hierarchy to Settle Production Cost Collectors (Posts T)

The previously described variance process updates secondary cost elements, but these values remain in CO. When settlement of the cost object hierarchy is run at the end of each period, the variance values for each production cost collector that is linked to the cost object hierarchy are posted to the Financial (FI) module and to CO-PA.

Summary of the Sample Scenario

The graphic on the first page illustrates steps A to Y. The T-accounts reflect the postings made during the repetitive manufacturing process using:

- One utilities cost center

- Four manufacturing overhead cost centers

- One production cost center

- One production cost collector, linked to the cost object hierarchy

Postings were made for one period. Since backflushing is used, there is no timing difference between the goods issue, activity confirmation, and goods receipt, so no WIP resides on the cost collector. All remaining costs on the production cost collector after confirmation are variances, which are calculated and posted during settlement.

The steps illustrated by the T-accounts include period 1: A – B – C – E – F –T – Settlement – R – X - Y

T-Accounts: FI G/L Accounts

BALANCE SHEET

	Raw Mat'l Inv. 131000		Fin Gds Inv. 134000		A/P 211000		A/R 121000
Period 1	B	170	E	500	A-1	800	Y	1000
			X	500	A-3	1000		

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

	Salary Exp 610000		Raw Mat'l Consum 510000		Revenue 410000*		Sales Discounts 420000*
Period 1	A-1	800	B	170	Y	1200	Y	200
	A-3	1000						

	Mfg Output - Std 519000		Mfg. Output - Var 519500		Production Variance 531000*		Cost of Goods Sold 500000*
Period 1	E	500	T	175	T	175	X	500

* Cost elements are not created for WIP, production variance (price difference), and sales-related accounts (cost of goods sold, revenue, and sales discounts).

T-Accounts: CO Secondary Cost Elements

CO - SECONDARY COST ELEMENTS

	Utilities Assessment 810000		Labor Hours 801000		Machine Hours 800000		CO-PA Assessment 811000
Period 1	A-2	800	C-2	120	C-3	120	R-1	157.5
	A-2	800	C-2	120	C-3	120	R-2	110
							R-3	170
							R-4	97.5
							R-5	760

	Material OH 840000		Machine OH 841000		Labor OH 842000		Admin OH 843000
Period 1	F-1	42.5	F-2	90	F-3	30	F-4	102.5
	F-1	42.5	F-2	90	F-3	30	F-4	102.5

Since backflushing is used in this repetitive manufacturing scenario, WIP does not need to be calculated. Therefore, results analysis cost elements are not used.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

	Utilities CCtr 90100			Mat'l OH CCtr 30250			Mach OH CCtr 30260			Labor OH CCtr 30270			Mfg Admin OH CCtr 30280	
Period 1	A-1	800		A-2	200		A-2	200		A-2	200		A-2	200	
	A-2		800	F-1		42.5	F-2		90	F-3		30	F-4		102.5
				R-1		157.5	R-2		110	R-3		170	R-4		97.5

	Production CCtr 30100			Cost Collector xxxxxxxxx				Operating Concern 0010		
Period 1	A-3	1000		B	170		Raw material	Period 1	T	175	Variances
	C-2		120	C-2	120		Labor hours		R-1	157.5	OH CCtr Ass'mnt
	C-3		120	C-3	120		Machine hours		R-2	110	OH CCtr Ass'mnt
	R-5		760	E		500	Receive fin goods		R-3	170	OH CCtr Ass'mnt
				F-1	42.5		Material OH		R-4	97.5	OH CCtr Ass'mnt
				F-2	90		Machine OH		R-5	760	Prd CCtr Ass'mnt
				F-3	30		Labor OH		Y	1200	Revenue
				F-4	102.5		Admin OH		Y	200	Discount
				T		175	Settle variances		Y	500	COGS

Variances: Cost Coll. Costs vs. Std. Cost

E	Standard Cost		T	CostColl Variances	
Material	120		Qty - Matl	50	
Labor	80		Qty - Lab	40	
Machine	100		Qty - Mch	20	
OH Mat	30	25%	Inpt - Matl	12.5	
OH Mach	75	75%	Inpt - Mch	15	
OH Labor	20	25%	Inpt - Lab	10	
OH Admin	75	25%	Inpt - Adm	27.5	
Total Std	0		Total Vars	175	

- Variance categories are determined based on the cost elements that make up the standard product cost.

- All manufacturing postings are updated in CO-PA with their original sign. To simplify reporting for profit margin calculations, all sales revenue and discount postings are updated with a positive sign for sales orders and for sales order types created for normal sales.

FI/CO Reconciliation

FI

FI includes the balance sheet and P&L accounts. These accounts can be created as cost elements and posted to FI and CO. Cost elements determine for which accounts additional detail should be tracked with CO objects, such as production cost collectors and cost centers.

Sales-related accounts, such as the cost of sales, revenue, and sales discount P&L accounts are outside the manufacturing process and are not included in the reconciliation. Of the manufacturing accounts in this chapter, only the production variance (price difference) account (531000) is not created as a cost element in CO. At the end of the manufacturing process, the variance account contains the net impact on the P&L.

CO

Production costs that flow through a production cost collector, not through a cost center, include:

- Material costs that are directly posted to the production cost collector

- Labor and machine time posted from the production cost center to the production cost collector

- Overhead allocations to the production cost collector from the manufacturing pool cost centers

In FI, the direct postings made to the service and production cost centers are reflected, but the activity allocation and the overhead applied from the cost centers to the production cost collectors are only indirectly reflected. The allocations are reassigning costs that were originally posted to other expense accounts in the G/L, such as salary accounts. Reconciliation is necessary because the actual cost of producing the material includes these reassigned costs (activity rates and overhead allocations). The total actual costs that are posted to the manufacturing offset accounts, when the production cost collector item is settled, include these secondary cost elements.

To reconcile the postings that occur during the manufacturing process, the original accounts that contain the expense postings to the production and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original postings to FI and CO are included during the manufacturing process reconciliation, with the exception of the written-off variances, the sales and production cost collectors have no net impact on the P&L.

When CO-PA is used, the cost center variances are not directly reflected in variance accounts in FI, but are analyzed in CO or CO-PA. The variances are included in the original expense postings to the cost centers. Although a manual entry to the G/L is possible to reclassify these variances to a cost center variance account, to avoid double-counting variances, this entry would not be reflected in CO. This manual entry is not used in this example.

Reconciliation

Due to the nature of FI/CO functions, where not all CO transactions, such as hourly activity rates and overhead allocations, are reflected in FI accounts, a reconciliation process must take place. This reconciliation ensures that FI and CO remain balanced for reporting.

The goals of this reconciliation are to determine whether:

- FI accounts are in balance with the CO postings
  The manufacturing process managed by the production cost collectors should have a net zero impact on the P&L. The only impact should be the calculated production variances that are written off, and which are posted at settlement. In this example, cost center variances are not reclassified in the P&L.

- Variances in the CO objects are consistent with variances reported in CO-PA
  Once the manufacturing process is complete, variances in the CO objects must be cleared using period-end processes. Variances calculated on the production cost collector are settled to a variance account and to CO-PA. Cost center variances are assessed to CO-PA, but the variances reported in CO reporting and CO-PA reporting are the same.

Reconciliation Procedure

All debits and credits to the P&L accounts in the manufacturing process are accumulated. The manufacturing variance account is initially excluded, because it represents a reclassification of the written-off variances. The other expense accounts contain only the cost center variances, which are represented in CO-PA but not on the G/L. The production cost collector variances are the same in product cost reporting and in CO-PA reporting. The cost center variances are the same in cost center reporting and in CO-PA reporting.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process	DR	CR	CO	DR	CR	CO Variances CR to CO	PA Value Fields
Salary Exp	1800		Util CCtr	800	800		
Raw Mat'l	170		Matl OH CCtr	200	42.5	157.5	OH CCtr Vars
MfgOut-Std		500	Mach OH CCtr	200	90	110	OH CCtr Vars
MfgOut-Var		175	Labor OH CCtr	200	30	170	OH CCtr Vars
			Admin OH CCtr	200	102.5	97.5	OH CCtr Vars
			ProdCCtr	1000	240	760	Prod CCtr Var
			Prod Ord	675	500	175	Prod Ord ActCst
			Sales Ord				Sls Ord ActCst
	1970	675	Subtotal	3275	1805	1470	Total Var
CCtr Var	1295		DR/CR bal for CO	0			CCtr + Ord Vars
							(1295 + 175)

As a result of the T-accounts on the previous page, we concluded that:

- There is a net impact of zero on the manufacturing process for the production cost collector.

  Only manufacturing variances have a P&L impact once the cost collector has been settled.

- The variances on the CO objects are shown in the CO section before these variances are cleared to CO-PA.

- The variances on the production cost collector are consistent.

  The variances are the same in the G/L account, on the cost collector, and in CO-PA.

- All manufacturing costs are considered at the time that the cost collector is fully settled.

Due to backflushing, since no WIP is calculated, all costs are handled during the month in which they are incurred.

- Variances, or balances, analyzed on the cost center level cannot be analyzed in "variance" accounts in FI but must be analyzed in CO or CO-PA.

    The cost center variances are not reflected in a FI variance account. The variances are contained in the cost elements that were used to post costs to the cost center, such as salary and supplies expenses.

- If the cost center variances were to be reflected in FI, a manual journal entry to a cost center offset account and to a cost center variance account would be necessary to reclassify these variances.

    To avoid double-counting the cost center variances, since the cost centers have already been cleared to CO-PA, neither of these accounts should be created as cost elements.

Cost-Based Profitability Analysis

CO-PA, a separate module where the cost of sales can be analyzed, captures transactions from:

- Sales and Distribution (SD), when an invoice is processed

- FI, with direct journal entries

- CO, from cost center assessments

- Production Planning (PP), with the settlement of production cost collectors using the cost object hierarchy

Identifying the characteristics, such as customers, customer groups, products, product hierarchies, geographic regions, etc., that determine how profitability should be analyzed are used to configure CO-PA. Additionally, the values that are captured, such as the quantity of a product that is invoiced, the revenue and discounts applied when the product is sold, variances that are captured in the production cost collectors, and other cost allocations, must be identified and created in CO-PA.

One CO-PA document is created for each sales order line item, for each production cost collector settlement, and for each sender-receiver combination in cost center assessments. The receiver is a profitability segment, which is a unique combination of the values of the characteristics used to measure profitability. For example, different customer numbers result in different profitability segments. These segments are incorporated into CO, so that transactions can be carried out between other CO objects, such as cost centers and orders, and profitability segments in CO-PA. Once a value has been posted to CO-PA, the revenue and costs can no longer be allocated out of CO-PA with normal CO processing.

Design Decisions

This example includes the use of CO-PA. Although many different design options exist for CO-PA, this example only illustrates data flows as they pertain to costing this repetitive manufacturing scenario. CO-PA functionality and implementation outside this scope will not be discussed. The following design decisions and configuration options were implemented to set up the CO-PA operating concern for this product costing chapter:

- Cost-based CO-PA is used to match the revenues and product costs so that cost of sales and contribution margin analyses can be carried out.

  Value fields are used to capture cost and revenue data. Cost elements are mapped to value fields in configuration, but cost elements are not available for reporting or analysis in cost-based CO-PA.

- The cost of a product (cost of sales) is only posted to CO-PA when the revenue is posted or when the invoice is passed to accounting.

  The standard cost of the finished product being sold is obtained from the current cost estimate that is generated by product costing. The cost component detail is passed to CO-PA. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to obtain the total standard cost of the material from the material master, which does not allow detailed breakdown of the standard cost.

- Fixed and variable costs were posted to separate value fields.

  This configuration allows a more detailed analysis of contribution margins. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to accumulate the existing value fields, either by creating additional summarized valued fields or, in reporting, by accumulating the detailed value fields.

- Once the order is complete, the production cost collector variances are posted to CO-PA at order settlement.

  The variance detail passed to CO-PA mirrors the cost component detail that makes up the standard cost. This step allows a more exact matching of variances with the standard cost of products that are sold. It is possible to combine this detail into fewer value fields, such as a total variance field, or two fields to capture the fixed and variable portions of the variance. It is also possible to split the variance detail into additional value fields, using the variance categories generated during the variance calculation on the production cost collector (quantity variance, resource-usage variance, and so on).

- Variances are posted to CO-PA in the period in which they occur.

  This posting may not occur in the same period that the product was sold, or when the cost of sales is recognized for a specific product.

- User-defined characteristics were set up to include fields obtained from the material master, the customer master, and the invoice.

  The rules that regulate how these fields are updated include:
  - Characteristics that are obtained from the material master are updated whenever the material number is passed to CO-PA.

    Examples of this posting include invoicing (the material number is on the line item level of an invoice) and the posting of production cost collector variances (the material number is on the header level of the production cost collector).
  - Characteristics obtained from the customer master are updated whenever the customer number is passed to CO-PA.

    This step occurs during invoicing (the customer number is on the header level of an invoice), but not during the posting of production cost collector variances (a production cost collector in the repetitive environment has no direct link to a customer).

- Characteristics that are obtained from the invoice are updated whenever the invoice number is passed to CO-PA.

  This step occurs during invoicing, but not during the posting of production order variances.

- Allocations from the overhead and production cost centers to CO-PA segments may occur based on data captured in CO-PA.

  CO-PA data includes revenue, cost of sales, variances, and direct postings. The combination of characteristics to which the assessment is applied is determined in the configuration of the cost center assessment. If this assessment occurs to a product, all other data related to the material master is also captured; if the assessment occurs to a product and a customer, all product and customer-related characteristics will also be populated. However, these types of allocations should typically not be performed to the lowest level of detail, such as product number, but should instead be based on higher-level characteristics, such as product lines or geography.

Issues

In reconciling the production postings into cost-based CO-PA with the G/L, the following issues may be encountered:

- Cost-based CO-PA uses a cost of sales approach, where the standard cost of sales is not recognized until a product is sold.

  There is a time lag between the time the cost of sales is posted to the G/L (when the product is delivered), and when the cost of sales is posted to CO-PA (when the product is invoiced). If the delivery and the invoice occur in different periods, it is a reconciling item between the G/L and CO-PA.

- The CO-PA design that provides the most detail is the current standard cost estimate from product costing.

  This cost estimate is updated in the material master to be the standard cost of the product. The timing of product revaluation must be closely monitored, so that it does not occur between delivery and invoicing. If this occurs, the value of the standard cost posted to the G/L and to CO-PA is a reconciling item. Depending on the CO-PA design, this step may already be considered when inventory is revalued, which can be reflected in CO-PA.

- Cost elements and G/L accounts are not available in cost-based CO-PA.

  The reconciliation between CO-PA and the G/L must occur using value fields (categories of expense) and high-level information (such as company code and business area) on the side of CO-PA. The information captured in CO-PA at the lower levels is not available in journal entries in FI.

- Value fields can be freely defined to include more or less detail than the approach used in this example. If the value fields are defined at a detailed level, these fields can be summarized by updating an additional value field that accumulates values from several other value fields, or they can be summarized in reporting. If they are captured at a high level, drill-down to additional detail is only available in the originating module (SD, CO, CO-PC), not in CO-PA.

The chart on the following page contains sample characteristics and value fields used by the manufacturing process. Fixed characteristics are automatically generated when the operating concern is generated. For clarity, the administrative characteristics (time, date, user ID stamps at creation, alternate

currencies, fixed parameters such as client and ledger numbers, and similar data) are not listed. Up to 30 additional user-defined characteristics may be created and populated in CO-PA. All value fields, up to 120, must be defined in cost-based CO-PA.

The value fields are updated at the following times:

- Passing an invoice to accounting updates the revenue, discount, freight, and cost of sales value fields.

- Settling production cost collector variances updates the variance fields at the same level of detail as the COGS value fields.

- Assessing cost centers updates the cost center variance fields.

CO-PA Fields Updated by an Invoice

OPERATING CONCERN

Value Fields
Invoice (Revenue)

Value Fields
Invoice (Standard Cost)

Revenue group columns (10):
1. Invoiced quantity
2. Revenue - Domestic
3. Revenue - Internat'l
4. Revenue - Government
5. Discounts - Domestic
6. Discounts - Internat'l
7. Discounts - Government
8. Freight - Domestic
9. Freight - Internat'l
10. Freight - Government

Standard Cost group columns (21):
1. COGS - Raw material (variable)
2. COGS - Semi-finished goods (fixed)
3. COGS - Semi-finished goods (variable)
4. COGS - Prod Setup (fixed)
5. COGS - Prod Setup (variable)
6. COGS - Prod labor (fixed)
7. COGS - Prod labor (variable)
8. COGS - Prod machine (fixed)
9. COGS - Prod machine (variable)
10. COGS - OH Material (fixed)
11. COGS - OH Material (variable)
12. COGS - OH Labor (fixed)
13. COGS - OH Labor (variable)
14. COGS - OH Machine (fixed)
15. COGS - OH Machine (variable)
16. COGS - OH Admin (fixed)
17. COGS - OH Admin (variable)
18. COGS - OH Sales/Marketing (fixed)
19. COGS - OH Sales/Marketing (variable)
20. COGS - Miscellaneous (fixed)
21. COGS - Miscellaneous (variable)

Characteristics	Inv qty	Rev-Dom	Rev-Intl	Rev-Govt	Disc-Dom	Disc-Intl	Disc-Govt	Frt-Dom	Frt-Intl	Frt-Govt	Raw mat(v)	Semi(f)	Semi(v)	Setup(f)	Setup(v)	Labor(f)	Labor(v)	Mach(f)	Mach(v)	OHMat(f)	OHMat(v)	OHLab(f)	OHLab(v)	OHMach(f)	OHMach(v)	OHAdm(f)	OHAdm(v)	OHSM(f)	OHSM(v)	Misc(f)	Misc(v)
Fixed																															
Document number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Item number																															
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																															
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Business area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales organization	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Distribution channel	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Division	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plant	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Customer	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reference document no.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reference item	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales order	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales order item	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Billing type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Goods issue date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Invoice date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Posting date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fiscal year	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Period	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profit center	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WBS element																															
Order																															
Cost object																															
Sender cost center																															
Tracing factor																															
Cost element																															
User-Defined																															
Product hierarchy - Lvl 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product hierarchy - Lvl 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product hierarchy - Lvl 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Customer group	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales district	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales office	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

- Hidden rows for control data are usually not used for analysis.

- The fields in bold indicate that they are visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

CO-PA Fields Updated by Period-End Controlling Processes

OPERATING CONCERN

Value Fields
Production cost collector settlement

Value Fields
CCtr Assessments

Characteristics	Variances - Raw material (variable)	Variances - Semi-finished goods (fixed)	Variances - Semi-finished goods (variable)	Variances - Prod Setup (fixed)	Variances - Prod Setup (variable)	Variances - Prod labor (fixed)	Variances - Prod labor (variable)	Variances - Prod machine (fixed)	Variances - Prod machine (variable)	Variances - OH Material (fixed)	Variances - OH Material (variable)	Variances - OH Labor (fixed)	Variances - OH Labor (variable)	Variances - OH Machine (fixed)	Variances - OH Machine (variable)	Variances - OH Admin (fixed)	Variances - OH Admin (variable)	Variances - OH Sales/Marketing (fixed)	Variances - OH Sales/Marketing (variable)	Variances - Miscellaneous (fixed)	Variances - Miscellaneous (variable)	Variances - OH CCtr (fixed)	Variances - OH CCtr (variable)	Variances - Prod CCtr (fixed)	Variances - Prod CCtr (variable)
Fixed																									
Document number	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Item number																						**X**	**X**	**X**	**X**
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**X**	**X**	**X**	**X**
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																									
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Business area	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sales organization																									
Distribution channel																									
Division	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Plant	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Product	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Customer																									
Reference document no.	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Reference item	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Sales order																									
Sales order item																									
Billing type																									
Goods issue date																									
Invoice date																									
Posting date	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Fiscal year	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Period	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profit center	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
WBS element																									
Order	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Cost object																									
Sender cost center																						**X**	**X**	**X**	**X**
Tracing factor																						X	X	X	X
Cost element																						**X**	**X**	**X**	**X**
User-Defined																									
Product hierarchy - Lvl 1	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Product hierarchy - Lvl 2	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Product hierarchy - Lvl 3	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	X	X	X
Customer group																									
Sales district																									
Sales office																									

- Hidden rows for control data are usually not used for analysis.

- The fields in bold indicate that they are visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

Cost Object Hierarchy

The cost object hierarchy allows a rollup of all cost collectors. All material/production version combinations are linked to cost objects in the cost object hierarchy. All production cost collectors created for the material/version combination are then automatically linked to the cost object hierarchy. In this chapter, the cost object hierarchy is primarily used to collectively process all cost collectors at month-end for reporting, and for rollup. Costs are not directly posted to the cost objects.

It is possible to use the cost objects in the hierarchy to collect the costs relevant to the manufacturing process but which cannot easily be associated with individual production cost collectors. This step allows for a more complete picture of all costs in the manufacturing process. In most cases, the costs that are posted to the cost objects are cost center distributions and assessments, activity allocations, or internal order settlements. Financial entries are rarely directly made to cost objects. If no distribution to the production cost collectors takes place, the costs can be analyzed within the cost object hierarchy and may then be settled to CO-PA.

The costs in the hierarchy may also be directly distributed to the production cost collectors. The distribution should occur before overhead is applied, variance is calculated, and settlement is processed. The costs posted to the hierarchy are distributed to the cost collectors based on the target costs in each cost collector. Target costs are calculated by multiplying the standard cost of the finished product by the quantity that was backflushed for the cost collector. If no postings occurred to a production cost collector in a period, this cost collector would not receive costs in the distribution. The distributed costs are then included in any further processing of the production cost collectors, including the overhead and variance calculations and the settlement. During settlement, the distributed costs are posted to the variance account of the finished product and to CO-PA. If the distribution was not taken into consideration while developing the standard cost, variances will be incurred on a production cost collector level, and cost center variances will be classified as manufacturing variances.

Chapter 8: Product Costing Flow for Engineer-to-Order Production with Profitability Analysis

Contents

The following graphic provides an overview of the engineer-to-order (ETO) process:
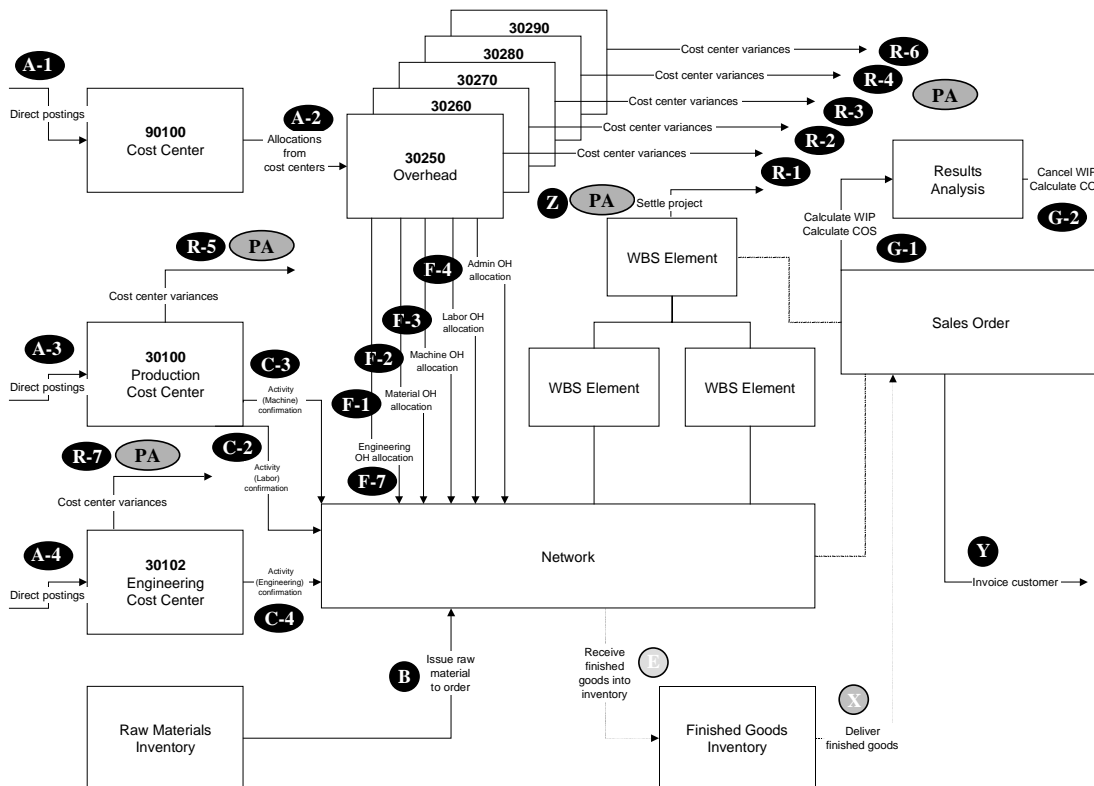
Overview

This chapter describes the accounting logic associated with SAP's engineer-to-order (ETO) production process, using the Project System (PS) module and valuing the cost of sales for the finished product with actual production costs. In this manufacturing scenario, the following items are documented:

- Production flow with projects

- Interaction of WBS elements and networks

- Associated T-accounts

- Reconciliation of T-accounts

The current example uses profitability analysis (CO-PA). The assumptions made during the configuration of CO-PA are discussed in a later section.

The WBS element that is designated a billing element in the project is the focus of the direct, controllable costs incurred during the ETO production process. A sales order automatically creates a network, which is an order within Project System. The network, in turn, automatically creates the WBS for the project, which

includes the project definition and the appropriate WBS elements. The manufacturing costs may be incurred during the production of a finished, or a semi-finished product (subassembly).

The indirect costs associated with the product's cost are:

- Collected using the system's overhead costing capabilities
- Allocated to the engineering and production cost centers
- Allocated (in direct proportion) to the direct costs posted to a project (WBS elements and networks)

The differences between SAP's product costing process and most U.S. legacy systems` are that:

- In R/3, inventory does not flow through cost centers

  Rather than tracking inventory, the cost centers track the total costs associated with the production process, including the costs for available resources, such as labor and machine costs, and indirect production expenses. In the ETO environment, instead of cost centers, our projects capture the product's total cost.

- In most U.S. systems, until variances are recognized, production costs remain on the balance sheet

  In most legacy systems, production costs are moved from the raw materials inventory account, to the work in process (WIP) balance sheet account, to the finished goods inventory account. Using the Controlling (CO) module, the production costs associated with a project are temporarily tracked on the profit and loss (P&L) statement. This process allows for greater flexibility when accounting for value-added costs. At month-end, these production costs are moved to a WIP balance sheet account.

On the following pages, each step in the process is described, followed by the T-accounts used in the Pre-Configured Client. A method of reconciling the general ledger (G/L) accounts with the CO objects used in ETO manufacturing is also explained.

TechTalk

The numbering scheme was developed to allow additional processing for product costing using different manufacturing methods. The omission of several letters of the alphabet is not an error.

The Production Process Using Projects (WBS Elements and Networks)

Overview

Each step in the engineer-to-order (ETO) production process is described on the following pages. Product costing is closely tied to production, so the financial and costing entries automatically result from the daily project and manufacturing transactions that are entered into the system. The month-end processes are necessary to complete the financial picture for product costing.

In the following example, we assume that the project remains open for three periods and that:

1. Costs are posted to the cost centers.

2. During creation of a sales order, a network is automatically created. In an ETO environment in Release 3.x, for the network to be automatically created, it is assumed that only one unit of a unique product will be designed and produced. In Release 4.x, a quantity greater than one is possible. In this scenario,

the network uses activity account assignment, meaning that costs are collected at the activity (step) level, not at the header level.

The following events take place:

- The network is copied from a standard network.

  The standard network is a template that contains the steps that must be followed when producing the finished product, the material components, and the activities that are related to each step.

- The standard network is linked to a standard WBS element structure.
  All WBS elements in the standard project structure that are linked to a network activity (step) are also automatically created.

- The planned completion dates of selected activities (steps) in the network that contain relevant milestones are updated in the sales order item's billing plan for the finished product.
  This configuration assumes that billing will occur when certain milestones have been reached in engineering and manufacturing the finished product, so that invoicing is spread throughout the life of the project.

3. Costs for the project must be planned.

   - When the network is created, planned costs and activities required to complete the product are automatically posted based on the BOM.

   - The network may be manually changed once it has been created, which may also change the planned costs.

   - The revenue determined during pricing of the sales order item for the finished product is copied into the WBS element revenue plan.

   - Additional costs and revenues may be planned at the WBS element level.
     This example does not use this type of planning.

4. Confirmations occur for each activity (step) of a network.

   During a confirmation, resources (activity types) are provided from the engineering and production cost centers to the network. Additionally, material components are automatically issued to the network during a confirmation.

5. The month-end process is executed for the project (WBS elements and networks) and cost centers.

The project

 is used to manage the all costs and resources of the manufacturing process. Each WBS element and activity within a network is its own controlling object, which collects the costs associated with engineering and producing the finished product. The sales order is not a controlling object itself, but directs the revenue to a WBS element in the project that is designated as a billing element.

This business process may not reflect every manufacturing scenario. In many industries, some component materials are issued to the project across periods, or a purchase requisition may be automatically created for unique components. Costs may be managed at the header level in the network rather than at the activity (step) level. In many industries, the project creates MRP requirements that result in production orders, so that the network manages various assembly processes. Industries that have a high emphasis on engineering a unique product will spend more time modifying the automatically created network. For industries that are primarily service-oriented, the majority of the costs may be managed at the WBS element level rather than network level. Some companies may not use networks, in which case the project must be created and the billing WBS element manually linked to the sales order item. There may also be

differences in the cost center design between companies. In such cases, the following scenario should be modified.

Processing Throughout a Period

Series A: Posting to Cost Centers

During the period, actual costs are posted to cost centers. Some of these costs are direct production labor costs, while others are manufacturing overhead (indirect) costs. Steps A-1 to A-4 are examples of these postings. In this example, the cost center design uses separate cost centers for the direct engineering and production costs and for each type of manufacturing overhead cost. The cost center design is flexible, but other options are not discussed at this time.

The following cost center structure and transactions illustrate the design used for this scenario:

- Post costs to service or administrative cost centers

  At a plant-wide level, utilities and rent must be considered during the production process. Often, these costs are incurred regardless of whether the production line is running. Therefore, a portion of these indirect costs is allocated to the products being produced, but the overall indirect costs and their variances are not managed at the product (project) level. In this cost center design, the utilities and services are managed at a cost center level, and these cost centers allocate their expenses to the manufacturing overhead pools. These pool cost centers, in turn, manage the variances of the indirect costs.

  In this example, actual salaries are posted to a utility cost center in all periods. Salaries are a direct cost for the utility cost center, but an indirect cost for the overall production process. Other costs, such as supplies and maintenance, repair, and operations materials, may also be posted. These postings occur for all cost centers that allocate costs to the manufacturing overhead cost centers.

- Allocate costs from service and administrative cost centers to manufacturing overhead pools

  Costs are allocated from the service and administrative cost centers to the manufacturing overhead pools (also cost centers). Usually, many service and administrative cost centers allocate their costs to only a few manufacturing overhead pools. This allocation may be accomplished with direct activity allocation postings or cost center assessments and distributions. In this example, the expenses incurred by the utility cost center are equally assessed to all manufacturing overhead pool cost centers.

- Post costs to the production cost center

  Production line workers' salaries are directly posted to the production cost center. Other costs, such as supplies, may also be posted. The production cost center will later supply resources, such as labor and machine time, to the network. The cost center manager determines a rate, represented by system activities, for each of these resources. The rate, usually managed in hours, can be manually entered by the cost center manager or calculated by the system based on the planned expenses and planned hours available in the cost center.

- Post costs to the engineering cost center

  Salaries for engineers are directly posted to the engineering cost center. Other costs, such as research materials, may also be posted. The engineering cost center will later supply resources, such as engineering time, to the network. The cost center manager determines a rate, represented by system activities, for each of these resources. The rate, usually managed in hours, can be manually entered by

the cost center manager or calculated by the system based on the planned expenses and planned hours available in the cost center.

Step B: Raw Material Is Issued from Inventory to the Network Activity

From inventory, raw material is issued to the network. The system bases the expected quantity of raw material to be issued on the components linked to the standard network. The BOM was originally copied to the standard network that is used as a template for the individual networks that are created by the sales order item. The raw materials may be manually updated to reflect actual usage. In this example, raw materials are issued to the network activity at their moving average cost.

The raw materials may be issued to the network in one of the following ways:

- Manually as a goods issue

- Automatically when the first operation is confirmed, if materials are allocated to the operation

Other alternatives are possible but are not demonstrated in this chapter. For example, a purchase requisition may be automatically created for material components that are on the BOM in the network as non-stock items. These components are usually unique to a particular design. These material components are then received against the network activity. For these non-stock items, the network creates a purchase requisition. Before it is converted to a purchase order, each purchase requisition must undergo normal processing by the purchasing department, which may involve approvals and online releases. When the components are received against the purchase order, they are not placed in inventory but are directly physically received on the production floor by referencing the network in the system. The cost of the components is posted directly to the network. Any additional charges for these items, which are recorded during invoice verification, are also posted directly to the network activity to which they are allocated.

In this example, all required components are issued to the network through a confirmation during period one. The components are issued out of unrestricted stock because they are assumed to be common and do not need to be managed as project or sales order stock. In some industries, additional components may be issued in the later stages of the project, or the components may be charged directly to a WBS element.

Series C: Activities Are Allocated from the Engineering and Production Cost Centers to the Network

The engineering and production cost centers supply value-added resources, such as engineering time, labor time, and machine time, to the network. From a production perspective, the resources are represented by work centers. From a costing perspective, the resources are represented as activity types (such as labor hours and machine hours) and each activity type has a planned rate. The activity types are linked to the work center in the master data. The resources (activity types) used to design and produce the finished good are posted to the network. The quantity of each activity is multiplied by its planned activity rate. The system expects a standard number of hours to be confirmed. In an ETO environment, it is assumed that only one unit of a product will be designed and produced. In Release 4.x, using execution factors, sales orders have the capability to automatically create networks for more than one unit.

For this network, because confirmation occurs manually at the operation level, the standard number of hours that default from each internal activity in the network can be updated to reflect actual hours.

The following list assumes that engineering time is posted only in the first period, while labor and machine times are posted to the network for all three open periods:

- Engineering hours are allocated from the engineering cost center to the network

  The standard number of engineering hours required to design the product is multiplied by the activity rate for engineering time.

- Labor hours are allocated from the production cost center to the network

  The standard number of labor hours required to produce the product is multiplied by the activity rate for labor time.

- Machine hours are allocated from the production cost center to the network

  The standard number of machine hours required to produce the product is multiplied by the activity rate for machine time.

Step E: Finished Goods Are Received into Inventory (Optional)

A goods receipt is an optional step that may be carried out once the product managed by the network is complete. It is not a system requirement to process the goods receipt to invoice the customer, since invoicing is based on milestones, and is not held until the product has been delivered.

If the completed finished product is entered, it is entered as a goods receipt from the network. However, the product is not placed into inventory. Since this product was produced to a customer's specifications, placing it into inventory would allow another customer to purchase it. The goods receipt places the finished product into sales order stock, which is linked to the sales order. This order was used to create the demand for the engineering of the finished product. Since the product is not placed into inventory, no accounting entries take place at this time. All costs that are incurred during the production of the finished product have been posted to the project and continue to reside on the P&L in various accounts (material consumption, salary expense, and so on).

Step X: Deliver Product to the Customer (Optional)

The delivery is an optional step, which may be carried out in one of two cases. In the first case, the sales order item is billed based on the milestone confirmations, so a delivery is not necessary for invoicing to occur. If paperwork should be generated, a delivery document may be created without processing a goods issue.

In the second case, if a goods receipt was previously processed in the system for the network, the finished product is placed in sales order stock. Since the product is not received into inventory, it is not taken out of inventory. The sales order stock is relieved when the delivery is processed. Again, no accounting entries take place at this time. All costs that are incurred in the production of the finished product still remain on the P&L.

Step Y: Invoice the Customer

In an ETO scenario, it is unlikely that invoicing will be delayed until a delivery has taken place, especially if portions of a product are delivered, or if the engineering process takes months or years. In this example, invoicing occurs when particular milestones are met. When the sales order item originally creates the network, the planned completion dates of the activities (steps) in the network that are relevant to billing update the billing plan for the sales order item. When each of these network activities that are relevant to billing are confirmed, the actual billing dates are updated in the billing plan of the sales order item, and the billing blocks for each corresponding date in the billing plan are automatically removed.

When invoicing takes place, the revenue is posted to the G/L and to the project. In ETO production, the controlling object for the revenue posting is the WBS element that is identified as the billing element. The sales order item is a pointer to the controlling object, or the WBS element. For any one transaction, only one "real" controlling object can be referenced (the project); therefore, no posting to CO-PA occurs at this time.

Month-End Processing

Series F: Apply Overhead from the Manufacturing Overhead Cost Centers to the Project

Overhead is applied to the project, thereby posting additional costs to WBS elements or to network activities. It is possible to split the overhead between WBS elements and networks, if costs were posted directly to the WBS elements. In this scenario, however, all costs are managed directly on the network. In this example, the network uses activity account assignment, meaning that all costs are posted to the network's individual activities (steps), not to the header. Therefore all overhead costs are also applied to the network activities.

The applied overhead cost is a percentage of the direct costs that have already been posted to the network activities during the period. If overhead processing is run more than once in the same period, only the difference in the overhead from the previous run is applied to each of the orders. A costing sheet, which stores the rules for applying these overhead costs, is associated with the network. It is possible to apply an overhead rate based on the quantity of material components that were issued to the network activities; this technique is not used in this scenario. Although the overhead design is flexible and may involve the use of internal orders, other options are not discussed at this time.

In this example, separate overhead cost centers and separate overhead rates are used for each type of overhead being applied. The following five manufacturing overhead pool cost centers are used to apply these different overhead types:

- Material overhead to the network

  For example, a manufacturing overhead cost center collects indirect costs related to materials, such as material handling or quality inspections. The overhead percentage rate is based on the cost of the material components that were issued to the network during the period. Since material is only issued to the network in the first period, material overhead is only applied in the first period.

- Machine overhead to the network

  For example, a manufacturing overhead cost center collects indirect costs, such as maintenance or utility consumption, that are related to the machines on the production floor. The overhead percentage rate is based on the cost of the machine time that was confirmed for the network during the period.

- Labor overhead to the network

  For example, a manufacturing overhead cost center collects indirect costs, such as those related to human resources and accounting, that are related to production workers. The overhead percentage rate is based on the cost of the labor time that was confirmed for the network during the period.

- Engineering overhead to the network

  For example, an engineering overhead cost center collects indirect costs, such as human resources and R&D related to the engineers and the iterative design process. The overhead percentage rate is based on the cost of the engineering time that was confirmed for the network during the period.

- Administrative overhead to the network

  For example, a manufacturing overhead cost center collects indirect costs, such as F&A or depreciation. These costs cannot be directly associated with a particular type of cost on the network. The overhead percentage rate is based on all direct costs posted to the network during the period.

Series G: Results Analysis for WBS Element

In R/3, since the manufacturing costs are tracked on the P&L statement, the balance of all open projects must be moved to the balance sheet at the end of the period. This movement ensures that the materials issued to the project, whether to a WBS element or to a network activity, remain in inventory and are not written off before production is complete. If the open project balance is positive, the P&L is credited and the balance sheet is debited. If this balance is negative, the P&L is debited and the balance sheet is credited. Manufacturing costs may be split between the WBS elements and network activities, but the WBS element that is designated as the billing element and is referenced in the sales order is used as the controlling object for ETO month-end processing.

When calculating results analysis (RA) and displaying project data, network costs are included in the project processing and reporting. The reports may be by structure, meaning that the displayed costs and revenues are based on which controlling object in the project the postings occurred, or they may be by cost element. The WIP posting to the G/L is not displayed when displaying project costs. This impact is purely a financial transaction and does not affect the normal ETO manufacturing process or the project balances in the WBS elements or networks.

A project is considered open until its status has been manually set to TECO. Since a direct goods receipt against the project is not required, a delivery status is not relevant. Additionally, since a billing plan is used to spread out the invoices that are sent to the customer, invoicing alone does not indicate when a project is complete. While the project remains open, the system calculates the costs incurred when producing the engineered project that should be posted to WIP, and the estimated cost of sales that should be posted based on the amount for which the customer has been invoiced. RA cost elements track the WIP and COGS amounts so that these values are not directly posted to the project. These elements are then used to make the entry to the G/L, but not directly to the project. If a project remains open for several periods, the WIP and COGS balances are recalculated for each period, and the adjustments are posted to the G/L. The WIP balance cannot be automatically carried over into CO-PA. The COGS amount is posted to CO-PA so that costs and revenues can be matched.

The costs that were incurred in engineering and producing the finished product are not originally classified as cost of sales on the financial statements; instead, the cost of sales resides in the material consumption account, the salary expense account (the source of the activity rates), and so on. Once revenue has been posted to the project, the RA process calculates the estimated cost of sales that should be financially recognized, based on the ratio of actual vs. planned revenue that has been posted the project. During project settlement, this amount is posted to a cost of sales account with an offset to a manufacturing output account. Once the project has been closed, all WIP is canceled and the complete actual cost of manufacturing the project is calculated to be the cost of sales. An entry is made for any portion of this COGS that has not yet been posted to the G/L and to CO-PA.

In this example, the P&L account is a single offsetting account for all postings to the project and P&L in the manufacturing process. This account is not a cost element, so no direct postings to the project take place. The calculated WIP amount is stored in RA cost elements, which refer to the originating WBS element designated as the billing element. The components of the WIP balance are analyzed using these RA cost

elements. Once revenue has been received for the product, the portion of the cost of sales related to the revenue is calculated and posted to the G/L. In this example, a standard does not exist for the engineered product, so the cost of sales is the actual cost of production. The reason for this is that the engineered product is assumed to be unique and will not likely be replicated for another customer. The effort involved in developing a standard cost for essentially a one-time product is usually considered to be non-value-added.

To complete WIP processing:

1. Calculate WIP (posted at settlement) and calculate the estimated cost of sales (posted at settlement)

    When the RA process is run, WIP is calculated for projects that are released (REL) but not yet TECO. Additionally, if revenue has been posted to the project, the estimated cost of sales in proportion to the revenue is calculated. In this example, the project remains open at the end of periods 1 and 2. At the end of period 1, WIP is calculated. At the end of period 2, WIP and an estimated cost of sales are calculated.

2. Cancel WIP (posted at settlement) and calculate the actual cost of sales (posted at settlement)

    When the RA process is run, WIP is canceled for projects for which a TECO status has been manually set. This step reverses all WIP that has been posted to the G/L and calculates the complete actual cost of sales for the finished product.

    In this example, WIP is canceled because the project status has been set to TECO. The WIP that was calculated and posted to the balance sheet at the end of periods 1 and 2 is canceled (or reversed), and the cost of sales account is updated with the remainder of the actual, total cost of manufacturing the product.

Series R: Assess Cost Center Variances

The balance of the cost centers used in the manufacturing process will rarely, if ever, be zero. These variances result from the over (or under) absorption of the manufacturing overhead cost centers and over (or under) utilization of the engineering and production cost centers' resources. These variances are assessed to CO-PA at the end of the month, where they can be allocated to products, product lines, customers, geography, or other combinations of dimensions (characteristics) tracked in CO-PA. The assessment takes place only in CO, so no posting is made to the G/L.

In this example, the cost center variances are assessed to CO-PA at the end of each period. Optionally, these variances can also be reflected in FI by manually posting a financial entry. However, the assessment to CO-PA already clears the cost center, so if this posting were desired, neither G/L account should be a cost element, and the FI/CO reconciliation would change. This option is not used in this chapter.

The following is a list of these variances:

*   Manufacturing overhead variances for material overhead

    The manufacturing overhead cost center, which collects indirect costs related to materials, is assessed to CO-PA.

*   Assess manufacturing overhead variances for machine overhead

    The manufacturing overhead cost center, which collects indirect costs related to the machines on the production floor, is assessed to CO-PA.

- Assess manufacturing overhead variances for labor overhead

  The manufacturing overhead cost center, which collects indirect costs related to the production workers, is assessed to CO-PA.

- Assess manufacturing overhead variances for administrative overhead

  The manufacturing overhead cost center, which collects indirect costs related to nonproduct-specific plant operations, is assessed to CO-PA.

- Assess production cost center variances

  The production cost center, which collects direct costs related to production resources, is assessed to CO-PA.

- Assess manufacturing overhead variances for engineering overhead

  The manufacturing overhead cost center, which collects indirect costs related to research and development, is assessed to CO-PA.

- Assess engineering cost center variances

  The engineering cost center, which collects direct costs related to engineering resources, is assessed to CO-PA.

Step Z: Settle Project (Posts G-1, G-2)

The previously described RA process updates secondary cost elements, but these values remain in the CO module. When project settlement is run at the end of each period, the RA values for WIP and the cost of sales are posted to the Financial (FI) module, and the appropriate G/L accounts are updated. Although RA calculates additional values, such as revenue and profit accruals, only the WIP and the cost of sales are posted to the G/L in this scenario.

In ETO manufacturing, settlement is used to post values related to the project to CO-PA. Before the project is complete, the revenues and the estimated cost of sales is posted to CO-PA. Once the project is TECO, the remaining revenue and actual cost of sales (all costs involved in the manufacturing process) are posted to CO-PA. The cost of sales and the revenue are matched in CO-PA, and there are no timing differences between the time that the cost of sales is posted to the G/L and the time it is posted to CO-PA. The actual cost is updated in CO-PA using the cost elements from the manufacturing process. In CO-PA, the cost elements can also be combined into fewer value fields. Any characteristics that have been configured in CO-PA that are related to the sale, such as product number, product line, customer, customer group, and geographic region, are carried over for analysis.

The cost of sales and the WIP values are calculated at the billing element level in the WBS of the project. All project costs, including those posted to either lower-level WBS elements or to networks, are included in the RA calculation. For this reason, all project controlling objects, such as WBS elements and networks, that collect costs and that are on lower levels to the billing element should not be settled directly to CO-PA so that the cost of sales will not be double-counted. Only the billing element should be settled directly to CO-PA. This settlement rule must be manually created.

The networks are settled to the WBS elements to which they are linked; this settlement rule is automatically created by the system when the project structure is created using the sales order line item. Separate secondary cost elements that mirror the original cost elements are used for this settlement. Once the project is TECO, all lower-level WBS elements are settled to their higher-level billing element using the same secondary cost elements that were used during the network settlement. Again, these settlement rules

must be manually created. If the original cost elements were used for settlement in the project, the costs would be seen as a new posting on the higher level, and overhead would be double applied. Before the final settlement, the billing WBS element must also have account assignment activated so that it can receive postings for the settled costs. To avoid recursion errors, the final settlement of the project must be performed using a collective process.

Summary of the Sample Scenario

The graphic on the first page illustrates steps A to Z. The T-accounts reflect the postings made during the ETO production process using:

- One utilities cost center

- Five manufacturing overhead cost centers

- One engineering cost center

- One production cost center

- One project
  - One billing WBS element
  - Two account assignment WBS elements
  - One network (with six activities)

Postings were made for three periods. We assumed that the project was open at the end of the first period, and that the finished product was not completed, delivered, or invoiced. This assumption means that WIP was calculated and posted when the project was settled.

We also assumed that the project was partially billed at the end of the second period, meaning that revenue was received for the finished product. This assumption means that WIP was recalculated and posted during settlement. An estimated cost of sales was also calculated and posted.

We finally assumed that at the end of period three, the project was TECO, and all invoices were processed. This assumption means that all WIP was canceled, the actual cost of sales was calculated, and the difference between the previously posted estimated cost of sales and the actual cost of sales is posted. Variances cannot be calculated or posted because the finished product is unique to customer specifications, so that no standard cost can be developed.

The steps illustrated by the T-accounts include:

- Period 1: A – B – C – F – G1 –R – Z

- Period 2: A –C – E – F – G1 –R – X – Y – Z

- Period 3: A – C – F – G2 – R – X – Y – Z

T-Accounts: FI G/L Accounts

BALANCE SHEET

	Raw Mat'l Inv. 131000		A/P 211000		WIP Inventory 138000		A/R 121000
Period 1	B 120000	A-1	150000	G1 336000			
		A-3	100000				
		A-4	100000				
Period 2		A-1	150000	G1 180000	Y	500000	
		A-3	100000				
		A-4	100000				
Period 3		A-1	150000	G2 156000	Y	500000	
		A-3	100000				
		A-4	100000				

P&L STATEMENT (ACCOUNTS ALSO CO COST ELEMENTS, UNLESS MARKED WITH AN ASTERISTK)

	Salary Exp 610000		Raw Mat'l Consum 510000		Revenue 410000		Sales Discounts 420000
Period 1	A-1 150000	B	120000				
	A-3 100000						
	A-4 100000						
Period 2	A-1 150000			Y	625000	Y 125000	
	A-3 100000						
	A-4 100000						
Period 3	A-1 150000			Y	625000	Y 125000	
	A-3 100000						
	A-4 100000						

	Cost of Goods Sold 500001*		COGS Offset 519200*		WIP Offset 511000*
Period 1				G1 336000	
Period 2	G-1 300000	G-1	300000	G1 180000	
Period 3	G-2 392000	G-2	392000	G2 156000	

Cost elements are not created for WIP, COGS, and COGS offset accounts. All of these accounts are used in the postings made during settlement of the billing WBS element.

T-Accounts: CO Secondary Cost Elements

Utilities Assessment 810000

Period	Label	Debit	Credit
Period 1	A-2	150000	
	A-2		150000
Period 2	A-2	150000	
	A-2		150000
Period 3	A-2	150000	
	A-2		150000

Engineering Hours 803000

Period	Label	Debit	Credit
Period 1	C-4	60000	
	C-4		60000
Period 2			
Period 3			

Labor Hours 801000

Period	Label	Debit	Credit
Period 1	C-2	24000	
	C-2		24000
Period 2			
Period 3	C-2	84000	
	C-2		84000

Machine Hours 800000

Period	Label	Debit	Credit
Period 1			
Period 2	C-3	60000	
	C-3		60000
Period 3	C-3	55000	
	C-3		55000

Material OH 840000

Period	Label	Debit	Credit
Period 1	F-1	30000	
	F-1		30000
Period 2			
Period 3			

Machine OH 841000

Period	Label	Debit	Credit
Period 1			
Period 2	F-2	45000	
	F-2		45000
Period 3	F-2	41250	
	F-2		41250

Labor OH 842000

Period	Label	Debit	Credit
Period 1	F-3	6000	
	F-3		6000
Period 2			
Period 3	F-3	21000	
	F-3		21000

Engineering OH 844000

Period	Label	Debit	Credit
Period 1	F-7	45000	
	F-7		45000
Period 2			
Period 3			

Admin OH 843000

Period	Label	Debit	Credit
Period 1	F-4	51000	
	F-4		51000
Period 2	F-4	15000	
	F-4		15000
Period 3	F-4	34750	
	F-4		34750

WBS/Network Settlement Summarized (8122xx)

Period	Label	Debit	Credit
Period 1	Z-1	120000	120000
	Z-2	216000	216000
Period 2	Z-3	120000	120000
Period 3	Z-4	60000	60000
	Z-5	110000	110000
	Z-6	66000	66000
	Z-A	120000	120000
	Z-B	572000	572000

WBS Settlement to PA 812000

Period	Label	Debit	Credit
Period 1			
Period 2	Z	625000	
	Z		125000
	Z	300000	
Period 3	Z	625000	
	Z		125000
	Z	392000	

CO-PA Assessment 811000

Period	Label	Debit	Credit
Period 1	R-1		0
	R-2		30000
	R-3		24000
	R-4	21000	
	R-6	15000	
	R-5		76000
	R-7		40000
Period 2	R-1		30000
	R-2	15000	
	R-3		30000
	R-4		15000
	R-6		30000
	R-5		40000
	R-7		100000
Period 3	R-1		30000
	R-2	11250	
	R-3		9000
	R-4	4750	
	R-6		30000
	R-5	39000	
	R-7		100000

The cost elements for the settlement of the network to the WBS elements, and the lower-level account assignment WBS elements to the high-level billing WBS element, are summarized above for clarity. In the actual postings, each primary and secondary cost element used to post costs to a network is mirrored by its own secondary settlement cost element. For example, the original material consumption cost element has a corresponding secondary settlement cost element for material consumption. This mirroring preserves the integrity of the original cost classification as costs are settled within the project. This process also avoids a double application of overhead as costs are moved around the project.

RA cost elements are also secondary cost elements that are used to calculate the WIP and the cost of sales postings. Due to the number of RA cost elements, these secondary cost elements are described in the section after the controlling objects.

T-Accounts: CO Controlling Objects

CO - CONTROLLING OBJECTS

Utilities CCtr 90100

Period	Ref	Debit	Credit
Period 1	A-1	150000	
	A-2		150000
Period 2	A-1	150000	
	A-2		150000
Period 3	A-1	150000	
	A-2		150000

Mat'l OH CCtr 30250

Period	Ref	Debit	Credit
Period 1	A-2	30000	
	F-1		30000
	R-1		0
Period 2	A-2	30000	
	R-1		30000
Period 3	A-2	30000	
	R-1		30000

Mach OH CCtr 30260

Period	Ref	Debit	Credit
Period 1	A-2	30000	
	R-2		30000
Period 2	A-2	30000	
	F-2		45000
	R-2	15000	
Period 3	A-2	30000	
	F-2		41250
	R-2	11250	

Labor OH CCtr 30270

Period	Ref	Debit	Credit
Period 1	A-2	30000	
	F-3		6000
	R-3		24000
Period 2	A-2	30000	
	R-3		30000
Period 3	A-2	30000	
	F-3		21000
	R-3		9000

Engin OH CCtr 30290

Period	Ref	Debit	Credit
Period 1	A-2	30000	
	F-7		45000
	R-6	15000	
Period 2	A-2	30000	
	R-6		30000
Period 3	A-2	30000	
	R-6		30000

Admin CCtr 30280

Period	Ref	Debit	Credit
Period 1	A-2	30000	
	F-4		51000
	R-4	21000	
Period 2	A-2	30000	
	F-4		15000
	R-4		15000
Period 3	A-2	30000	
	F-4		34750
	R-4	4750	

Engineering CCtr 30102

Period	Ref	Debit	Credit
Period 1	A-4	100000	
	C-4		60000
	R-7		40000
Period 2	A-4	100000	
	R-7		100000
Period 3	A-4	100000	
	R-7		100000

Production CCtr 30100

Period	Ref	Debit	Credit
Period 1	A-3	100000	
	C-2		24000
	R-5		76000
Period 2	A-3	100000	
	C-3		60000
	R-5		40000
Period 3	A-3	100000	
	C-2		84000
	C-3		55000
	R-5	39000	

WBS Element (Billing) xxxxxxxxx

Period	Ref	Debit	Credit
Period 1			
Period 2	Y		625000
	Y	125000	
	Z	625000	
	Z		125000
	Z	300000	
Period 3	Y		625000
	Y	125000	
	Z-A	120000	
	Z-B	572000	
	Z	625000	
	Z		125000
	Z	392000	

WBS Element (Acct-A) xxxxxxxxx

Period	Ref	Debit	Credit
Period 1	Z-1	120000	
Period 2			
Period 3	Z-A		120000

WBS Element (Acct-B) xxxxxxxxx

Period	Ref	Debit	Credit
Period 1	Z-2	216000	
Period 2	Z-3	120000	
Period 3	Z-4	60000	
	Z-5	110000	
	Z-6	66000	
	Z-B		572000

Network xxxxxxxxx

Period	Code	Debit	Credit	Description
Period 1	B	120000		Raw Material
	C-4	60000		Engin Hours
	C-2	24000		Labor Hours
	F-1	30000		OH - Material
	F-3	6000		OH - Labor
	F-7	45000		OH - Engin
	F-4	51000		OH - Admin
	Z-1		120000	Settle - Op 10
	Z-2		216000	Settle - Op 20
Period 2	C-3	60000		Mach Hours
	F-2	45000		OH - Mach
	F-4	15000		OH - Admin
	Z-3		120000	Settle - Op 30
Period 3	C-2	84000		Labor Hours
	C-3	55000		Mach Hours
	F-2	41250		OH - Mach
	F-3	21000		OH - Labor
	F-4	34750		OH - Admin
	Z-4		60000	Settle - Op 40
	Z-5		110000	Settle - Op 50
	Z-6		66000	Settle - Op 60

Operating Concern 0010

Period	Code	Debit	Credit	Description
Period 1	R-1	0		OH CCtr Ass'mnt
	R-2	30000		OH CCtr Ass'mnt
	R-3	24000		OH CCtr Ass'mnt
	R-4		21000	OH CCtr Ass'mnt
	R-6		15000	OH CCtr Ass'mnt
	R-5	76000		Prd CCtr Ass'mnt
	R-7	40000		Eng CCtr Ass'mnt
Period 2	Z		625000	Revenue
	Z	125000		Sales Discounts
	Z		300000	COGS
	R-1	30000		OH CCtr Ass'mnt
	R-2		15000	OH CCtr Ass'mnt
	R-3	30000		OH CCtr Ass'mnt
	R-4	15000		OH CCtr Ass'mnt
	R-6	30000		OH CCtr Ass'mnt
	R-5	40000		Prd CCtr Ass'mnt
	R-7	100000		Eng CCtr Ass'mnt
Period 3	Z		625000	Revenue
	Z	125000		Sales Discounts
	Z		392000	COGS
	R-1	30000		OH CCtr Ass'mnt
	R-2		11250	OH CCtr Ass'mnt
	R-3	9000		OH CCtr Ass'mnt
	R-4		4750	OH CCtr Ass'mnt
	R-6	30000		OH CCtr Ass'mnt
	R-5		39000	Prd CCtr Ass'mnt
	R-7	100000		Eng CCtr Ass'mnt

Since the ETO environment is used to produce uniquely designed items for a customer, a standard cost is not developed for the product. For this reason, the actual cost of the product is the cost of sales. Since there is no standard cost, variances cannot be calculated.

The planned costs on the sales order can be viewed as the "standard" cost of this particular. However, since actual costing is used in this scenario, the total actual costs, and not the planned project costs, are considered the cost of sales.

T-Accounts: CO Results Analysis Cost Elements

CO - RESULTS ANALYSIS COST ELEMENTS

	WIP/Debits RA - Mat Crtn 822001	WIP/Credits RA - Mat Usg 822002	WIP/Debits RA - Mach Crtn 823001	WIP/Credits RA - Mach Usg 823002
Period 1	G-1 120000	G-1	G-1	G-1
Period 2	G1/G2 120000	G1/G2 60000	G1/G2 60000	G1/G2 50000
Period 3	G-2 120000	G-2 120000	G-2 115000	G-2 115000

	WIP/Debits RA - Lab Crtn 824001	WIP/Credits RA - Lab Usg 824002	WIP/Debits RA - Eng Crtn 833001	WIP/Credits RA - Eng Usg 833002
Period 1	G-1 24000		G-1 60000	
Period 2	G-1 24000	G-1 24000	G-1 60000	G-1 25000
Period 3	G-2 108000	G-2 108000	G-2 60000	G-2 60000

	WIP/Debits RA - OH Mat Crtn 826001	WIP/Credits RA - OH Mat Usg 826002	WIP/Debits RA - OH Mach Crtn 827001	WIP/Credits RA - OH Mach Usg 827002
Period 1	G-1 30000			
Period 2	G-1 30000	G-1 15000	G-1 45000	G-1 37500
Period 3	G-2 30000	G-2 30000	G-2 86250	G-2 86250

	WIP/Debits RA - OH Lab Crtn 828001	WIP/Credits RA - OH Lab Usg 828002	WIP/Debits RA - OH Admin Crtn 829001	WIP/Credits RA - OH Admin Usg 829002
Period 1	G-1 6000		G-1 51000	
Period 2	G-1 6000	G-1 6000	G-1 66000	G-1 43750
Period 3	G-2 27000	G-2 27000	G-2 100750	G-2 100750

	WIP/Debits RA - OH Eng Crtn 834001	WIP/Credits RA - OH Eng Usg 834002	RES/Debits RA - Lab Crtn 824003	RES/Debits RA - OH Lab Crtn 828003
Period 1	G-1 45000			
Period 2	G-1 45000	G-1 18750	G-1 16000	G-1 4000
Period 3	G-2 45000	G-2 45000	G-2	G-2

	Cost of Sales RA - COS Mat 822005	Cost of Sales RA - COS Mach 823005	Cost of Sales RA - COS Lab 824005
Period 1			
Period 2	G-1 60000	G-1 50000	G-1 40000
Period 3	G-2 120000	G-2 115000	G-2 108000

Cost of Sales RA - COS OH Mat (826005)

	Debit	Credit
Period 1		
Period 2	G-1 15000	
Period 3	G-2 30000	

Cost of Sales RA - COS OH Mach (827005)

	Debit	Credit
Period 1		
Period 2	G-1 37500	
Period 3	G-2 86250	

Cost of Sales RA - COS OH Lab (828005)

	Debit	Credit
Period 1		
Period 2	G-1 10000	
Period 3	G-2 27000	

Cost of Sales RA - COS OH Admin (829005)

	Debit	Credit
Period 1		
Period 2	G-1 43750	
Period 3	G-2 100750	

Cost of Sales RA - COS Eng (833005)

	Debit	Credit
Period 1		
Period 2	G-1 25000	
Period 3	G-2 60000	

Cost of Sales RA - COS OH Eng (834005)

	Debit	Credit
Period 1		
Period 2	G-1 18750	
Period 3	G-2 45000	

Cost of Sales RA - COS Rev (830005)

	Debit	Credit
Period 1		
Period 2	G-1	625000
Period 3	G-2	1250000

Cost of Sales RA - COS Dsnt (831005)

	Debit	Credit
Period 1		
Period 2	G-1 125000	
Period 3	G-2 250000	

COS: Actual Costs RA - Calc Costs (821000)

	Debit	Credit
Period 1		
Period 2	G-1 300000	
Period 3	G-2 692000	

Calculated Revenue RA - Calc Rev (821200)

	Debit	Credit
Period 1	G-1	560000
Period 2	G-1	760000
Period 3	G-2	1000000

Calculated Actual Costs RA - Valutd Act Costs (820000)

	Debit	Credit
Period 1	G-1 336000	
Period 2	G-1 456000	
Period 3	G-2 692000	

Calculated Profit RA - Cap Profit (821100)

	Debit	Credit
Period 1		
Period 2	G-1	
Period 3	G-2	

RA is calculated on the WBS element designated as the billing element in the project. The RA cost elements are updated based on the cost elements that are posted to the WBS elements and the network. The network costs roll up to the lower-level WBS elements, and costs on the lower-level WBS element costs roll up to the higher-level (billing) WBS element.

For illustrative purposes, the postings to the RA cost elements in the above example are interpreted differently than the "normal" T-accounts. These postings to the RA cost elements refer to the balances of the cost element at the end of each period. For example, RA cost element 822001 represents the cost of the product that results from a material posting to the network. At the end of period 1, the balance posted is 120,000. Since no additional material postings were made in period 2, the balance of the RA cost element remains at 120,000. This approach helps illustrate the calculations performed by the system.

Different RA cost elements are set up for different purposes.

The RA cost elements setup include the:

- Creation of the ETO product

    These RA cost elements are categorized according to the original cost elements posted to the network and WBS elements, such as the material, labor, overhead, and other costs, and represent the current cost of the material as it is being produced. These cost elements are used to calculate the debits to the current WIP balance.

- Usage of the ETO product

    These RA cost elements are also categorized according to the original cost elements posted to the network and WBS elements, and represent the current cost of the material as it is being used or sold. These cost elements are used to calculate the credits to the current WIP balance.

- Creation of reserves for the ETO product

    These RA cost elements are again categorized according to the original cost elements posted to the network and WBS elements. The elements represent the current cost of the material that exceeds the

calculated COGS and are used to calculate the credits to the current WIP balance based on expected losses.

- COGS

  These RA cost elements contain the COGS data, which is the COGS value that is later posted to the G/L to represent the completed product. According to the configuration used for this scenario, revenue-based RA is used, so the COGS is not calculated until revenue has been posted to the WBS element during billing. If the product is not completed, but revenue has been posted, the system calculates the percentage of the total expected revenue that was actually posted (actual revenue / planned revenue), and multiplies the planned cost by this percentage to obtain the estimated COGS value that will be posted. Once final billing has taken place and the project is set to TECO, the COGS RA elements are updated with the actual postings for the revenue, the discounts, and cost of the product.

- RA cost elements for calculated values

  These RA cost elements may be used to calculate the revenue that should have been posted, based on the cost to revenue ratio posted to the project. This calculation may be used to post revenue accruals to the balance sheet, to adjust the revenue that has actually been posted to reflect the calculated value that should have been posted.

  These RA elements are not used for G/L postings in this example, since the concentration is on matching the cost of sales with the revenues. Revenue accruals are most commonly used when using an earned value calculation for a project; such projects are usually resource-intensive, such as in service-oriented industries, or span a longer period of time than used in this chapter.

- These cost elements include the calculated revenue, calculated costs, valuated costs, and calculated profit.

At the end of period 1, the following postings to the RA cost elements are made:

- The RA cost elements that record debits to WIP contain all costs posted to the network and WBS elements.

- Since the ETO product has not yet been used (sold), the RA cost elements that record credits to WIP do not contain data.

- Since no revenue has been posted to the WBS element, the RA cost elements that record the COGS are not updated.

- Since the estimated COGS has not been calculated, and therefore does not exceed the actual costs posted to date, the RA cost elements that record reserves do not contain data.

- The RA cost element that records the calculated cost of the product does not contain data.

  Since actual costs have been posted, but no actual revenue has been posted, no calculation takes place.

- The RA cost element that contains the total valuated actual cost contains the product's total current actual cost.

- The RA cost element that contains the calculated revenue is updated based on the following ratio: planned revenue / planned cost = calculated revenue / valuated actual cost, where "calculated revenue" is the variable.

  Since earned value is not calculated for this ETO project, and RA is primarily used to calculate the WIP and the cost of sales, accruals based on this calculation are not posted to the balance sheet.

At the end of period 2, the following postings to the RA cost elements are made:

- The RA cost elements that record debits to WIP contain the additional costs posted to the network and WBS elements.
- The RA cost elements that record credits to WIP contain the the portion of the costs that are considered COGS, which must be removed from WIP.
- The RA cost elements that record the COGS are updated with the estimated COGS, which will be financially recognized.

    The estimated COGS are based on the following formula:

    COGS = (actual revenue / planned revenue) * planned cost

- The RA cost elements that record reserves for expected losses, which are also posted to WIP, contain the difference between the COGS and the actual costs posted to the project.
- The RA cost element that contains the calculated cost is updated with the estimated COGS for the portion of the product that has been invoiced.
- The RA cost element that contains the valuated actual cost is updated with the total actual cost of producing the product.
- The RA cost element that contains the total calculated revenue based on the actual billing document posted to the WBS element is updated based on the following formula:

    planned revenue / planned cost = calculated revenue / valuated actual cost, where "calculated revenue" is the variable.

At the end of period 3, the following postings to the RA cost elements are made:

- The RA cost elements that record debits to WIP contain the additional costs posted to the network and WBS elements.
- The RA cost elements that record credits to WIP contain the offsetting postings to the debits.

    This step occurs because the project status has been set to TECO, and all processing for the ETO product has been completed. There should be no costs in WIP.

- The RA cost elements that record the COGS are updated with the actual cost of producing the ETO product.

    This cost is based on postings to the WBS elements and the network, and the actual revenue and sales discounts posted to the WBS element that is used for billing.

- The RA cost elements that record reserves for expected losses do not contain data.

    All reserves are cleared, and all costs, whether they are greater than or less than the planned costs, are now considered the actual COGS.

- The RA cost element that contains the calculated cost is updated with the total actual cost of producing the product.
- The RA cost element that contains the valuated actual cost is updated with the total actual cost of producing the product.
- The RA cost element that contains the total calculated revenue, based on the actual billing document posted to the sales order, is updated based on the following formula:

    revenue – discounts = calculated revenue

FI/CO Reconciliation

FI

FI includes a balance sheet and P&L accounts. Only these accounts can be created as cost elements and posted to FI and CO. Cost elements determine for which accounts additional detail should be tracked with controlling objects, such as projects and cost centers.

Of the accounts in this example, only the following are not created as cost elements in CO:

*   The WIP offset account (511000)

*   The cost of sales account (500001)

*   The offset to the cost of sales account (519200)

The WIP account is a placeholder that, during the production process, moves the manufacturing costs collected on the WBS elements and the network to the balance sheet. In this ETO processing example, a standard cost for the product does not exist. All costs are captured as actual costs and reside on the P&L in various accounts. As revenue is posted against the project, the posting to the COGS account and its offset reclassify these costs only in FI, not on the controlling objects in CO. The detailed breakdown of the COGS is available in CO through reporting.

CO

Production costs that flow through a project, not through a cost center, include:

*   Material costs that are directly posted to the WBS elements or networks

*   Engineering, labor, and machine time posted from the engineering and production cost centers to the WBS elements and networks

*   Overhead allocations to the WBS elements and networks from the manufacturing pool cost centers

In FI, direct postings made to the service and production cost centers are directly reflected, but the activity allocation and the overhead applied from the cost centers to the project and network are only indirectly reflected. The allocations reassign costs originally posted to other expense accounts such as salary accounts in the G/L. This reassignment occurs only in CO. Reconciliation is necessary because the actual cost of producing the material includes these reassigned costs, which are the activity rates and the overhead allocations. The total actual costs that are posted to the COGS and manufacturing offset accounts when the billing WBS element is finally settled include these secondary cost elements.

To reconcile the postings that occur during the production process, the original accounts that contain the expense postings to the production, engineering, and overhead cost centers must be included. These original expense postings help develop the activity and overhead rates. This example demonstrates that when the original postings to FI and CO are included during the reconciliation of the production process, the project and network have no net impact on the P&L. Since there is no standard cost, all costs incurred in the manufacturing process are cost of sales; no costs are written off in variance accounts.

When CO-PA is used, the cost center variances are not directly reflected in variance accounts in FI, but are analyzed in CO or CO-PA. The variances are included in the original expense postings to the cost centers. Although a manual entry to the G/L is possible to reclassify these variances to a cost center variance

account, to avoid double-counting variances, this entry is not be reflected in CO. This manual entry is not used in this chapter.

Reconciliation

Due to the nature of FI/CO functions, where not all CO transactions (such as hourly activity rates and overhead allocations) are reflected in FI accounts, a reconciliation process must take place. This process ensures that FI and CO remain balanced for reporting.

The goals of this reconciliation are to determine whether the:

- FI accounts are in balance with the CO postings

   The production process managed by the project should have a net zero impact on the P&L. Cost center variances are not reclassified in the P&L in this example, and production variances are not calculated.

- Variances in the CO objects are consistent with variances reported in CO-PA

   When the production process is complete, variances in the controlling objects must be cleared using period-end processes. Since the finished product does not have a standard cost, variances are not calculated in the manufacturing process. Cost center variances are assessed to CO-PA. The variances reported in CO and CO-PA reporting are the same.

Reconciliation Procedure

All debits and credits to the P&L accounts in the production process are accumulated. The expense accounts contain only the cost center variances, which are represented in CO-PA but not on the G/L. The cost center variances are the same in cost center and CO-PA reporting.

T-Accounts: FI/CO Reconciliation

Period 1

FI/Production Process

	DR	CR
Salary Exp	350000	
Raw Mat'l	120000	
COGS - Std		
WIP Offset		336000
	470000	336000
CCtr Var	134000	

CO

	DR	CR
Util CCtr	150000	150000
Matl OH CCtr	30000	30000
Mach OH CCtr	30000	0
Labor OH CCtr	30000	6000
Admin OH CCtr	30000	51000
Engin OH CCtr	30000	45000
Engin CCtr	100000	60000
Prod CCtr	100000	24000
Project		
Subtotal	500000	366000
DR/CR bal for CO	0	

CO Variances | **PA**

CR to CO	Value Fields
0	
0	OH CCtr Vars
30000	OH CCtr Vars
24000	OH CCtr Vars
-21000	OH CCtr Vars
-15000	OH CCtr Vars
40000	Engin CCtr Var
76000	Prod CCtr Var
0	Project COGS
134000	CCtr Var

Period 2

FI/Production Process	DR	CR		CO	DR	CR		CO Variances CR to CO	PA Value Fields
Salary Exp	350000			Util CCtr	15000	15000		0	
Raw Mat'l				Matl OH CCtr	30000	0		30000	OH CCtr Vars
COGS - Std		300000		Mach OH CCtr	30000	45000		-15000	OH CCtr Vars
WIP Offset	180000			Labor OH CCtr	30000	0		30000	OH CCtr Vars
				Admin OH CCtr	30000	15000		15000	OH CCtr Vars
				Engin OH CCtr	30000	0		30000	OH CCtr Vars
				Engin CCtr	100000	0		100000	Engin CCtr Var
				Prod CCtr	100000	60000		40000	Prod CCtr Var
				Project	300000			300000	Project COGS
	530000	300000		Subtotal	665000	135000		530000	Total Var
CCtr Var	230000			DR/CR bal for CO	0				CCtr + COGS
									(230000 + 300000)

Period 3

FI/Production Process	DR	CR		CO	DR	CR		CO Variances CR to CO	PA Value Fields
Salary Exp	350000			Util CCtr	150000	150000		0	
Raw Mat'l				Matl OH CCtr	30000	0		30000	OH CCtr Vars
COGS - Std		392000		Mach OH CCtr	30000	41250		-11250	OH CCtr Vars
WIP Offset	156000			Labor OH CCtr	30000	21000		9000	OH CCtr Vars
				Admin OH CCtr	30000	34750		-4750	OH CCtr Vars
				Engin OH CCtr	30000	0		30000	OH CCtr Vars
				Engin CCtr	100000	0		100000	Engin CCtr Var
				ProdCCtr	100000	139000		-39000	Prod CCtr Var
				Project	392000			392000	Project COGS
	506000	392000		Subtotal	892000	386000		506000	Total Var
CCtr Var	114000			DR/CR bal for CO	0				CCtr + Ord Vars
									(114000 + 392000)

As a result of the T-accounts on the previous page, we concluded that:

- There is a net impact of zero on the production process for the project.

  Variances are not calculated on this project, so all costs incurred in the manufacturing process are considered COGS. Since the finished product is considered to be unique, a standard cost cannot be developed.

- The variances on the controlling objects are depicted in CO prior to the clearing of these variances to CO-PA.

- Revenue and sales discounts, although collected on the project, are not considered in the reconciliation, since these accounts do not reflect manufacturing costs.

- ETO project costs, regardless of when they were originally posted, are only considered when revenue has been posted against the project.

  This way, either an estimated or actual COGS posting is made during project settlement. All other costs are considered WIP, which has no FI impact.
  - In period 1, no revenue was posted to the project, so all project costs are handled in FI with the WIP process.
    Since there is no FI impact due to the open project, the WIP amount does not flow into CO-PA.
  - In period 2, all costs posted to the project in periods 1 and 2 are considered in calculating the COGS posting, and remaining WIP again has no CO impact.

- In period 3, when the project is technically completed, all project costs posted to date are again considered in the calculation and are all set to be COGS, so all WIP balances are cleared.

- Variances, or balances, analyzed on the cost center level cannot be analyzed in "variance" accounts in FI, but must be analyzed in CO or CO-PA.

  The object (cost center) variances are not reflected in a FI variance account. The variances are contained in the cost elements that were used to post the original costs to the cost center, or the salary and supplies expenses are posted to the cost center.

- If the cost center variances were to be reflected in FI, a manual journal entry to a cost center offset account and to a cost center variance account would be necessary to reclassify these variances.

  To avoid double counting the cost center variances, neither of these accounts should then be created as cost elements, since the cost centers have already been cleared to CO-PA.

Project System Structure for this Scenario

Overview

Project System (PS) is a separate module that allows the management of the costs, revenues, schedules, and capacity of a large-scale project. Typically, the project involves resources that need to be brought together from different parts of the organization over an extended period of time.

How the project is structured depends on how:
- A project should be managed
- The costs should be controlled
- The customer should be invoiced

The WBS is used primarily to manage the following aspects of the project:
- High-level phases
- Costs
- Revenues

Networks, or orders specific to the PS module, are used to manage the scheduling and capacity planning aspects of projects, which in turn generate costs that are rolled up into the WBS analysis.

Project Structure

This scenario includes the use of the PS. Although many different design options exist for projects, this chapter only illustrates data flows as they pertain to costing this ETO manufacturing scenario. PS functionality and implementation outside this scope will not be discussed. The design decisions and configuration options that were implemented to set up the project for this chapter are discussed below.

The types of master data available in the PS include:
- Project definition
- WBS elements
- Networks
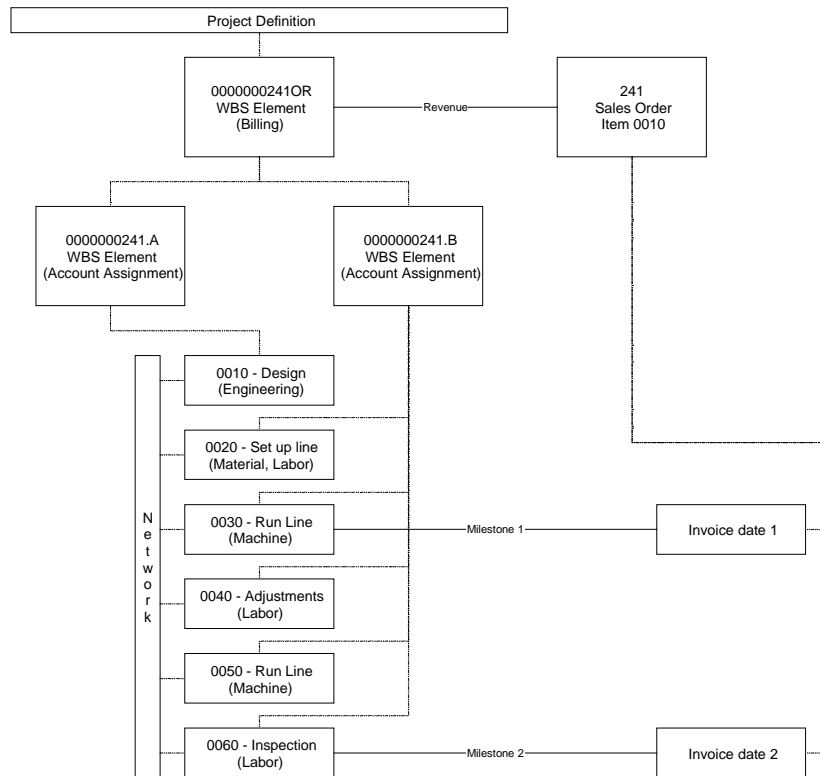
Master Data

The project definition is used to identify the entire project and to act as the "umbrella" to hold all other master data records together in an organized structure. The structure within the project definition is composed of individual master records, that is, the WBS elements and networks. The project definition number is the sales order number, followed by the characters *OR,* which indicate it was automatically created by a sales order.

The WBS elements that are created in the project definition also begin with the sales order number followed by additional characters specified in the standard WBS structure from which this project structure is copied. The WBS is simple in this example. The highest level WBS element is identified as a billing element, meaning that it is used for revenue postings to the project. The billing element is linked to the sales order line item, so that all revenue posted to the sales order item using invoicing automatically updates the WBS element. Once the project is technically complete, the billing element must be immediately activated as an account assignment element before the final settlement, so that the costs from the lower-level WBS elements can be settled to the billing element.

The two WBS elements on the second level of the structure are account assignment elements, which means that these elements are used to capture costs associated with different project phases. Although it is possible to directly plan and post costs to these WBS elements, this option is not used in this chapter. Costs that are directly posted to the WBS elements would be included in the cost of sales and WIP calculations.

This network has six activities, or steps. All activities are internal, which means that internal resources are required to design and produce the product. The first activity is linked to the first account assignment WBS element in the second level, while all other activities are linked to the second WBS element on the second

level. In this chapter, the costs are directly assigned to the network activities, not to the network at the header level.

In period 1, the first two activities are confirmed. Material components are assigned to the second activity, so they are automatically issued to the activity during confirmation. In period 2, the third activity is confirmed. This activity is linked to the billing plan in the sales order item; once confirmation has taken place, the actual billing date is updated in the sales order item, and the billing block is removed, allowing the first invoice to be generated. In period 3, all other activities are confirmed. Again, the last activity is linked to the billing plan in the sales order item.

Non-stock components are not used here, so no purchasing is initiated from this project. External activities are not used here; they are used to purchase outside services directly to the network. General cost activities are also not used here; they are used to plan and post additional costs to the network that are not posted during normal confirmations, direct purchasing, and overhead postings. The project is also not being used to manage the manufacturing of subassemblies using production order before these subassemblies are used in the network.

Cost-Based Profitability Analysis

Overview

CO-PA, a separate module where the cost of sales can be analyzed, captures transactions from the:

- Project System at settlement

   Projects include sales and manufacturing data

- FI module with direct journal entries

- CO module from cost center assessments

Identifying the characteristics that determine how profitability should be analyzed, such as customers, customer groups, products, product hierarchies, geographic regions, etc., is used to configure CO-PA. Additionally, the values that are captured, such as the quantity of an invoiced product, the revenue and discounts applied when the product is sold, the COGS of the product, and other cost allocations must be identified and created in CO-PA.

One CO-PA document is created for each WBS element that is directly settled to CO-PA, which should only be the billing WBS elements, and for each sender-receiver combination in cost center assessments. The receiver is a profitability segment, which is a unique combination of the values of the characteristics used to measure profitability. For example, different customer numbers result in different profitability segments. These segments are controlling objects, so that transactions can be carried out between other controlling objects, such as cost centers and orders, and a profitability segment. Once a value has been posted to CO-PA, the revenue and costs can no longer be allocated out of CO-PA with normal CO processing.

Design Decisions

This chapter includes the use of CO-PA. Although many different design options exist for CO-PA, this chapter only illustrates data flows as they pertain to costing this ETO manufacturing scenario. CO-PA functionality and implementation outside this scope will not be discussed.

The following design decisions and configuration options were implemented to set up the CO-PA operating concern for this chapter:

- Cost-based CO-PA is used to match product revenues and costs so that cost of sales and contribution margin analyses can be carried out.

  Value fields are used to capture cost and revenue data. Cost elements are mapped to value fields in configuration, but cost elements are not available for reporting or analysis in cost-based CO-PA.

- The cost of a product (cost of sales) is posted to CO-PA when the project is settled.

  Since the finished product is unique and designed specifically for a customer, a standard cost is not maintained. For this reason, all costs during ETO production are captured as actual costs. These actual cost elements are passed to CO-PA in the same detail that can be used to capture a standard cost estimate, such as the fixed and variable portions of the material, engineering, labor, machine, and overhead costs. In the ETO environment, this process is based on cost elements, not a cost component layout or cost estimate. It is possible to combine this detail into fewer value fields than used in this chapter.

- Fixed and variable costs are posted to separate value fields.

  This step allows for a more detailed analysis of contribution margins. It is possible to combine this detail into fewer value fields than used in this example. It is also possible to accumulate the existing value fields, either by creating additional summarized valued fields or, in reporting, by summarizing the detailed value fields.

- User-defined characteristics were set up to include fields that are obtained from the material master and the customer master.

  The rules according to which characteristics are updated include:
  - Material master data, which is updated whenever the material number is passed to CO-PA.
    An example of this posting is the settlement of the project, provided that the material number is entered as a characteristic in the settlement rule of the billing WBS element.
  - Customer master data, which is updated whenever the customer number is passed to CO-PA.
    An example is the settlement of the project, provided that the customer number is entered as a characteristic in the settlement rule of the billing WBS element.

- Allocations from the overhead, engineering, and production cost centers to CO-PA segments may occur based on data that has already been captured in CO-PA.

  CO-PA data includes revenue, cost of sales, and direct postings. The combination of characteristics to which the assessment is applied is determined in the configuration of the cost center assessment. If the assessment occurs to a product, all other data related to the material master is also captured; if the assessment occurs to a product and customer, all product and customer-related characteristics will also be populated. However, these types of allocations should typically not be performed to the lowest level of detail, such as product number, but should instead be based on higher-level characteristics, such as product lines or geography.

Issues

Issues that may be encountered in reconciling the manufacturing postings into cost-based CO-PA with the G/L include:

- Cost-based CO-PA in the ETO environment uses a cost of sales approach, where the actual cost of sales is recognized at the same time as the revenue.

  There is a time lag between the time the revenue is recognized in the G/L (when the product is invoiced), and when the revenue and cost of sales are posted to CO-PA (when the project is settled). Due to timing differences, if invoicing and settlement occur in different periods, it is a reconciling item between the G/L and CO-PA.

- Since a standard cost does not exist for the finished product, variances cannot be posted into CO-PA. The variances are included in the actual costs that are posted to CO-PA as part of the actual COGS. If a product is unique enough that it must be engineered specifically for a customer, or if variant configuration was used to select options during sales order processing (not illustrated in this example), a standard is not developed. If variances against a standard could be calculated, it would not be clear whether these variances are due to design changes, choosing a different set of options, or whether there was a problem in the manufacturing process.

- WIP is not transferred to CO-PA.

  A profitability segment is viewed as a controlling object to which costs in CO are transferred. WIP is a background process to ensure that the balance sheet contains the correct values, and the resulting G/L entry ensures that the production process has no P&L impact for the period. No posting is made directly to the project, so the WIP balance cannot be transferred into CO-PA in a balanced controlling transaction. As previously described, a reconciliation must take place. It is also possible to make a direct entry into CO-PA to account for the WIP offset posting to the P&L, but this option is not used in this chapter.

- Cost elements and G/L accounts are not available in cost-based CO-PA.

  The reconciliation between CO-PA and the G/L must occur using value fields (categories of expense) and high-level (company code and business area) information on the side of CO-PA. The information captured in CO-PA at the lower levels (characteristics) is not available in journal entries in FI.

- Value fields can be freely defined to include more or less detail than the approach used in this chapter. If the value fields are defined at a detailed level, they can be summarized by:
  - Updating an additional value field that accumulates other value fields
  - Summarizing the detailed value fields in reporting

  If the value fields are only captured at a very high level, additional detail is only available in the originating module (PS, CO, CO-PC), not in CO-PA.

The chart on the following page contains sample characteristics and value fields used by the production process. Fixed characteristics are automatically generated when the operating concern is generated. For clarity, the administrative characteristics (time, date, user ID stamps at creation, alternate currencies, fixed parameters such as client and ledger numbers, and similar data) are not listed. Up to 30 additional user-defined characteristics may be created and populated in CO-PA. All value fields, up to 120, must be defined in cost-based CO-PA.

The value fields are updated at the following times:

- Settling a project updates the revenue and COGS value fields
- Assessing cost centers updates the cost center variance fields

CO-PA Fields Updated by Period-End Controlling Processes

OPERATING CONCERN

Value Fields — Settlement (Revenue): Invoiced quantity, Revenue - Domestic, Revenue - Internat'l, Revenue - Government, Discounts - Domestic, Discounts - Internat'l, Discounts - Government, Freight - Domestic, Freight - Internat'l, Freight - Government

Value Fields — Settlement (Actual Cost): COGS - Raw material (variable), COGS - Semi-finished goods (fixed), COGS - Semi-finished goods (variable), COGS - Prod Setup (fixed), COGS - Prod Setup (variable), COGS - Prod labor (fixed), COGS - Prod labor (variable), COGS - Prod machine (fixed), COGS - Prod machine (variable), COGS - OH Material (fixed), COGS - OH Material (variable), COGS - OH Labor (fixed), COGS - OH Labor (variable), COGS - OH Machine (fixed), COGS - OH Machine (variable), COGS - OH Admin (fixed), COGS - OH Admin (variable), COGS - OH Sales/Marketing (fixed), COGS - OH Sales/Marketing (variable), COGS - Miscellaneous (fixed), COGS - Miscellaneous (variable)

Value Fields — CCtr Assessments: Variances - OH CCtr (fixed), Variances - OH CCtr (variable), Variances - Prod CCtr (fixed), Variances - Prod CCtr (variable), Variances - Engin CCtr (fixed), Variances - Engin CCtr (variable)

Characteristics	Settlement (Revenue)	Settlement (Actual Cost)	CCtr Assessments
Fixed			
Document number	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Item number			X X X X X X
Record type	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Plan/actual indicator	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Version			
Controlling area	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Company code	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Business area	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Sales organization	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Distribution channel	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Division	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Plant	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Product	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Customer	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Reference document no.	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Reference item	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Sales order			
Sales order item			
Billing type			
Goods issue date			
Invoice date			
Posting date	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Fiscal year	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Period	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Profitability segment	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Subnumber	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Profit center	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
WBS element	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Order			
Cost object			
Sender cost center			X X X X X X
Tracing factor			X X X X X X
Cost element			X X X X X X
User-Defined			
Product hierarchy - Lvl 1	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Product hierarchy - Lvl 2	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Product hierarchy - Lvl 3	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	X X X X X X
Customer group	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Sales district	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	
Sales office	X X X X X X X X X X	X X X X X X X X X X X X X X X X X X X X X	

Hidden rows for control data are usually not used for analysis. The fields in bold indicate that these fields are visible in the CO-PA document display; fields that are not in bold are available in the operating concern table for reporting.

Special Topics

Options for Using "Standard Costing" in the Engineer-to-Order Environment

Using Planned Project Costs as the Standard

When a project is created by a sales order, the different master records in a project are the controlling objects. Planned costs can automatically be included for the network, based on the material components, activity types, and overhead that is copied from the standard network. These planned costs can be changed in the network. Additionally, costs and revenues can be planned on the WBS elements, either by cost element, or based on the project structure.

During the RA calculation, it is possible to use the planned costs of the project, based on both the WBS elements and the networks, as the "standard" cost of the product. This planned cost is already based on the unique requirements of the product that is being engineered for the specific customer, so cost differences incurred between the planned project costs and the actual costs can be attributed to manufacturing process variances. During the settlement of the project, the difference between the planned and actual costs can be posted to a different G/L account, such as an ETO variance account. At the same time, this "variance" can be posted to a different value field in CO-PA. The variances are posted as only one number, with no detailed variance category breakdown.

It may be desirable to activate the variance calculation in RA only once the project status has been set to TECO, to prevent the system from posting estimated variances too early in the project. The postings of the estimated cost of sales will occur throughout the life of the project, which is based on the planned project costs; this posting mirrors normal standard cost postings. Once the project is technically complete, the planned costs will still be posted as the cost of sales instead of being set to actual costs, and variances will be calculated and recognized only at the end of the engineering and manufacturing process.

Tips & Tricks

In Release 4.x, it is possible to transfer the detailed sales order item cost estimate to CO-PA.

Using the Standard Cost of the Material Being Produced

It is possible to use the standard cost of the material being produced to manage the COGS. A released cost estimate can be created for the material, provided that the standard cost has been configured to use the standard network in lieu of a standard routing. Additionally, the standard network, which is the template for the network being created by the sales order, must be allocated to the BOM of a finished product or subassembly. All differences between the standard cost of the material and the actual costs collected by the network can then be posted to a variance account using the RA calculation.

However, this approach assumes that no additional costs are being planned on the WBS elements that need to be taken into account as the total planned cost of the product. Additionally, developing a standard cost for a product that has unique engineering requirements for each customer will be difficult. Different engineering requirements will impact both the time it takes to complete the design and the material components and steps that will be required to produce the product and complete the design. Again, for

truly unique products, a manufacturing variance based on a standard cost should not be posted due to differences in the design that is developed for a particular customer.

Earned Value Calculation in Projects

Earned value is data that is included in the calculation for a project to determine the values that should be posted in the R/3 System for revenue accruals and the cost of sales. If earned value is not used, the system uses the ratio between planned and actual costs, and planned and actual revenues, to determine these accrual values. In the earned value calculation, the project manager enters a completion percentage that is used instead of the cost ratio to determine the estimated COGS and revenue values. This percentage may be entered in the network activities or the WBS elements; in this scenario, the percentage of completion (POC) is entered only in the network activities.

In large-scale projects, the costs and revenues may not be representative of the actual stage of completion. Reasons for this discrepancy may be as follows:

- A large proportion of the costs can be incurred near the beginning of the project for the procurement of the correct components.

    Meanwhile, little work actually occurs, which leads to a higher POC calculation based on costs than is accurate based on actual work completed.

- The billing schedule to the customer does not correspond to the work completed or costs incurred. Earned value allows the project manager to supply additional data to the system; a judgement call that allows for the adjustment of the project postings based on work actually completed.

Process

Before the normal period-end RA process is run, the actual earned value must be entered for all network activities. In this scenario, a default value for the POC has already been entered when each network activity is confirmed, but this value must be changed in a separate step before or after the confirmation. The POC value is considered in the earned value calculation only for completely confirmed network activities.

Once the POC values have been entered, the earned value calculation is run. This process calculates the completion percentage for all the WBS elements, based on the POC entered in the confirmed networks.

PERIOD 1

WBS ELEMENT/NETWORK	LEVEL	BILLING ELEMENT	ACCT ASSIGN ELEMENT	PLANNING ELEMENT	POC ENTERED	PLANNED COST	PLANNED REVENUE	ACTUAL COST	ACTUAL REVENUE	ACTUAL POC	CALC COST	CALC REVENUE	ACCRUAL
0000000249	1	YES	NO*	YES	NO	600,000	1,000,000	266,000	500,000	**62.50%**	375,000	625,000	125,000
0000000249.A	2	NO	YES	YES	NO	100,000		110,000		**100.00%**	100,000	-	-
NWK ACT 1	N/A	N/A	YES	N/A	YES	100,000		110,000		100%	100,000		
0000000249.B	2	NO	YES	YES	NO	500,000		156,000		**55.00%**	275,000	-	-
NWK ACT 2	N/A	N/A	YES	N/A	YES	210,000		36,000		100%	210,000		
NWK ACT 3	N/A	N/A	YES	N/A	YES	100,000		120,000		65%	65,000		
NWK ACT 4	N/A	N/A	YES	N/A	YES	30,000					-		
NWK ACT 5	N/A	N/A	YES	N/A	YES	100,000					-		
NWK ACT 6	N/A	N/A	YES	N/A	YES	60,000					-		

PERIOD 2

WBS ELEMENT/NETWORK	LEVEL	BILLING ELEMENT	ACCT ASSIGN ELEMENT	PLANNING ELEMENT	POC ENTERED	PLANNED COST	PLANNED REVENUE	ACTUAL COST	ACTUAL REVENUE	ACTUAL POC	CALC COST	CALC REVENUE	ACCRUAL
0000000249	1	YES	NO*	YES	NO	600,000	1,000,000	845,000	1,000,000	**100.00%**	600,000	1,000,000	-
0000000249.A	2	NO	YES	YES	NO	100,000		110,000		**100.00%**	100,000	-	-
NWK ACT 1	N/A	N/A	YES	N/A	YES	100,000		110,000		100%	100,000		
0000000249.B	2	NO	YES	YES	NO	500,000		735,000		**100.00%**	500,000	-	-
NWK ACT 2	N/A	N/A	YES	N/A	YES	210,000		240,000		100%	210,000		
NWK ACT 3	N/A	N/A	YES	N/A	YES	100,000		120,000		100%	100,000		
NWK ACT 4	N/A	N/A	YES	N/A	YES	30,000		75,000		100%	30,000		
NWK ACT 5	N/A	N/A	YES	N/A	YES	100,000		120,000		100%	100,000		
NWK ACT 6	N/A	N/A	YES	N/A	YES	60,000		180,000		100%	60,000		

The calculation takes place as follows:

- The POC entered in each confirmed network is multiplied by the planned network cost to obtain the calculated cost.
- The calculated cost of all WBS elements is determined by rolling up the calculated costs of the networks and lower-level WBS elements to the billing element level.
- The POC for each WBS element is calculated by dividing its calculated cost by its planned cost.
- For each billing WBS element, the only top-level WBS element in this scenario, the POC is multiplied by the planned revenue to obtain the calculated revenue.
- For each billing WBS element, the actual revenue is subtracted from the calculated revenue to obtain the revenue accrual value.

  If the accrual is positive, it is classified as expected revenue based on the POC value (RA category POCI). If the accrual is negative, it is classified as surplus revenue (RA category POCS).

Selected T-Accounts at Period-End

BALANCE SHEET

	WIP Inventory 138000		Accrued Revenue 210100		A/R 121000	
Period 1	G-1	109000	G-1 125000		Y 500000	
Period 2	G-2 109000		G-2	125000	Y 500000	

P&L STATEMENT

	WIP Offset 511000*		Cost of Goods Sold 500001*		COGS Offset 519200*	
Period 1	G-1 109000		G-1 375000		G-1	375000
Period 2	G-2	109000	G-2 470000		G-2	470000

	Revenue 410000		Discounts 420000		Accrued Revenue Offset 410000	
Period 1	Y	625000	Y 125000		G-1	125000
Period 2	Y	625000	Y 125000		G-2 125000	

CO - RESULTS ANALYSIS COST ELEMENTS

	WIP/Debits RA - Cost/Crt&Usg 8xxxxx (Dr)	WIP/Debits (Cr)	RES/Debits RA - Cost/Crt&Usg 8xxxxx (Dr)	RES/Debits (Cr)	Cost of Sales RA - COS Costs 8xxxxx (Dr)	Cost of Sales (Cr)	Cost of Sales RA - COS Rev/Disc 8xxxxx (Dr)	Cost of Sales (Cr)
Period 1	G-1	41562.5	G-1 150562.5		G-1 375000		G-1	625000
Period 2	G-2		G-2		G-2 845000		G-2	

	Calculated Costs RA - Calc Costs 821000 (Dr)	(Cr)	Calculated Revenue RA - Calc Rev 821200 (Dr)	(Cr)	Valuated Costs RA - Valutd Act Costs 820000 (Dr)	(Cr)	Unbilled Revenue RA - Inv for Rev 821300 (Dr)	(Cr)
Period 1	G-1 375000		G-1	625000	G-1 26600		G-1 125000	
Period 2	G-2 600000		G-2	1000000	G-2 845000		G-2	

Selected T-accounts are represented above, to highlight the differences between the RA calculation in the primary scenario, and the earned value calculation based on a manually entered completion percentage.

In period 1, actual costs of $266,000 were posted, along with $500,000 of actual revenue. In period 2, actual costs of $845,000 were posted, along with $1,000,000 of actual revenue.

At the end of period 1, the following postings to the RA cost elements are made:

- The RA cost elements that contain the WIP and reserve postings contain the difference between the actual costs and the calculated COGS that will be posted to the G/L.

- The RA cost elements that record the COGS are updated with the earned value calculated by the system, or the costs and revenues that should have been posted based on the completion percentage of the ETO project.

- The RA cost element that contains the calculated cost is updated with the earned value, or the 62.5 percent completion multiplied by the planned cost.

- The RA cost element that contains the valuated actual cost is updated with the total actual cost of producing the product.

- The RA cost element that contains the calculated revenue is updated with the earned value, or the 62.5 percent completion multiplied by the planned revenue.

- The RA cost element that contains the inventory from which revenue is generated contains the difference between the earned value (revenue) and the actual revenue.

  This amount is the revenue accrual that is posted to the G/L. This revenue was expected based on the POC of the project, but has not yet been posted to the project.

At the end of period 2, the following postings to the RA cost elements are made:

- The RA cost elements that contain the WIP and reserve postings are cleared.

  The project status has been set to TECO, so there should be no costs in WIP.

- The RA cost elements that record the COGS are updated with the actual production cost for the ETO product.

  This cost is based on postings to the WBS elements and the network and the actual revenue and sales discounts posted to the WBS element that are used for billing.

- The RA cost element that contains the calculated cost is updated with the total earned value, or the 100 percent completion multiplied by the planned cost.

- The RA cost element that contains the valuated actual cost is updated with the total actual production cost of the product.

- The RA cost element that contains the calculated revenue is updated with the total earned value, or the 100 percent completion multiplied by the planned revenue.
- The RA cost element that contains the inventory from which revenue is generated is cleared because the earned value is now 100 percent and the status of the project has been set to TECO.

  All revenue accruals are cleared.

The RA cost element that contains the revenue surplus was not used for posting in either period, since at no time did the actual revenue exceed the calculated revenue.

Appendix A: Standard Versus Moving Average in R/3

Contents

Overview

In the R/3 System there are two types of price controls:

- Standard
- Weighted moving average

These price types differ how they handle the price variances that result from goods or invoice receipts. In a plant, since the used method is identified in the accounting view, different materials can use different methods.

The decision to use the moving average or standard for certain materials should reflect the approach used to analyze manufacturing and purchasing contribution margins and variances. Although R/3 does not restrict this choice, the moving average price is usually only used for purchased materials and the standard price for finished and semi-finished materials.

SAP Recommendation

Do not use the moving average for semi-finished and finished materials. This recommendation is based on the fact that the moving average may become distorted as a result of the timing of cost postings, settlements, and the number of orders in progress for the same material (for more information, see OSS note #81682).

Standard Price

Definition and Description

Valuation using a standard price results in:

- Inventory postings being carried out at the standard price
- Variances being posted to price difference accounts
- Variances being updated
- Price changes being monitored

If a material is assigned a standard price, its value is always calculated at this price. If goods movements or invoice receipts contain a price that differs from the standard price, these differences are posted to a price difference account and the variance is not considered during valuation.

Advantages

Standard costing is based on setting an estimated or budgeted cost of purchased resources and manufactured products for a specific period, which provides a benchmark to measure performance. The standard unit costs are usually developed during the annual budget and compare actual and estimated performance.

Typical measurements associated with standard unit costs are:

- Purchase price
- Labor efficiency
- Overhead spending
- Standard margin

Other measurements that facilitate the use of standard unit costs include the permanent, and temporary, effects of product design and manufacturing process changes. Standard costs provide a consistent value for inventory and measurement.

The following list outlines how standard costing can be used:

- Purchased materials

  The standard unit costs established for purchased materials are based on known economic conditions, such as firm pricing, during the time that covers the standard (contract or blanket purchase order) or forecasted economic conditions (an expected three percent increase in paper products). Purchase material standard unit costs may also include an inbound freight cost factor and duties or import fees, if these costs are separately paid. If the costs are known when the purchase order is created, they may be planned.

- Direct labor

  The standard unit cost for direct labor is usually the average hourly wage paid, adjusted by time phasing for projected wage increases and rate mix changes. This rate may be adjusted for budgeted efficiency and the fringe benefits associated with direct labor may also be included.

- Overhead

  The annual budget process is the starting point for overhead. Expenses are budgeted by the cost center or product line and the rate is calculated by dividing the total budgeted expenses by the budgeted base for application (such as direct labor hours and dollars or quantity of material consumed on the production or process order).

- Manufactured products

  The standard costs for manufactured products use the economic rates listed above and a bill of material (BOM) that reasonably reflects the required components. Also included in the calculation is the routing. The effective dates are usually used to control the BOM and routing contents. An "Accounting BOM and Routing" that reflects the proper components and processing requirements may need to be created.

  This issue raises the understandable concern in manufacturing that the standard cost developed on January 1 will later be used as a performance measure. Again, the primary concern here is product redesign or production method changes. It is important to note that measuring production performance is first based on the planned values of the production or process order. That is, the BOM and routing or recipe that has been copied into the order. This step provides the performance measurement against current standards or alternate methods. The second measurement, based on the standard cost, provides the isolation of spending and volume variances in addition to reporting the impact of the change to the original cost structure.

When a product has a calculated cost estimate, the subsequent CO-PA reporting is enhanced. A cost estimate of a material sold can be displayed in CO-PA and divided as fixed and variable portions of the cost components. During billing, up to three cost estimates for a material can be transferred to PA. Also, after production order settlement, the detailed variance calculation categories can be displayed in PA. The variance categories can be further divided by cost element categories, such as labor versus material, and mapped to CO-PA value fields.

Disadvantages

Management effort is required to create, release, and analyze standard cost estimates. Standard costs that are supported by released cost estimates can only be changed once during an accounting period. Decisions such as which level the price should be set and which criteria can impact these decisions must be made.

Standard costs for products that dramatically change during the budget year or the cost of highly unstable resources can distort the standard margin and provide an unrealistic base to price finished products. This fact is true especially if the standard unit costs are annually updated. If inventory levels are constant, gross margin variances make the number more realistic.

Due to the lack of integration from MM-purchasing to product costing, it is time consuming to use standard prices for purchased materials. New standard prices cannot be automatically copied from info-records or contracts to the standard price.

There are limitations to using standard cost estimates for materials that are split-valued. (There is no costing view by valuation type, only an accounting view.) Therefore, cost estimates cannot be created by valuation type. The created cost estimate is saved for the header material.

In environments where some materials are carried at the moving average and others at standard, a subtle error is possible. Even for materials carried at the moving average, the cost rollup updates the standard price field with the calculated value. Since the material is transacted at the moving average, this step appears only to be a statistical or a memo entry.

However, the "as-delivered" settings for valuation variant 001 (for cost rollups in costing variant PPC1*)* are:

- Planned price #1
- Standard cost
- Moving average cost

This process means that in a cost rollup, a component (purchased item) will have a standard price recorded if it also:

- Is carried at the moving average
- Has a costing view
- Has been previously included in a cost rollup

According to the standard valuation variant, this price means that higher level material would see and use the standard cost before the component's moving average. This step could result in a built-in variance between the total material value rolled up and the sum of the issued raw materials.

Getting a Standard Cost into the System

A standard cost estimate is created at the beginning of a period and is valid for the entire period. If the standard cost estimate is released, the system writes the results of this estimate as the standard price into the costing detail screen of the material master record. This price is then active for financial accounting and is used to value the material until the next standard cost estimate is released.

In this period, all transactions that involve products produced in-house in the Logistics module are valued using the results of the standard cost estimate. If a material with standard price control is delivered to stock, for example, inventories of this material are valued with the standard price determined by the standard cost estimate.

The results of the standard cost estimate can also be used to determine the following data for each production order or run schedule header at the end of the accounting period:

- Variances
- Scrap
- WIP

Tips & Tricks

> Do not change the standard cost estimate during this period. The results of the cost estimate remain constant and are not influenced by price fluctuations or production setup changes during the planning period.

The standard price for a material may be directly changed with transaction *MR21*, unlike the more formalized cost rollup procedure. However, this change contains none of the detail of the cost rollup and cannot be used as a basis for variance analysis.

Caution

Restrict access to this transaction.

Moving Average Price

Definition and Description

Valuation using a moving average price results in:

- Goods receipts being posted at the goods receipts value
- The price in the material master being adjusted to the delivered price
- Price differences occurring only in exceptional circumstances
- Manual price changes becoming unnecessary, but possible

If a material is assigned a moving average price, when price variances occur, this price is automatically adjusted in the material master record. If goods movements or invoice receipts are carried out with a price that differs from the moving average price, the differences are posted to the stock account. As a result, the moving average price and the stock value change.

The moving average price in the material master record is rounded off. For valuation calculations, the system always uses the exact price (stock value or stock quantity). At first glance, moving averages may seem easier or may generate costs closer to actual than a standard cost approach, but there are other issues to be considered.

Advantages

Using the moving average on purchased materials, with small cost fluctuations in small volume environments may be appropriate when the item is an easily obtained commodity. The impact on margins is now minimized, which reduces the need for formal variance analysis. Examples of such materials include maintenance spare parts inventory. The administrative effort is relatively low, because there are no cost estimates to maintain. The cost reflects variances, which may be closer to actual costs. This step depends on the level of on-hand inventory.

Disadvantages

One of the apparent advantages in using the moving average is the ease of maintaining costs and inventory valuation. However, because there is no standard, there is no detailed variance calculation for such materials. In certain industries, notably the chemical and pharmaceutical, there may be little need to analyze variances in detail (the process may be highly variable), which may be acceptable to these industries.

Although this process may save time during month-end processing, it eliminates variance analysis on raw materials and does not provide a benchmark for long-term performance measurement. If this issue is a concern, to avoid losing analysis, some companies continue to create standard cost estimates for raw materials carried at the moving average and update the standard price field in the material master as a statistical entry.

The existence of the statistical standard may be designed to provide a benchmark to measure buyer performance with simple reporting on the material master price fields. For such a system to be effective, timely resolution of large differences is required. As an example, the buyers do not control the market and such a variance alone is not an accurate measure of buyer performance.

In a production environment, using the standard price as a statistical entry can provide certain benefits. With the material at moving average, the goods issue to production will have a price that is different from the price used in the standard cost estimate, which results in a production price variance. This price can be directly settled to CO-PA resulting in a more accurate actual contribution. If the material was at standard price, the purchase price variance has to be allocated to CO-PA, which is less accurate. Remember, when viewing this benefit, consider the other ramifications of choosing moving average over standard price.

It may also help identify the source of changes in higher-level products. If this option is chosen, see the section above on using PPC1, the standard costing variant. Process and production order variances are included in the average unit cost, which can adversely affect other batch costs.

For example, in using moving average cost, if you:

- Spend too much
- Take too long to manufacture
- Use too much material
- Use a different material than was specified in the design

All of this information is buried in the product cost. If the errors that affect the average unit cost are detected after the inventory has moved, these errors are not easily corrected. Since the moving average price is continually changing, it is impossible to correct the valuation without a manual price change. Since the variance is adjusted on reversal, this correction does not occur for standard price control. Production variances can only be computed for differences between planned values in the production, the process order, and the actual incurred costs.

Differences between planned and target costs and between actual and target costs cannot be measured unless a "standard cost estimate" is created for these materials. Remember that the calculation of planned-to-target and actual-to-target calculations help isolate design and manufacturing change and economic (price) variances.

During rapid inventory turnover, due to inadequate stock coverage to absorb settlement adjustments, using the moving average on subassemblies may result in variance postings. Attempts to settle more often, or automatically, may not be feasible if all costs have not been posted. Thus, margins may be distorted and CO-PA compromised.

If subassemblies are carried at the moving average, since many materials in the BOM may contribute to these subassemblies, it is difficult to identify the source of fluctuating valuation. Again, there is no variance calculation to analyze manufacturing operations. Additionally, cost fluctuations will seriously impact margin analysis for sold or transferred items. Some companies also create cost estimates for subassemblies to provide cost component variance analysis, even if the result is not booked to the G/L. The extra effort to create such statistical standards needs to be weighed against the variance analysis they may provide.

Moving average cost fluctuations at lower levels in the BOM may have a delayed impact on parent items for variance postings or adjustment of parent moving averages. For example, a lower-level material that is adjusted through its own settlement may be used at various points during the life cycle of higher-level orders. The component's cost under (or over) runs will later be reflected on higher level orders.

Moving average can be set to zero and will not generate warnings during transactions (for example, no FI postings). As of Release 3.0D, standard cost also allows a zero standard cost but generates at least a warning. To reduce fluctuations in the moving average from MM and accounts payable postings, pay attention when configuring tolerance warnings in:

- Purchase order creation
- Goods receipt
- Invoice receipt

For subassemblies, backflushing of material and labor may prevent cost swings resulting from data entry errors. If automatic goods receipt is feasible, it will ensure timely inventory postings that impact moving averages after settlement. From an integration perspective, if SD and CO-PA are used, ensure that pricing procedures and copy controls in SD pass the most recent cost into CO-PA. Since the moving average costs change, this step could cause reconciliation issues between FI and CO-PA (see OSS note #24832 for more information). Materials carried at the moving average do not automatically create settlement rules for settlement to CO-PA.

> **Caution**
>
> Do not allow negative stocks for materials carried at the moving average.

Getting a Moving Average Cost into the System

The moving average for a material may be directly changed with transaction *MR21*, unlike the more formalized cost rollup procedure used in standard costing.

> **Caution**
>
> Restrict access to this transaction.

Changing a material from standard cost to the moving average overwrites the existing moving average with the current standard. If this data is needed for historical reference, before you begin the update, generate a report extract. Changing the configuration for the price control of a material type impacts only newly created materials. These changes are default settings and do not affect existing materials.

Appendix B: Fixed and Variable Costs

Contents

Overview

The distinction between fixed and variable costs can be made in various Controlling (CO) modules, including product costing. In a broad sense, static costs incurred by the enterprise, such as rent or salaries are usually fixed, and production costs are variable because they vary by the volume produced. However, even within this broad definition, variable costs are usually broken down to recognize that not all manufacturing costs vary by the quantity of goods produced.

From a CO and costing perspective, by definition fixed costs remain constant regardless of the operating rate or lot size. By contrast, if these factors change, variable costs will fluctuate. This segregation between fixed and variable costs is optional and is derived from the configuration and master data created in the cost center accounting (CO-CCA) and overhead accounting (CO-OM) modules (specifically, the activity types and overhead tables). If this separation is not required, costs should be entered as variable costs to avoid erroneous variance calculations.

The approach to identifying costs as fixed should be carefully planned and should reflect what can actually be identified as fixed in nature and posted accordingly. The benefit of this identification is that in product costing, these costs can be incorporated in the cost estimate, and through the activity type, allocated from a cost center into the material and inventory. Additionally, the cost estimate detail is available for variance analysis within the product costing module, activity absorption can be monitored in CO-CCA, and margin analysis may be performed within profitability analysis (CO-PA). Exactly which costs are labeled as fixed is user-defined as explained below.

Activity Prices

There are several different methods that may be used in CO-CCA to determine the activity price. The simplest way is to manually enter the specific planned values (transaction *KP26*) for fixed and variable cost per unit of activity, such as $50 per setup hour (all fixed cost). However, there are other methods used in cost center planning (budgeting) that automatically calculates the values. These methods typically aggregate planned costs by cost element, and capacity by planned units to be consumed in that cost center. For example, $10,000 in planned wages for 1,000 hours of cost center operation would yield a cost per unit of activity.

Therefore, if specific cost elements are used to plan specific costs (such as setup), the results could then be labeled fixed costs. Alternatively, the activity type, which is linked to a cost element, may be split into fixed and variable portions itself. Whichever method is used, the values may be valid for the entire fiscal year or vary by period. Cost center accounting also provides for the actual costs incurred to be aggregated and used to compute actual costs per unit of activity. Determining which rate to use in product costing is determined by the strategy chosen for internal activities in the valuation variant.

Regardless of the chosen method, when cost estimates are created, this fixed and variable split is maintained and the value extended, based on the number of activity units to be consumed.

For example, here is the cost estimate for material "X":

		Fixed	**Variable**
Raw Material	1 each at $2.00		$2.00
Setup time	30 minutes at $50/hr (all fixed)	$25.00	
Labor time (all variable)	1 hour at $40/hr		$40.00
Total cost/unit	$67.00, split as:	$25.00	$42.00

Activity Prices: Fixed and Variable split

As described earlier, it is possible to separately plan the fixed and variable cost of an activity. In some organizations, it may be customary to use "fully-burdened" labor hours in cost calculations. For example, one labor hour may represent the cost of wages and benefits, some of which may be incurred regardless of the hours worked. In these situations, the static portion may be labeled as fixed. Accordingly, it would be necessary to split the cost of such an activity (for example, labor hour) into fixed and variable portions. In CO-CCA, this step requires the appropriate split be made in the values entered for the activity type. If the values are computed in this module, rather than entered manually, the appropriate segregation of fixed and variable charges at the cost element level would be required during planning or posting. For more information on this technique, see *Secondary cost planning* in the online documentation for CO-CCA. In this example, the cost of vacation pay would be included in the cost of goods manufactured and not treated as a separate overhead. Treating costs in this fashion varies by industry and audit policy.

In the case just described, the cost estimate would include the additional fixed costs in the cost rollup and would be updated to the material master during the mark and release step. This process means that these additional costs would be capitalized in the inventory valuation.

If this process is inappropriate, choose one of the following options:

- Exclude the additional fixed costs from the activity price.

  Use a costing sheet for overhead and use different cost component views to aggregate the fully burdened cost for analysis only.

- Cost elements used for such costs should be mapped to a different cost component that is not rolled up for inventory valuation purposes using the standard cost variant (PPC1).

  This option can be mapped in configuration with transaction *OKTZ*, level 2.

- Control parameters on the cost share view of the component layout should be set accordingly.

  This option is set with transaction *OKTZ*, then double-click on the appropriate cost component.

Overhead

If you use costing sheets to apply overhead, this fixed or variable segregation is represented in the choice of cost elements in the calculation base along with the appropriate button on the *Overhead base configuration* screen (transaction *KZB2*). Similarly, a split in the credit to the cost center is the *% fxd* column in transaction *KZE2*.

Costing of Production Objects

This extension of values is performed when a product is manufactured and actual activity or overhead allocations are made to the production cost object (order, run schedule, etc.). For activities, this step is usually achieved with production confirmation, and a periodic batch program allocates overhead. At this point, the cost object is debited and the cost center is credited, using the same secondary cost element for both sides of the transaction. Since it represents a transfer of costs within the company, there is no posting to the G/L.

During the month-end process, the variance calculation program compares the total actual costs to the standard cost per unit multiplied by the number of good units produced. However during this process, fixed costs are treated as a lump-sum value over the production run quantity, and are not prorated based on the units produced. If the lot size differs from that used for the cost estimate, the system will compute a lot size variance. For a detailed example of such postings, please see *Product Costing Flow for Discrete Manufacturing*.

Costing Analysis

From an analysis perspective, the actual versus planned costs may be reviewed at any time, whether on the production object, summary objects such as order hierarchies, or within cost center accounting. If costs are split between fixed and variable, the costs incurred in the cost center may be compared to their absorption into inventory (from the activity or overhead allocation that credits the cost center). This step provides a basis for review and possible adjustment of the activity prices or overhead rates, either fixed or variable portions. If CO-PA is active, the fixed and variable portions may be posted to separate value fields in PA for review of contribution margins. Additional analysis is possible by computing margins based on different versions of cost estimates and target cost versions used in variance calculation.

Summary

The costing system may plan the fixed and variable costs per unit and post actuals using the same (or a different) split. This split may be useful for cost and margin analysis and needs to be planned in a manner consistent with how actual data is posted and used. Also, it should be recognized that the material is still carried in inventory under one total value per unit. At the present time, there is no standard report that will break out the value of inventory by fixed or variable cost components.

Appendix C: Work-In-Process and Results Analysis

Contents

Overview

The objective for calculating work in process (WIP) is to determine the value of manufacturing activity in process at the end of a fiscal period and to properly reflect this value on the financial statements. The cost accounting functionality supports this objective, but the mechanics of the process differ from other systems. Although WIP calculation is usually used to describe this process for production orders, it is only one facet of results analysis (RA).

RA is a sophisticated tool within the Controlling module that computes and analyzes the value of WIP. In make-to-order (MTO) or engineer-to-order (ETO) environments, it also computes the cost of goods sold (COGS). WIP calculation and RA are generally interchangeable terms.

The key difference between the R/3 System and other systems is in the treatment of material consumption for manufacturing, such as component issues to production orders, run schedules, recipes, etc. In the R/3 System, the issue of materials to a manufacturing order is immediately treated as expense to the profit and loss statement. It is not treated as a reclassification from raw or semi-finished inventory to WIP inventory. (In the MM module, it is not possible to transact from one balance sheet account to another.)

If an order remains in process at month-end, without intervention, such costs would be written off as a period-based expense. In this context, SAP considers WIP to be a snapshot of values that can be computed on demand and passed to the general ledger as needed to reclassify them to the balance sheet. This process

dictates a specific, methodical approach be used for the month-end process and for mid-month pro-forma statements.

From a high-level perspective, using discrete manufacturing with production orders as an example, to calculate WIP and settlement to G/L:

1. Calculating overhead with costing sheets (if used)

2. Calculating WIP

3. Calculating variances

4. Order Settlement

(Other tasks such as monthly allocations or assessments are not included in this appendix.) Step 2 may be considered the program that computes the WIP values and stages them for subsequent processing. Step 4 is the program that actually posts these values to the G/L.

With this perspective as a general background to the process, the rules used to calculate the value of WIP and settle it to the G/L are defined in several RA tables in configuration. Because different manufacturing methods, such as discrete vs repetitive vs MTO, require different costing techniques, the configuration of Cost Object Controlling contains sections appropriate to each. However, many tasks are simply different views of the same underlying tables. For discrete manufacturing, production orders are found under the *Order related production* section. (Do not confuse this with sales order-related, which is for MTO manufacturing).

To provide a quick-reference guide to the "typical" configuration for the various methods, a general explanation of the configuration tables is shown, followed by a matrix to identify the appropriate table settings and their impact. Bear in mind that that RA is designed to support a wide variety of techniques, and there may be alternative settings depending on the circumstances. In all cases, the full configuration should be thoroughly tested with integrated scenarios to ensure all requirements are met.

List of Configuration Transactions

*   RA Key (transaction *OKG1*)

    The key is simply a name that groups together various control parameters on how to compute WIP. As delivered, the required keys already exist. This table is simply a list. There is no drill-down in this screen.

*   RA Versions (transaction *OKG2* or *OKG9*)

    Important control parameters on whether to pass WIP to FI, whether calculations are done uniquely by RA key, some of the secondary cost elements used, etc.

*   Valuation Method Order-Related [actual (transaction *OKGC*)]

    Settings on exactly how to compute WIP, if using the actual costs option based on order status. This method only accrues for costs actually incurred. This was the only method prior to Release 3.0, and is a common choice.

*   Valuation Method Order-related/Repetitive [plan (transaction *OKGD*)]

    Settings used to compute WIP, if using the planned cost option in orders or run schedules. The planned cost option assumes standard values are earned based on progress through the task list (routing). This method is also known as reporting points. In repetitive manufacturing this implies the possibility of

WIP, unlike the final backflush method. If using collective orders at Release 3.x, see OSS note #90651 for additional considerations.

- Define Line IDs (no transactions, so drill down within IMG)

Abbreviated names for grouping together like costs, such as material, labor, etc. Each grouping can be treated differently in posting to FI. As delivered, these are the German mnemonics for such groupings and could be redefined as needed.

- Define Assignment (transaction *OKGB* or *OKG5*)

An important table which contains maps with incoming charges (by cost element) to line IDs above. Allows various grouping techniques.

- Define update (transaction *OKG4*)

Provides bucket for accumulation of costs from line ID's, using secondary cost elements. This table is required by program logic and the stored results may be analyzed if required, although this is not typical. It can be used to segregate WIP creation (accrual) from usage.

- Define Posting Rules (multiple transactions—see detail section)

Maps accumulation of costs (above) through system-defined categories into FI, or alternatively the individual cost elements can be mapped explicitly. This table defines the G/L accounts used to post WIP on the balance sheet (B/S) and the offset (stock change) to the P&L.

- Define Number Ranges (transaction *OKG6*)

RA creates documents within CO detailing the internal calculations and object postings; this table provides the number range used for the internally generated document numbers.

Detailed Configuration Settings

The following abbreviations will be used in the tables to describe the cost accounting terminology and the manufacturing methods they support. Where a setting is related to only one "flavor" of sales order-related manufacturing, it will be noted by its specific abbreviation.

- Order-related

MTS means make-to-stock for discrete manufacturing with production orders, or process orders (PP-PI)

- Repetitive manufacturing:

REM means repetitive manufacturing using run schedules

- Sales-order-related:
  - MTO means MTO or assemble-to-order using production orders
  - PRJ means projects using networks and WBS elements
  - ETO means engineer-to-order (which may also use project techniques)

Results Analysis Key

Transaction OKG1

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
RA key	Name for grouping of control parameters used to compute WIP for similar production objects. This key is associated to a production object through its order type and defaults into the object when it is created. This ensures a consistent method is used for costing.	FERT (if using actual vs. plan costs) FERT-P (if using plan costs)	FERT-P	MTO/ETO: KUND PRJ: AUFT
Text	Description for the key			

Results Analysis Version

Transactions OKG2 or OKG9

Field or Setting	Explanation	Order-related / Repetitive/ Sales order-related
CO Area	Versions are defined per controlling area, even if they are identical	Enter your controlling area
RA version	User-assigned number that provides for multiple versions for analysis purposes in CO.	Default is version 0. Additional versions are optional. Only version 0 may be passed to CO-PA.
Financial accounting	If enabled, will pass results to FI. First item to check if postings are not made in FI.; common mistake.	Enable for standard version. (May need to disable temporarily when configuring posting table in transaction *OKG8*).
Split acc. to crtn/usage	Allows the WIP amounts to be differentiated between what was accrued and what was reversed/consumed.	Optional because it requires twice the number of cost elements.
Create line items	Tracks who ran the WIP calc and when it was done, at order level.	Disabled because it uses additional disk space. Generally few people are authorized to run *WIP calc*, so it is not useful.

Field or Setting	Explanation	Order-related / Repetitive/ Sales order-related
Transfer old data	Allows manual entry of WIP values (from non-SAP system)	Disabled for standard version (0); prevents automatic RA
Deletion allowed	Allows the WIP calculations to be manually deleted.	Disabled; change only if unusual situation requires
Assignment/RA key	Provides multiple rule sets for grouping/posting of costs by cost element, depending on the RA key name	Enable if using more than one RA key for posting flexibility.
Update/RA key	Provides multiple rule sets for posting to FI, depending on the RA key name	Enable if using more than one RA key for posting flexibility.
Closing period	WIP values are stored with a period association. This table defines the period used as a comparison for changes in WIP values. This must be updated manually each month via transaction KKA0.	Initialize in this table; subsequent updates done with transaction KKA0.
Valuated actual costs	Type 31 cost element used to aggregate actual costs	Define cost element with transaction *KA06*; then assign here.
Calculated costs	Type 31 cost element used to aggregate costs calculated within RA as comparison.	Define cost element with transaction *KA06*; then assign here.
(Other cost elements)	Type 31 cost elements used for MTO costing.	Required for sales-order-related. Define list ahead of time and then enter here.
WIP on dependent orders	For cross-company costing of Sales-order-related production. Enables WIP to be computed on supporting production orders in one company and settled to sales order in another company code. See documentation for more information.	Typically disabled for sales order-related within one company code. (WIP will be calculated and passed to sales order in such cases).
Cross-comp. Valuation	For cross-company costing of sales order-related, allows production costs to be visible in other company code. See documentation for more info.	Typically disabled for calculations within a company code.

Field or Setting	Explanation	Order-related / Repetitive/ Sales order-related
Usage RA version	For sales order-related, allows RA to be carried out using actual costs or simulated costs based on planned revenue. This might be done for analysis purposes only in CO.	Blank or "A" (actual)

Valuation Method—Actual (Order-Related)

Transaction OKGC

Detailed settings behind each of these keys or status codes is not available with drill-down in the order-related section of configuration, but is with the sales order-related section. See page C–9 for a detailed explanation of the settings for all manufacturing methods.

Field or setting	Explanation	Order-Related/Repetitive
Controlling area	At the highest level, WIP calculation rules are defined separately by controlling area.	Enter the controlling area.
RA version	When WIP and RA are run, there is an option to run for one RA version or all versions. Since the rule sets may vary per RA version or key, alternate results can be generated for analysis.	Typically, the standard version 0 is used for FI purposes; others are optional for CO analysis. Define for version 0.
RA key	The control parameters in the underlying table will apply to all objects covered by the RA key. Since the key typically represents production orders vs. run schedules, etc., the calculation rules will be applied to all such objects when WIP / RA is run. (The appropriate RA key defaults into the production object when it is created.)	Define an entry for each RA key and status (see next field). As delivered the following keys should exist for controlling area 0001: ▪ FERT (REL status) ▪ FERT (DLV status) ▪ FERT (TECO status) Use the "copy as" function (from ctlg area 0001) to populate underlying entries for keys in new controlling areas.
Status	The calculation of WIP is governed by the status of the production object / order. By definition, those in a REL (released) status may have costs to be accrued; those in a DLV (delivered) or TECO (technically complete) should not have any WIP values remaining.	Verify or create an entry for each RA key with a status of REL, DLV, and TECO. The specific values for such keys are noted in subsequent entries in this document. Use the "copy as" function to populate underlying (default) entries.

Field or setting	Explanation	Order-Related/Repetitive
Status number	Production objects/orders will have multiple status codes, only a few of which relate to WIP calculations. If an order has multiple status codes, the status number indicates which takes precedence. Higher numbers take priority over lower.	Typical settings are: • REL = 1 • DLV = 2 • TECO = 3

Valuation Method—Planned (for Order related and Repetitive)

Transaction OKGD

Tips & Tricks

Detailed settings behind each of these keys or status codes are not available using drill-down in the order-related section of configuration but is with the sales order-related section. See page 9 for a detailed explanation of the settings for all manufacturing methods.

Field or setting	Explanation	Order-related / Repetitive
Controlling area	At the highest level, WIP calculation rules are defined separately by controlling area.	Enter the controlling area.
RA version	When WIP/RA is run, there is an option to run for one RA version or all versions. Since the rule sets may vary per RA version or key, alternate results can be generated for analysis.	Typically, the standard version 0 is used for FI; others are optional for CO analysis. Define for version 0.

RA key	The control parameters in the underlying table will apply to all objects covered by the RA key. Since the key typically represents production orders vs. run schedules, etc., the calculation rules will be applied to all such objects when WIP/RA is run. (The appropriate RA key defaults into the production object when it is created)	Define an entry for each RA key. As delivered the following key should exist for controlling area 0001: FERT-P Use the "copy as" function (from ctlg area 0001) to populate underlying entries for keys in new controlling areas.

Valuation Method—Sales Order-Related

Transaction OKG3

> For order-related and repetitive, all of the settings in this table have been standardized and can be used "as delivered." The only fields to check are the *Closg per.* and the *End ind.*

For sales order-related, the settings in this table are critical to the appropriate calculation of WIP and COGS. There are various approaches, each yielding a different logic in how these values are computed. The configuration settings shown below use the following assumptions:

- Sale of configured product
- Use of ATO manufacturing
- The system should cancel any reserves for unrealized costs or imminent loss when the sales order item reaches a final billing status

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
Res. Analysis type	Determines how the order is monitored for progress and WIP calculation. Many of the settings on this screen are interdependent.	F = calc if using actual costs S = calc if using plan costs Z = cancel / reverse	F = calc if using actual costs S = calc if using plan costs Z = cancel / reverse	E = calc; see doc for alternatives Z = cancel / reverse
Profit indicator	Of primary importance in sales order-related. Determines what factors affect the COGS calculation.	"M"	"M"	"M"; see doc for alternatives
Valuation basis	Of primary importance in sales order-related. Determines on what basis to evaluate revenue and costs for WIP and COGS.	"O"	"O"	REL status: • "S"; see doc for alternatives • DLV or TECO status: "J"
Plan version	Allows multiple versions to for planning purposes, using differing assumptions. For costing of sales order items, this must be version 0.	0	0	0
Version f. sim.	Allows for cost simulation if using alternate planning versions (above).	0	0	0
Valuation level	Determines the level at which WIP and reserves are calculated and apportioned—at order level (summary), or at the line ID level.	"S"	"S"	"S"

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
Profit basis	Identifies the source of cost and revenue planning information. This choice has significant impact on cost and WIP postings in sales order-related. See field level help for alternatives.	"C"	"C"	For sales order-related, generally "K." For Assemble-to-order manufacturing which involves configured product and no product/unit cost estimate created in SO. Use "C." See doc for alternatives
Base quantity	Identifies whether actual revenue is based on quantity delivered or billed. More conservative is on billed.	N/A	N/A	"B"
Loss realization	Creates reserves for loss on orders that are below breakeven.	"E"	"E"	"E"
Final RA	Can be used to cancel all reserves and post any remaining costs as COGS. This is typically handled via the "results analysis type" above (cancel = Z).	---	---	---
Project struct.	For PRJ only, identifies how costs and revenues are to be aggregated in RA	---	---	PRJ: see field-level help and documentation. For all others, leave blank.

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
SalesOrdStruc	For sales order-related, if sales order contains sub-items that carry revenue, identifies whether it should be included with the higher-level item for RA purposes.	---	---	---
Profit %	Only used in revenue-based RA if using profit base "T" or "U." By definition, this identifies the specific profit percentage to be used in RA calculations.	---	---	---
Rslts res.	Used in cases where cost planning is not available and intent is to provide cost reserves based on fixed percentage of revenue realized.	---	---	---
Commitment	Allows for costs committed, but not yet realized against a sales order item to be considered by RA, such as a PO. Similarly, allows customer down payments to be considered as revenue for RA purposes. See documentation for more detail.	---	---	---

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
No valuation	Override flag that tells the system not to calculate anything on objects using this RA type and in this status. In high-volume environments, might be used to limit number of objects subject to RA, in conjunction with manual assignment of a user status, or possibly TECO status.	---	---	---
Cancellation / apportionment: *Cap. Costs*	Controls if and how the WIP & COGS values are computed.	Enabled Method "I"	Enabled Method "I"	Enabled Method "I"
Reserves	Controls if and how the reserves for unrealized costs are computed.	Enabled Method "D"	Enabled Method "D"	Enabled Method "D"
Res. For comp.	Controls if and how the reserves for complaints are computed.	Enabled Method "D"	Enabled Method "D"	Enabled Method "D"
ReservesImmLos	Controls if and how the reserves for imminent loss are computed.	Enabled Method "C"	Enabled Method "C"	Enabled Method "S"
Other apportionment	In some situations, it may not be possible to apportion costs to the line IDs based on the cost element breakdown. This provides alternative logic in such cases.	"A"	"A"	Enabled, using method "N".

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
Cost of sales	In sales order-related, indicates how the COGS can be apportioned to the line IDs.	---	---	---
Planned values: *Complete plan*	Indicates the period for planning costs and revenues for the object: for the year, or for the life cycle of the object.	"E"	"E"	"A"
Line ID costs	For PRJ, allows for manually planned costs to be mapped to a specific line ID.	---	---	PRJ: enter line ID for costs
Line ID revenue	For PRJ, allows for manually planned revenues to be mapped to a specific line ID.	---	---	PRJ: enter line ID for revenues
Overrun	For PRJ, if actual cost/revenue exceeds plan, identifies how this difference is to be handled.	"A"	"A"	PRJ: use the list function to choose the method desired
Line ID overrun	Only applies for PRJ and if method "E" was used in the "overrun" field above.	---	---	PRJ: if applicable, enter the line ID to which this difference should be mapped
Minimum values: *Cap. Costs*	Instructs the system not to accrue a WIP value less than this amount	---	---	---
Reserves	Instructs the system not to accrue any reserves for unrealized costs less than this amount	---	---	---

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
ResrvCompl	Instructs the system not to accrue any reserves for complaints less than this amount	---	---	---
ResImmLoss	Instructs the system not to accrue any reserves for imminent loss less than this amount	---	---	---
Further control: *Closg per.*	Protects RA values of previous periods from being overwritten. Thus the current period reflects the difference from the "closing period" values (prior month close).	"D"	"D"	"D"
Special func.	In sales order-related, if there are no actual revenues, but there are actual costs, this can control whether the system creates reserves or "negative WIP."	---	---	--- (Interpreted as creating reserves)
End ind.	Treats each fiscal month as a separate period, rather than one perpetual period.	If using *actual* costs, "M" If using *plan* costs, "E"	"M"	"M"
Manual RA	Allows manual changes or additions to the RA values computed by the system.	"E"	"E"	"E"

Field or setting	Explanation	Order-related	Repetitive	Sales order-related
Only periodic	If manual changes are allowed (above), indicates it may only be done while in the period-based display (vs. cumulative)	Disabled	Disabled	Disabled
UsrFtn 1	Flag to perform user exit for RA calculations on objects covered by this RA type and status.	Not set	Not set	Not set
COS freely	If RA data is entered manually, allows entry of COGS that does not match what system would compute based on actual values	Disabled	Disabled	Disabled

Define Line IDs

There is no transaction available, so you must drill down in the IMG.

Field or setting	Explanation	Order-related / Repetitive / Sales order-related
CO area	Lines IDs can be set uniquely by controlling area.	Enter ctlg area
Line ID	User-defined abbreviation related to the type of cost/revenue being posted. Can use the "as delivered," or replace with new values. Will be referenced in both the assignment and update tables described below. These tables allow for a percentage of the line ID cost to be capitalized (if desired).	As delivered: • ABR – costs already "settled" (either from goods receipt or settlement) • EK – material costs to be capitalized • EL – revenues • FK – activity costs to be capitalized • GK – costs not to be capitalized Alternative idea: • STL – costs already settled • MAT – material costs to be capitalized • LAB – labor costs to be capitalized • OVH – overhead costs to be capitalized • REV – revenue

Define Assignment

Transactions OKGB or OKG5

The purpose of this table is to group cost (and possibly revenue) postings made to the production object to a "line ID." Depending on the need to treat or view groups of costs differently in the WIP calculation, this assignment can be broad or specific. "As delivered," the dummy controlling area 0001 uses the above line IDs and maps sample cost elements accordingly (4xxx = material, 6xxx = activity, etc.). The 0001 controlling area also provides for some overhead costs to be separately mapped and a portion excluded from the WIP capitalization (line ID "GK"). As noted below, the plus sign (+) sign is a "mask" (wildcard). If the desired numbering or naming convention used in cost elements / cost centers prevents full use of masking (for example, discontinuous ranges), it is possible to map multiple table lines to the same line ID.

Tips & Tricks

All fields in this table up through the *Vbl/fx in* column are considered to be key fields and cannot be changed once entered. If a mistake is make, simply delete the line, save the table, and then re-enter it with the correct values. Once the first entry is made, use the "copy as" function to ensure proper masking and leading zeros.

Field or Setting	Explanation	Order-Related/Repetitive/Sales Order-Related
CO area	Mapping is by controlling area	Enter controlling area
RA vs	Mapping is also specific to an RA version (even if identical to another)	Unless multiple versions have been defined, enter the standard version "0."
RA key	The RA version can provide for different account mapping based on the different RA keys, such as FERT, KUND, etc.	If the "assignment/RA" flag was enabled in the RA version, enter the RA key; otherwise leave blank.
Cost elem	Each line represents a series of cost elements that represent possible charges to a production object, and in sales order-related, sales revenue. These should be consistent with the cost component layout, and should cover all possible postings.	On a separate line, enter each source of costs (cost element) for a production object that you wish to group to one line ID. This field requires leading zeros. The plus sign (+) is a wildcard. Examples: all materials are mapped to one line ID, but differing cost center activities are to be segregated.
Origin	Materials with the "origin" indicator in the material master, and all activity costs have origins associated with them. If desired, this can be an additional qualifier in grouping costs to unique line IDs. A blank is **not** the same as the	If desired, enter the appropriate origin to be used as a unique grouping, otherwise mask with the plus sign (+) wildcard.

Field or Setting	Explanation	Order-Related/Repetitive/Sales Order-Related
	plus sign wildcard.	
Cost cent	The cost center associated with activity costs can be an additional qualifier in grouping costs to unique line IDs. A blank is **not** the same as the plus sign wildcard.	For activity or overhead allocations, either mask or specify a cost center that is to be uniquely grouped for this line ID.
ActTyp	The specific activity type for activity costs can be an additional qualifier in grouping costs to unique line IDs. A blank is the same as the plus sign wildcard.	For activity types, either mask or specify an activity type that is to be uniquely grouped for this line ID.
De/Cr in	It is possible to map the sign of the posting as an additional qualifier in grouping costs to unique line IDs. In this case the plus sign (+) sign is a wildcard – it does not mean only positive / debit values.	If the source and sign of the cost posting should be a grouping criteria, choose one of the values from the drop-down list function; otherwise use the plus sign (+) wildcard.
Vbl/Fx ind.	If the charges with the cost element are broken into fixed and variable portions, this can be an additional qualifier in grouping costs to unique line IDs.	If the fixed versus variable portion of the cost element posting should be a qualifier, choose one of the values from the drop-down list function; otherwise use the plus sign (+) wildcard.
ValidFrmPer	All of the above mappings can be setup with date effectivity (month/year).	Enter the month and year in MM/YYYY format that this mapping should be effective. For new configuration, this is typically from the beginning of the current fiscal year.
ReqToCap	Line IDs entered in this column indicate the full amount is required to be capitalized.	If the postings represented on this line are to capitalized, enter the line ID in this column. This is the most typical entry in the U.S. for all lines.
OptToCap	Line IDs entered in this column indicate that a percentage is required to be capitalized. The percentage itself is entered in the column labeled "OptToCap". Note: such values may be reconciling items in FI or CO because they will not be reclassified on the B/S or P&L.	If the postings represented on this line are to partially capitalized, enter the line ID in this column.

Field or Setting	Explanation	Order-Related/Repetitive/Sales Order-Related
ProhToCap	Line IDs entered in this column indicate that some (or all) of the postings represented on this line are not to be capitalized. Note: such values may be reconciling items in FI or CO because they will not be reclassified on the B/S or P&L.	If a portion of the postings represented on this line are not to be capitalized, enter the line ID in this column.
%OptToCap	This column indicates the percentage allowed to be capitalized.	If you have entered line IDs in the "OptToCap" column, enter the desired percentage (whole numbers) which should be capitalized.
%CannotBeCap	This column indicates the percentage prohibited to be capitalized.	If you have entered line IDs in the "ProhToCap" column, enter the desired percentage (whole number) which should not be capitalized. The remaining balance (if any) of the line ID should be represented under the "ReqToCap" column.

Define Update

Transaction OKG4

Tips & Tricks

The first four columns in this table are considered to be keys to the file. If a mistake is made in any of the four fields, delete the entry, save the table, and reenter the correct values.

Field or Setting	Explanation	Order-Related / Repetitive / Sales Order-Related
Controlling area	Mapping is by controlling area	Enter controlling area
Version	Mapping is also specific to an RA version (even if identical to another)	Unless multiple versions have been defined, enter the standard version "0."
RA Key	The RA version can provide for different account mapping based on the different RA keys, such as FERT, KUND, etc.	If the "Update/RA" flag was enabled in the RA version, enter the RA key; otherwise leave blank.
LID	The line IDs defined earlier are individually mapped to buckets (secondary cost elements) for storing the results of the RA calculation.	Enter the first line ID defined earlier (see previous section of this document).
"C"ategory	This is a categorization of the values represented on this line (for example, costs, revenues, previously-settled costs, etc).	Choose the category appropriate to this line ID. Typically, this is one of the following: • K – costs • A – previously settled costs (via goods receipt or settlement) • E – revenue Repeat this process for each line ID. Note that once saved, the line for "settled" costs will hide the cost elements used.
Creation: *Capitalized costs*	Secondary cost elements (type 31) are used to store the results of the RA calculation for each unique combination of the first four fields in this table. If the "split to creation/usage" indicator was enabled in the RA version, then two cost elements will be required per line; otherwise the "creation" field serves both purposes.	A list of the secondary cost elements required should be identified and created first. Once done, enter the cost elements in the fields provided. Each field should have a unique cost element number.

Usage	As noted above, if the system is to separately track the "created" (accrued) costs from the "usage" (consumption / reversal), a second cost element will be required for each line.	See above.
Reserves	Cost elements used for internal calculation of reserves (unrealized costs / imminent loss)	See above.
CostOf Sales/Rev	For sales order-related only, a separate cost element is required for storing the COGS calculation, or the actual revenue value (dependent on whether the category is "K" or "E").	For sales order-related only, enter separate cost element(s) for this line ID.

Define Posting Rules

- For order-related and repetitive: transaction *OKG8*
- For process manufacturing: transaction *OKGA*
- For sales order-related: transaction *OKG4*

Tips & Tricks

The first seven columns in this table are considered to be keys to the file. If a mistake is made in any of the seven fields, delete the entry, save the table, and re-enter the correct values.

Field or Setting	Explanation	Order-Related/Repetitive/Sales Order-Related
CO area	Mapping is specific to the controlling area.	Enter the controlling area.
Company	Because this table controls posting into FI, the company code must also be specified.	Enter the company code involved in the potential posting to the G/L.
RA version	Mapping is also specific to an RA version (even if identical to another)	Unless multiple versions have been defined, enter the standard version "0."
Special note:	Similar to the "assignment" table, there are multiple options for posting RA data to the G/L, ranging from broad to specific. Usage of the next four fields provides this capability.	
Category	There is an option to select from broad system-defined accumulation of RA data, or to use values stored in specific secondary cost elements from the "update" table. Since system-defined accumulations can overlap, care should be taken in which entries are used and testing should verify all possible scenarios. Use list function to display system categories.	Typical usage for order-related and repetitive: • WIPR (for WIP) • RUCR (for reserves / negative WIP) Typical usage for sales order-related: • WIPR (for WIP) • RUCR (for reserves / negative WIP) • RIML (for imminent loss) • Possibly RUCO (for reserves optional to capitalize) • COSR (for COGS)

Creation	If the "split creation/usage" is enabled in the RA version, this allows posting of the RA creation value to a separate account than the usage.	If the split creation/usage indicator is enabled, see the field level help for more detail. Otherwise, leave blank.
Cost element	In contrast to the broad system-defined groupings of RA data, it is possible to map the contents of specific secondary cost elements from the "update" table to specific G/L accounts. On a given line within the posting table, usage of the RA "category" and the "cost element" are mutually exclusive.	If a specific secondary cost element from the RA update table (see previous section) is to be posted to a separate G/L account, enter that cost element here. Otherwise leave blank.
RecNo	Used in special circumstances only, such as when a line ID is entered in the "prohibited to capitalize" column in the assignment table. See field level help for further explanation.	Unless used as noted at left, leave blank (will display as zero).
Pr/LsAcct	The G/L account used to post the offset to material consumption based on the WIP accrual. This is commonly referred to as the "stock change" account.	Enter the G/L account desired. This **cannot** be defined as a cost element in CO! If an entry in the table is subsequently defined as a cost element, it **must be** deleted in CO (if possible), or another P&L account must be used. The system will not allow the table to be saved with this error condition. Special case for sales order-related: if posting COGS using the "COSR" RA category (or similar idea), this is the COGS account to be charged for the associated sales order invoice activity. The system may generate a warning that this is not a material stock account or B/S account; choose *Enter* to continue.
BalSheetAcct	The G/L account used to post the WIP inventory back on to the balance sheet.	Enter the balance sheet account used to hold the value of WIP inventory. Typically, lines representing reserves should be posted to a separate G/L account (liability rather than asset) to reflect the offsetting nature of the entry. Special case for Sales-order-related: if posting COGS using the "COSR" RA category (or similar idea), this is considered to be the stock change / offset account to the COGS account.

Define Number Ranges

Transaction OKG6

- Number ranges are assigned by controlling area.
- Define an internal number range to be used for the controlling area. It can be unique or shared with other controlling areas depending on your number range assignment policies.
- Existing assignments can be reviewed by choosing the *Overview* icon.
- New controlling areas can be assigned to a range by clicking on the change group icon. Unassigned RA processes will be listed at the bottom of the list. Look for the activity "KABG – Automatic Results Analysis," this must be assigned to an interval. Double-click on it to select, then scroll to the desired interval. Single click on the selection box to the left of the interval, and then click on the "element/group" button to assign.
- The related FI posting document number range is found under the settlement section of configuration (transaction *KO8N*).

Appendix D: Settlement

Contents

Overview

What Settlement Is

The prerequisite to settlement is the WIP calculation process, or in make-to-order (MTO), results analysis (RA); the configuration for this is detailed in appendix C. Settlement is the second step in closing orders and establishing work in process (WIP) on the balance sheet.

Settlement is the process by which costs are allocated from one cost object to another within the Controlling (CO) module, such as from a production order to a sales order item. In the typical month-end for cost accounting, it is this settlement process that creates postings to the general ledger (G/L) for financial reporting. However, it is important to understand that these postings are a result of system-generated allocations among the various cost objects, with the G/L postings representing change in values from the last settlement process that impact the financial statements.

For example, if raw material is issued to a production order, the result is an inventory decrease on the balance sheet, with a corresponding expense to the material consumption account associated with an order number. In CO, if the order remains in process at month-end, this value needs to be recognized as WIP. It is the month-end WIP or RA and settlement programs that explicitly identify such charges on various cost objects and determine what amount, if any, should be passed back to the G/L for financial purposes. At first, these changes may seem irrelevant technical details about the system's mechanical process. However, the distinction between values on cost objects in CO and postings in the financial G/L is important.

What Settlement Is Not

It is also important is to identify what settlement is not. Although SAP provides for differing settlement frequencies with full and periodic settlement, the reality is that settlement does not prevent subsequent charges to objects. While settlement may occur at various stages in the lifecycle of a manufacturing process (including at completion), it does not close the job. If additional charges were made to an order after settlement, the subsequent RA and settlement process would detect these changes and post additional

values. It is the system status of the production or cost object that determines which business transactions are allowed. As delivered, goods issues, activity and overhead allocations are still allowed when a production order is in a delivered (DLV) or technically complete (TECO) status. Changing what this system status allows is a modification. However, a user status can be applied to the order in which these business transactions are not allowed. The documentation on status profiles provides additional detail on this subject. For repetitive manufacturing, the ending validity date effectively provides this lockout.

Settlement provides for various techniques that can include simultaneous settlement to multiple objects. It is the configuration of settlement and the associated order types that determine which cost objects are involved and how the postings occur. This chapter explains the typical configuration to post manufacturing settlement to the Financial module (FI) and the initial links to profitability analysis (CO-PA).

By definition, settlement involves a sender (of costs) and a receiver. In a make-to-stock environment with discrete production orders, the order is the sender and the material (the inventory account) is the receiver. If the material is carried at standard cost and variances are recognized at completion, the variances are automatically settled to a different receiver (a variance account). By contrast, in make-to-order manufacturing, the receiver is usually a sales order item, which in turn might settle to CO-PA during the same settlement process. In make-to-stock environments, although this sender-and-receiver relationship is defined by the system, it can be manually changed. Relationships for all other manufacturing environments are defined by settings in various configuration tables.

The configuration for settlement is tightly integrated with Sales and Distribution (SD), Production Planning (PP), and the FI modules, and duplicate views of some costing parameters will be found in those areas.

There are two key tables within configuration that control the settlement process:

* Settlement profile
* Settlement structure

If CO-PA is enabled, a PA settlement structure must also be configured.

Settlement Profile

Transaction OKO7

The settlement profile provides various control parameters for the settlement process, such as what objects may serve as the receiver of costs from the settlement (G/L account, cost center, etc.). It also provides pointers to related configuration structures, such as the settlement structure.

The settlement profile used for a production object is determined by referring to the following corresponding order types:

* Order-related, configuration transaction *OPJH*
* Repetitive, configuration transaction *KOT2*
* Sales order-related, configuration transaction *OVZG* (sales order requirements class)

For example, a standard production order uses the order type *PP01*. Various costing parameters, one of which is the settlement profile, are associated with this order type. As delivered, the profile called out is either named FA_ABP or PP01.

A key concept in the profile is settlement rules. As noted, a production object may settle costs to more than one object, and the amount can be settled using a percentage or fixed portion of the sender object. Each of these allocations is referred to as a settlement rule.

The settings contained in the settlement profile are detailed below:

Field or Setting	Explanation	All Manufacturing Methods
Settlement profile	Key or name of the profile.	Several profiles are delivered with the software, generally named for the order types involved.
Actual costs or cost of sales: • Must be settled in full • Can be settled • Must not be settled	Indicates whether costs on the production objects are to be settled to another object.	• Order-related and repetitive, must be • Sales-order-related, if posting to CO-PA or PCA, then must be; otherwise must not
Default values, settlement structure	Pointer to the config. table that provides mapping of incoming costs to the receiver	Various structures provided as delivered and can be modified. *A1* is commonly used.
PA settlement str.	Pointer to the config. table and provides mapping of incoming costs to CO-PA value fields.	As delivered, structure *E1* is available for further definition / modification. To avoid error messages, if not using CO-PA, leave blank.
Default obj. type	For order types using this profile, this field identifies the default receiver to be used. This step can be changed on the production object.	Order related and Repetitive, leave blank (system assigns MAT for material or inventory) on the object. It is not possible to manually assign the MAT receiver. Sales order-related, if settling to CO-PA, PSG
Origin structure	Allows for specific groups of incoming costs (elements) to be settled to different receivers.	___

Field or Setting	Explanation	All Manufacturing Methods
Derivtn for rec. ind.	Used only in joint-venture accounting.	___
Indicators: *100% validation*	Used only for periodic settlement; see field-level *Help* for more info.	Enabled
% Settlement	Allows the amounts to be settled to a receiver using a percentage basis.	Enabled
Equivalence numbers	Alternative to using percentages for settlement. See field-level help for example.	___
Amount settlement	Allows fixed amount to be settled to a receiver, rather than percentages.	Disabled
Variances	Allows variances in order-related and repetitive production to be settled to CO-PA.	If using CO-PA, enabled; if not using CO-PA, not relevant.
Valid receivers: • *G/L account* • *Cost center* • *Etc.*		Set as desired to potentially allow settlement to the receivers listed. Suggestions set to 1 for: • Order-related and repetitive: G/L account, Cost center, Order, Material (mandatory), Order item (if using coproducts), Project, Network • Sales order-related production: G/L account, Sales order, Order (collective), Profit. Segment
Misc. parameter is document type	When settlement occurs, a financial document may be created; this is the FI document type that will be used. For easy segregation in the G/L, ensure this is not the same as is used for manual journal entries.	As delivered, SA

Field or Setting	Explanation	All Manufacturing Methods
Max. no dist. Rls	Settlement can be made in partial amounts to multiple objects. This process stipulates the maximum number of settlement rules (objects or splits).	As delivered, 6
Retention	Indicates how long the settlement documents should be retained before they can be archived.	Set as required per company data retention policy. As delivered, set to three months.

Settlement Structure

Transaction OKO6

The settlement structure provides the mapping of incoming costs by cost element to the receiving object. This process breaks down into two portions:

- The incoming costs are referred to as the origin, which is a cost element group.

  Costs incurred on production objects are originally posted against cost elements. Cost element groups may be defined (transaction *KAH1*) to aggregate costs of a similar nature, such as raw materials, labor, and so on, and use the same idea as in the cost component layout.

- The vehicle through which these costs are funneled to the receiver is the **settlement cost element**

  The costs are sent to the receiver with one of two choices. A secondary cost element defined exclusively for this purpose or with their original cost elements. The choice is made on the *Settlement cost element* screen in the settlement structure (by entering a secondary cost element or selecting the *OCE* box). If the secondary cost element is used, it will be shown as the source of costs on the receiving object; if the *OCE* box is selected, the original cost elements charged will be shown.

> *Tips & Tricks*
>
> The settlement structure settles costs to objects within CO not FI. Therefore, if all three of the following conditions are satisfied, the settlement structure is not required because it is irrelevant:
>
> - Only order-related (without collective orders or coproducts),or repetitive manufacturing will be used
>
> - Settlement is only used for the related FI postings (i.e. to inventory and variance accounts)
>
> - Postings are not required to CO-PA or CO-PCA.

The mapping contained in the settlement structure is detailed below.

Settlement Structure: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
SS (Settlement structure)	Key or name of this particular structure	A1 and A2 are delivered with the software.
Description	Describes the type(s) of settlement this structure supports.	Enter or edit as necessary.

Settlement Assignment: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
SAs (Settlement assignment)	A sequential number that identifies a line which will group similar costs on subsequent screens (such as materials, labor, etc.).	Start with 001 or as desired; once defined it cannot be changed without deleting and re-entering the dependent views.
Description	Text describing the type of costs to be mapped in subsequent step.	Enter the description, such as raw materials.

Caution

Exercise caution with regard to the cursor position in editing subsequent screens. The system displays or edits the line on which the cursor is positioned, which may not be the line selected or highlighted.

Origin: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
Group	The cost element group that groups costs of a similar nature, such as raw materials, labor, etc.	Define the cost element groups ahead of time (transaction KAH1) and reference here. We suggest that your use of groups enhances consistency or integrity and allows maintenance outside of configuration.
Description	Description of the cost element group.	Should default from cost element group.

Receiver type: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
Account assignment category	SAP-defined cost objects, such as ORD (order), CTR (cost center), etc.	Select the object(s) that may be a valid receiver of costs under this grouping, within this structure. To prevent settlement errors, be sure to choose all the receiver types that were allowed on the settlement profile.
OCE Box	Identifies whether to pass the costs to the above receiver through a secondary cost element or to use the original cost elements with which the costs were incurred Selecting this box is mutually exclusive with the item below.	If it is desirable to follow the cost with their original cost elements, select *OCE,* otherwise use a secondary cost element. In the latter case, the cost element must already be defined (type 21 for internal settlement, type 22 for external – G/L). One method is to assign a unique cost element for each cost type (materials, labor, etc.), regardless of the account assignment category.
S.CostElem.	See above; the two choices are mutually exclusive.	See above.
Name	Description of the secondary cost element above, if used.	If a secondary cost element is used, its default description is automatically entered; otherwise the field is blank.

PA Settlement Structure

Transaction KEI1

Based on the functionality of North American legacy systems, there is a common attempt to analyze costs and margins within the G/L. However, there are far better tools within CO, for example with CO-PA. For sales order-related production, the tools in FI or the cost object reporting menus may be inadequate.

If CO-PA has been enabled, it is possible to analyze costs and margins in greater detail. PA provides for account-based and cost-based CO-PA. In the context of product costing and settlement, this step implies use of cost-based PA, although it is possible to use both. The purpose of this appendix is not to detail CO-PA functionality or configuration but to identify the link between product costing and CO-PA.

In order-related and repetitive manufacturing, the PA settlement structure provides for the mapping of costs and variances on production objects to PA value fields. In sales order-related production, revenues from sales order items can also be passed. Where both types of settlement are used, separate PA settlement structures may be used for this mapping process.

Similar to the settlement structure previously discussed, the PA settlement structure has two parts:

- An origin structure consisting of the following for incoming costs (and revenues):
  - Cost elements
  - Groups
  - Variance categories
- The assignment of these costs or revenues to value fields

The cost elements and grouping techniques are the same as used for the settlement structure. The value fields are user-defined elsewhere in PA configuration and typically represent the cost or revenue grouping desired for analysis in PA. In addition to costs, quantities (that is, invoice quantities) may also be passed.

The mapping in the PA settlement structure is detailed below.

PA Settlement Structure: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
PA settlement structure	Key or name of this particular structure.	*E1* and CO are delivered with the software and can be copied or modified as desired.
Description	Describes the type of PA settlement this structure provides.	Enter or edit as necessary.

PA Settlement Structure Assignment: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
PA settlement assignment	A line number that represents a grouping of costs, variances, or revenues that are defined in subsequent screens.	Intervals of ten allow for logical insertions. Once defined, it cannot be changed without deleting and re-entering the dependent views.
Description	Describes the types of costs, variances, or revenues	Enter the description, such as material cost, usage variance, or gross revenue.
Quantity billed	Indicates this is a quantity field versus an amount.	Enable only if this is an invoice quantity in sales order-related production.

PA Settlement Structure Origin: Overview screen

Field or Setting	Explanation	All Manufacturing Methods
Origin	Identifies whether the source of this line is from cost elements or variance categories.	Select from the two options available.
SetID	A cost element or group that combines costs of a similar nature, such as materials, labor, etc. In the case of variances, this is the system-defined variance category.	Define groups ahead of time and enter here. The use of groups enhances consistency or integrity and allows maintenance outside of configuration.
Description	Describes the type of costs	The label should default from the cost element, group, or system-defined variance category.

Assign Settlement Str. Line to Value Fields: Overview screen

Field or setting	Explanation	All manufacturing methods
Quantity/value	Identifies whether this is a quantity or value being mapped.	Select one of the two system-defined options.
Fixed/variable	Indicates whether to map the fixed, variable, or total value represented on this line to the value field.	Select from one of the three system-defined options.
Value field	Identifies the database field within PA used to accumulate the values mapped on this line.	Select from the predefined value fields. Exercise caution as this is a user-define mapping and edit checks are usually not possible.

Define Number Range

Transaction KO8N

The following information applies to this transaction:

- The number range for settlement documents is assigned for a controlling area.

- An internal number range for financial documents should be defined for this purpose.

  This number can be unique or shared with other controlling areas, depending on your number range assignment policies.

- To review existing assignments, click the *Overview* icon at the far left of the icon bar.

- New controlling areas can be assigned to a range by clicking on the *Change group* icon.

  Unassigned controlling areas will be listed at the bottom of the list. Double-click to select, and click on the selection box to the left of the interval, and click on the *Element/group* button to assign.

Appendix E: Overhead

Contents

Overview

In Release 3.x, allocation of indirect costs to the product is supported in SAP, primarily through the use of costing sheets, although standard values or activity types within task lists (routings) are sometimes used. From Release 4.x, Activity-based costing provides additional methods for this purpose. Which elements constitute indirect costs vary by company and generally fall into one of the following categories:

- Indirect costs in manufacturing
- Broader sales, general, & administrative (SG&A) costs

Some examples of the former would be material handling on the shop floor, maintenance work, and general or cleanup labor. Examples of SG&A includes allocation of production supervision, warehouse material handling, utility costs, administrative salaries, and depreciation.

The costing sheet with the cost component layout provides the flexibility to identify and selectively incorporate overhead into the cost of the product when performing a cost rollup and when transacting

material. This selective inclusion is defined by the settings in the cost component detail screen. SAP provides several costing sheet templates with the software that may be modified as desired.

The costing sheet provides for allocation of costs by applying a fixed percentage of labor or material, or a fixed value per unit consumed. By contrast, the use of standard values or activity types in task lists allows costs to be charged into product costs based on confirmation of production and activity on the shop floor. Either method can provide rates that have date effectivity.

Because the costing sheet is indirectly linked to the costing variant used to set standards, it is important that a global view be taken in the design of the overhead allocation process to ensure that differing requirements will be accommodated. If the design is too narrow, revisions can become complex and confusing in practice.

The following table provides a brief comparison of the two methods of applying overhead:

Comparison of Overhead Methods

Considerations	Costing Sheet	Task List
Flexibility or Specificity	Applied by user-defined groupings as described in following sections. Careful design required. New materials simply refer to existing setup.	Task lists provide for material-specific overhead factors. Including overhead in them implies access by both manufacturing and accounting.
Data maintenance	Generally one-time setup, periodic revision of rates in config.	Depends on how used. Can range from periodic revision of activity prices, or detailed changes to all task list standard values. Task lists are limited to a total of six standard values per operation for both manufacturing and accounting purposes.
Values allowed	Percentage or fixed values per unit consumed	Fixed or calculated value based on formula and/or activity type price.
Actual overhead update	Periodic batch job; production objects do not reflect actuals until this is run.	Real-time absorption if shop floor confirmations are performed on a timely basis.

Costing Sheet Method

Configuration Overview

Costing sheets provide for calculation of overhead by applying one of the following:

- A fixed percentage against a "base" value, such as the total cost of material or labor consumed.
- A fixed value per quantity of material or activity consumed.

The configuration of a costing sheet contains three basic items:

- A base code that accumulates material or labor costs consumed in product manufacture.

  If using the quantity-based method (value vs. percentage), this code represents the quantities consumed.

- An overhead code that provides a variable percentage or fixed value to multiply against the base.

- A credit key that identifies the cost element and cost center (or internal order) to credit for overhead absorption.

The format of a costing sheet loosely resembles a spreadsheet containing numbered rows with these codes entered in three separate columns. A given line would represent a specific accumulation of costs as defined by the base code. One or more lines are then multiplied by the percentage or value represented by the overhead code (the *From* and *To* columns are provided for this purpose). The resulting value would then be debited to the product (on the cost estimate, the production order, or the object), and credited to the cost element or cost center defined by the credit key.

Configuration Tips

Although there are separate configuration tables for each element (code) referenced in the costing sheet, it is usually easier to take a top-down approach to first visualize the overall structure. Further, the costing sheet provides drill-down into the detail represented by the codes referenced. A review and drill-down on one of the templates will assist in this process, which can be followed by detailed setup of the individual tables. The costing sheet overview can be accessed in configuration using transaction *KZS2*. For quick reference, a sample costing sheet is shown below:

Row	Base	Overhead	Description	From	To line	Cr.
10	B000		Raw material			
20		C000	Material ovhd	10	10	E01
30	B010		Production labor			
40		C000	Production ovhd	30	30	E02

Base

The base represents an accumulation of costs for one or more cost elements that would be charged for material or labor consumed in the manufacturing process on the BOM and routing. For materials, these would be the cost elements for material consumption identified by automatic account determination using the component's valuation class on the material master and the GBB or VBR process key in account determination. For activity costs, these would be the cost elements associated with the activity type master data setup in cost center accounting.

The base is defined in transaction *KZB2* and individual cost elements or ranges of cost elements may be specified in this base code. The *Origin* field may be a further qualifier if this functionality is enabled on the material master of the components. This functionality may be used if it is necessary to apply different overhead rates per material that use a common consumption account. Origin codes are defined in CO

configuration (transaction *OKZ1*) and referenced on the material master. If the field is left blank, it is assumed there is no distinction between materials with different origins.

Overhead

The overhead code makes use of the conditioning technique used throughout SAP, but most commonly in the Sales & Distribution (SD) module. Rather than hard-coding certain values, the conditioning technique creates dependencies between tables that can then be combined to form complex look-up logic. For overhead, SAP delivers several predefined conditions that can be used to define multiple overhead rates (percentage or fixed values). Additionally, user-defined tables can be created to extend this functionality. Overhead codes are defined in transaction *KZZ2* for percentage rates and transaction *KZM2* for quantity-based (values).

> *Tips & Tricks*
>
> Quantity-based overhead requires the use of material origin groups.

As delivered, R/3 provides for overhead to be uniquely determined at a minimum by an effectivity date, the controlling area and the overhead code (all mandatory). In addition, the following fields may be used to further qualify the overhead. These fields are mutually exclusive and may not be combined to determine the overhead, although some are inherently subsets of another:

- *Company code*
- *Plant*
- *Overhead key / group* (specified on assembly level material)
- *Order type (i.e. PP01, PP04, etc.)*
- *Order category* (i.e. production order, internal order, etc.)
- *Business area*
- *Plan version* (for alternate CO analysis)

Finally, in the combination chosen here, the tables provide for different rates to be applied for plan and actual. The plan value is used for cost estimates and consequently for valuation of inventory and material transactions. "Actual" is used for absorbing these costs into production orders or objects. Remember that if different values are specified, variances will automatically be incurred. The *Overhead key / group* field is commonly used to apply a different overhead based on the parent item being produced. This rate would then be applied to the material or labor consumed to make that product.

On the costing sheet, specify the desired overhead condition that will be multiplied by the base. If multiple overhead rates are needed on different bases, then multiple lines should be entered on the costing sheet where the overhead "from" and "to" columns dictate to which base they apply.

> *Tips & Tricks*
>
> Overhead on raw materials will be rolled into the parent item. As such, subassemblies will already include an overhead factor in further rollups. This that should be considered in specifying the cost element range used for the base code. If both raw materials and subassemblies use the same consumption account, the overhead charge may be compounded in the assembly level rollup.

In the configuration table for the overhead code, the columns displayed in the screens will depend on which condition was chosen. All conditions will display the effective date, the controlling area, the

overhead type (plan or actual), and optionally one additional qualifier listed above. Effectivity date ranges may not overlap, and it may be useful to leave old ranges for audit purposes.

Credit Key

The credit key defines which cost element and cost center should receive credit for the overhead absorption into the production objects. You can optionally qualify the cost element or cost center used by specifying a material origin group; see above for discussion of origin groups. Credit keys also provide for date effectivity through the use of a *Valid to* date, which allows the cost element or cost center assignment to be revised over time.

As an alternative to a cost element, the system provides for the credit to be posted to an internal order, although this is not commonly used. Since costs on a production object can be treated as fixed or variable, the credit key allows for the overhead absorption to be categorized in the same fashion. The *% Fxd* column provides for either a specific percentage of the calculated overhead to be categorized as fixed, or use of the asterisk (*) indicator. This asterisk indicates that the calculated overhead should be apportioned using the same split as the underlying base on which it is computed. The online field help provides a good example of this concept.

Cost Component Layout

Whether and how overhead costs are reflected in the cost of the product or for ad-hoc reporting only is controlled by the cost component layout. As noted earlier, it is possible to simultaneously have different types of overhead. If a given overhead cost is to be included in cost of the product for valuation and transaction purposes, the following tips are offered:

- Define overhead using the costing sheet as identified above

- Ensure the costing sheet is referenced in the valuation variant (transaction *OKK4*), which is called out by the costing variant used for cost estimates (transaction *OKKN*).

  This is generally costing variant PPC1.

- A cost component should be defined for overhead(s) using transaction *OKTZ*, and the cost elements used for overhead (shown on the credit key for a costing sheet) should be mapped on the third level of this structure.

- Within the cost component layout, choose cost components with attributes and double-click on the overhead component.

  Ensure that the roll up cost component switch is enabled. Also select the appropriate settings under the filter criteria section. These two items control whether the cost is included in cost of goods manufactured or cost of goods sold. In particular, the stock valuation setting controls whether the cost will be included in the cost for inventory valuation and transaction purposes. If this setting is set to "not relevant," the overhead will still be broken out on the cost estimate, but not included in the value updated to the material master, and hence excluded from inventory and transaction valuation.

Overhead Group

If overhead groups are used to apply differing overhead amounts based on the assembly being produced (*Overhead key/group*), there is an additional configuration table involved. Specifically, the overhead code tables refer to an overhead type. This type is linked in a 1:1 ratio to a corresponding user-defined overhead group in transaction *OKZ2*. This group is referenced on the costing view of the material master.

Planned Overhead—Setting Standards

Based on the settings noted above, overhead will be included when a cost rollup is performed on the product. Once the estimate is marked and released (material master updated), inventory and material transactions will include this cost in the total. The total value is carried in the G/L account linked to the valuation class in the material master. Overheads included in the standard by means of a costing sheet are identified in the estimate with an item category of "G" on the itemization and costed BOM displays.

> Although the cost component detail on an estimate provides the breakout among material, labor and overhead, SAP does not breakout these components in G/L valuation.

Actual Overhead Period-End Procedures

Previous sections discussed how planned overhead could be incorporated in standards through the use of costing sheets, and consequently in inventory valuation and material transactions. The actual overhead is applied by means of a batch job (for example, transaction *CO43*) that should be run during the month-end closing process. If run more frequently, this job will only apply any differences since the last run. Individual production objects will not reflect the actual overhead costs until this job is run.

For the period, the actual material and labor consumed for each production object is calculated and overhead (as specified in the costing sheet) is applied. The debit will be to the production object using the same cost element as the overhead credit key. Therefore, the debit and credit will net to zero, but the cost has been moved between the CO cost objects. That is, the cost center is relieved, the production order is charged. This process aligns the actual cost of manufacturing to the planned cost set in the standard. If there are differences from plan in actual material or labor consumed, there will be differences in the actual overhead absorbed. These differences will be identified during the settlement process and either charged to the variance account for those materials using standard price control, or the moving average will be adjusted for materials using moving average price control. A detailed analysis of the variances is available through the variance calculation program (collective mode transaction *KKS1* or individual object transaction *KKS2*).

Task List Method

General Approach

As noted in the overview section, activity types in the task list may be used instead of costing sheets, or they may be used in addition to the types to apply overhead. Although generically referred to as activity types, it is really a combination of standard values, activity types, and formulas that compute the overhead in this approach. There are two ways to accomplish this approach:

- Use a standard value field within the operation as a multiplier against an activity type price (burden)
- Use a standard value field which makes use of a formula involving other values in the operation

For additional information on this approach, see *Alternate Uses of Standard Values* on page E–10.

Data Relationships and Terminology

To successfully use task lists to apply overhead, it is important to understand the integration of logistics and accounting data, both in the configuration and master data areas. For this reason, these relationships are discussed below in detail and illustrated in an accompanying graphic.

The data used to value manufacturing activity relies on master data in both the Logistics and Accounting modules, and there is a key linkage between a work center in logistics and a cost center in accounting. A task list draws information from both areas and computes processing times for manufacturing, and the associated costs for accounting purposes. The use of task lists for overhead charges is a specific flavor of the costs developed for accounting purposes. It is also worth noting that some of the data is hierarchical. That is, which subset of data may be used on a task list depends on linkages established at the work center and higher level relationships in configuration.

The use of task lists to apply overhead potentially relies on the:

- Individual standard value in the task list (for example, "2 hours per product *x* processed")
- Specific activity type associated with the standard value above (for example, "machine hour")
- Activity price potentially used to cost the activity type (for example, "$50 per machine hour")
- Formula used to calculate the value of this activity and its associated price (for example, "2 hours processing time * $50 per machine hour")

Because there are different ways in which these lists can be used for overhead, not all of these values may actually be referenced. The following section will clarify this point and starts at the point of a task list for a sample product and drills down to the underlying relationships.

Task List

In manufacturing, a task list is generally used to identify the manufacturing activity, the work center (production line or resource) in which it occurs, and the operational sequence in which it performed. An activity takes place within a work center at an operation (sequential step) on the task list. For example, at operation 10, it may take one hour of machine time and one hour of labor time in work center Board Assembly to process the material. Up to six of these activities may be planned and recorded per operation. Using this example, in SAP terminology:

- Operation 10 is the operation step

- Board assembly is the work center in which this is performed
- The machine or labor time is referred to as the activity type
- The one hour per unit processed is referred to as the standard value
- The cost of one hour of machine or labor time is referred to as the activity type price

Standard Value Key

Which activity types are to be planned and recorded is controlled by the work center with a standard value key. This key is defined in configuration (transaction *OP19*) and is referenced on the work center. This logic provides two key benefits:

- It provides a shorthand method of referencing common activities (standard values) to be tracked.
- It establishes the database mapping of such standard values to the activity types and associated prices.

   A standard value key allows up to **six** activity types to be planned, such as labor hour.

Standard Value Parameters

A standard value key provides the structure to support up to six standard values that will be entered at the operation level in the task list. The standard value key table contains fields (referred to as parameters) that are further defined (transaction *OP51*) to represent time or quantity values. These fields may be thought of as containers that hold the standard value (1 hour) and map it to a variable used in formulas used to compute run times or costs. To use a spreadsheet analogy, the parameter is "Cell A1" and the standard value is its contents (1).

Activity Types

Activity types are defined in cost center accounting (transaction *KL01*) to represent specific types of manufacturing activity, such as machine hour, labor hour, or setup time. The activity type master record requires the assignment of a secondary cost element (type 43). For additional information on this assignment, see the *Cost component layout* section earlier in this appendix.

Activity Type Prices

A work center is assigned to a cost center, which provides the linkage between logistics and accounting. The cost center (department) is used to manage costs and define which activity types may be used to allocate costs from the cost center to manufacturing. For example, one hour of labor in the assembly cost center may be consumed in the manufacturing of product *x*. Because one hour of labor in the assembly cost center may have a different cost than one hour of labor in the burn-in cost center, activity prices are set as a combination of the cost center and activity type in transaction *KP26*.

Work Center

The assignment screen in the work center maps the work center to the cost center. Thus, a work center can reference activity types defined in the cost center for which activity prices have been entered. Also, an activity type can be entered for each standard value field enabled on the work center, which will default into the task list when the work center is specified. Additionally, the formula used to compute the activity run time or cost is assigned for the associated standard value field. Formulas are defined in configuration transaction *OP54* and apply across company codes and plants in the same client. For additional information on using these formulas, see below.

The task list is constructed to list the sequence of operations. At each operation, the work center in which activity is to occur is entered. Because the work center contains a standard value key, the operation on the task list operation recognizes which standard values are to be tracked, along with their assignment to an activity type and formula.

Alternate Uses of Standard Values

With the above background on how standard values and activity types can be used for manufacturing and costing, below are some examples using the two methods identified at the beginning of this section. The formulas described below use text for illustration purposes. Actual formulas use the parameters entered in configuration.

Specific Value with Activity Price

Using this technique, the activity price serves as a set burden amount multiplied against a factor that varies by operation or material. This step allows differing overhead amounts to be applied based on the material or operation involved. If the variable factors are somewhat stable, then maintenance would be limited to periodic updates to the activity price. If these factors change frequently, individual task list maintenance would also be required.

```
        Task List for Material x – Operation #10 – Detail screen


                    Std value      Un        Activity Type
Setup                  30          MIN          SetupHr

Machine                60          MIN          MachHr

Labor                  60          MIN          LabHr

Vbl Ovhd               5           ---          VblOvh01
```

Work Center

Formula: Vbl Ovhd * Act type price

(e.g. = 5 * $50 per unit processed in this op)

Specific Value with Complex Formula

Similar to the second technique, in this technique, the formula may include references to other values within the task list. This formula leverages information that may already be present for manufacturing purposes.

```
         Task List for Material x - Operation #10 - Detail screen


              Std value      Un         Activity Type

Setup              30        MIN            SetupHr

Machine            60        MIN            MachHr

Labor              60        MIN            LabHr

Vbl Ovhd          .25        ---            VblOvh02
```

Work Center

Formula: [(Vbl Ovhd * Machine time) * Activity type price] / Base quantity

(e.g. = .25 * 60 min * $50/hr per unit processed in this op)

Data Relationships Diagrams

The following graphics illustrate the data relationships:
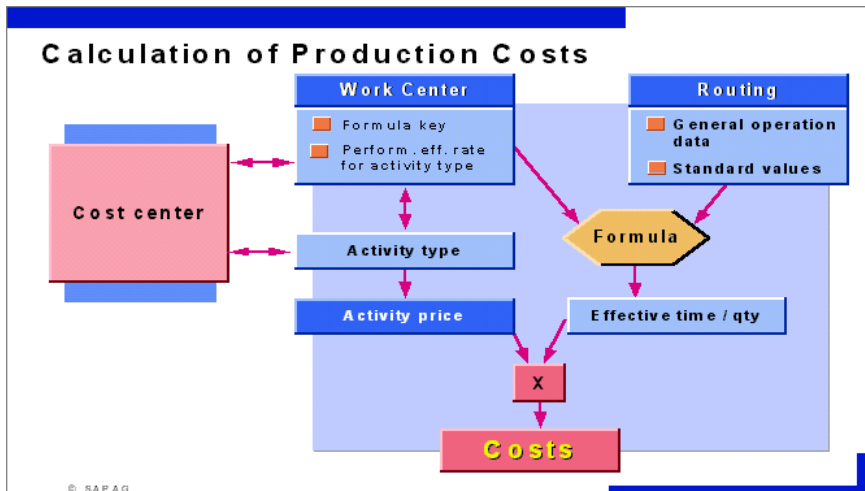
Data relationships for costing of manufacturing activity in SAP

CONFIGURATION
DATA (sample):

*Data flow for example
in italics explained at
bottom*

Parameters
(t/c OP51)

SAP_01 (Setup)
(A) SAP_02 (Machine time)
SAP_03 (Labor time)
...
SAP_08 (Base qty)
SAP_09 (Op qty)
SAP_11 (Op splits)

Std Value Keys
(t/c OP19)

SAP1

   Field #1: SAP_01 (Setup)
(A) Field #2: SAP_02 (Mach)
   Field #3: SAP_03 (Labor)

SAP2

   Field #1: SAP_02 (Mach)
   Field #2: Z00001(User-def)

Formulas
(t/c OP54)

SAP005 (Setup)
   SAP_01

(C) SAP006 (Machine time)
   *SAP_02 * SAP_09 / SAP_08 / SAP_11*

SAP007 (Labor time)
   SAP_03 * SAP_09 / SAP_08 / SAP_11

Data flow

MASTER
DATA:

Cost Center
(t/c KS01)

Cost center *4230 (B)*

Production Dept.
Company code 3000

Activity type
(t/c KL01)

1421 - Assembly Setup cost / hr
(B) 1422 - Assembly Machine cost / hr
1420 - Assembly Labor cost / hr

Work Center
(t/c CR01)
Work Center: *Assembly*

Basic data screen:

   Std value key: *SAP1*   *(A)*

     Setup hours
(A) Machine hours
     Labor hours

Assignment screen:

   Cost center: *4230*   *(B)*

Std value	**Act type**	**Formula key**
Setup hours	1421	SAP005
(A) Machine hrs	*1422 (B)*	*SAP006 (C)*
Labor hours	1420	SAP007

Activity type prices
(t/c KP26)

Periods 1 - 12 FY 1998

Cost Ctr	Act type	Vbl cost	Fixed cost
4230	1421	---	30
(B) *4230*	*1422*	*15*	*35*
4230	1420	25	10

Task List (Routing)
(t/c CA01)

Operation: 10   Work center: *Assembly (B)*   Base qty: 1 (no splits)

	Std values	**Un**	**Act Type**
Setup	30	Min	1421
(A) Machine	*60*	*Min*	*1422 (B)*
Labor	60	Min	1420

Example of data flow shown in italics:

60 min of activity type 1422 in this task list = $50

Key relationships:

   A = Std value for machine time
   B = Activity type and price in cost ctr
   C = Formula to calculate op cost

Planned Overhead—Setting Standards

Similar to the costing sheet method described earlier, overhead will be included when a cost rollup is performed on the product. The overhead cost will be determined from the individual task list standard values instead of (or in addition to) a costing sheet. Once the estimate is marked and released (material master updated), inventory and material transactions will include this value in the total cost. Again, the cost component layout must include the cost elements underlying the individual activity types used in the operations on the task list. Because the overhead costs in this approach are activities, these costs will be assigned an item category of E, not G, on the itemization and costed BOM displays.

Actual Overhead—Shop Floor Activity

Unlike the costing sheet approach, there is no month-end process required to apply actual overhead costs. Since overhead is an integral portion of the operations on the task list, as production is confirmed on the shop floor, activity costs (including overhead) are immediately posted to the production object. For a production order, confirmation occurs using transaction *CO11*, where quantities produced at the operation and the associated activities, such as labor hours, are recorded. The confirmation screens are designed to proportion the amount of activity required based on the quantity confirmed and the task list standard value per unit. Whether the amounts can be overridden is function of configuration and manufacturing method (repetitive manufacturing only posts standard activities at Release 3.x). Since overhead is simply another standard value, it will also be posted. When materials and activity are backflushed, the overhead costs will be posted automatically in the background. Assuming shop floor confirmations are done on a timely basis, actual overhead costs would be absorbed on a real-time basis, and no further processing would be required. If a confirmation is reversed, the associated material and activity postings (including overhead) will also be reversed.

Like the costing sheet approach, any variation in activities posted through confirmations, as measured against the task list used to set the standard, may result in differences in the actual overhead absorbed. This step will be identified during the settlement process and either charged to the variance account for those materials using standard price control, or the moving average will be adjusted for materials using moving average price control. A detailed analysis of the variances is available through the variance calculation program (collective mode transaction *KKS1*, or individual object transaction *KKS2*).

Appendix F: Process Industry in Release 4.5

Contents

PP-PI Functionality Available in Release 3.x

The manufacturing scenario for the process industry (PP-PI) in Release 3.x is essentially handled the same way as the discrete manufacturing scenario, so it was not separately documented. The primary differences between the two include:

- In PP-PI, the cost of the coproduct is subtracted from the cost of the primary product when developing a standard cost for the primary product.

  A negative quantity of the coproduct is entered in the bill of material (BOM) of the primary product to facilitate this calculation. A standard cost estimate for all non-primary coproducts with a quantity structure is not possible; a cost roll-up on these products uses the same logic as for material components without quantity structures.

- In PP-PI in the material master of the primary coproduct, an apportionment structure specifies equivalence numbers, or ratios that determine how actual costs are split between all coproducts.

  According to these ratios, the actual costs captured on the process order header are divided between the coproducts, represented by process order items. The settlement process then compares the credits (goods receipt) to the debits (apportionment of the actual costs) for each order item to make a posting to the manufacturing variance account for each coproduct. The apportionment ratios at the material master level cannot be changed for individual orders, so the manufacturing yield of the coproducts may not be accurately reflected. Although a financial entry is made to the variance account, the Controlling (CO) calculations for work in process (WIP) and variances on coproducts is not possible.

PP-PI Functionality Available in Release 4.5x

In Release 4.5x, additional functionality is available for the process industry, which differentiates this scenario from a costing perspective. The new features that will be available include:

- Calculation of the planned costs for coproducts.

  In previous releases, a standard cost estimate could only be created for the primary coproduct.

- Costing of production campaigns, or a logical group of process orders.

  The campaign itself is a cost object and allows normal costing functions, including calculation of planned costs, posting of actual costs, and calculation of WIP and variances. Additionally, fixed costs can be allocated to their origins, such as specific materials within the campaign. Costs for all process and campaign service orders can be consolidated in reporting. To use costing for production campaigns, activity-based costing (CO-ABC) must be active.

- Joint production

  This function incorporates additional period-end functions into process orders. At the month-end close, process order costs that are captured at the header level are distributed to the process order items, each of which represents a coproduct. This step allows both WIP and variance calculations to be carried out for process orders with coproducts.

- Costing of recursive structures

  When the cost estimate or costing run finds recursive structures, or BOMs in which a product's BOM contains itself, the products are valued using previously created cost estimates, not the recursive indicator set in the BOM. The costing of materials in the same cycle is iterative, until no changes in the cost estimates take place.

Appendix G: Special Profitability Analysis Topics

Contents

Alternate Operating Concern Design for Cost-Based CO-PA

The value fields that were used in the scenarios in which a standard cost was developed and detailed variance analysis was available, provide a detailed view of a product's cost components and allow for a comprehensive analysis of different types of margins. These manufacturing scenarios include the discrete, repetitive, and make-to-order (MTO) using valuated stock scenarios. For the variances in these production scenarios, the save level of detail used in the standard cost estimate (sales order cost estimate in MTO) is available for the manufacturing variances. It may be desirable to move less detail for cost of goods sold (COGS) and manufacturing variances (price differences) into profitability analysis (CO-PA).

In two of the custom order scenarios, such as MTO and engineer-to-order (ETO) manufacturing, actual costs were used to account for the cost of sales. Although the same level of detail is available for the COGS, based on cost elements instead of the cost component layout, it may again be desirable to bring less detail into CO-PA.

In all custom order scenarios, such as MTO without valuated stock, ETO, and assemble-to-order (ATO), if a planned or standard cost is used for the cost of sales, the variances are not available at the same level of detail as the planned cost. Variances cannot be broken down according to the variance categories, or origins, but are captured as one summarized value. Again fewer value fields may be desirable in this case.

A typical example of this design is demonstrated here, where both the cost of goods sold and the production variances, if available, are captured using only a breakdown of the fixed and variable costs. In this way, the level of detail brought into CO-PA for cost of goods sold and variances is consistent.

Less detail is available in CO-PA, which has the following effects:

- Less detail is available for various types of margin reporting in CO-PA.

  CO-PA is thereby performed at a higher, more strategic, level.

- The low-level analysis of cost components and variances must be performed in product costing, not in CO-PA.

  However, revenue is not available in product costing reports for discrete, repetitive, and MTO using valuated stock manufacturing, so detailed analysis relating a portion of product cost to revenue is not available.

- Cost center assessments cannot be performed based on only a selected portion of the product cost. Only the portions of the costs captured in this example the fixed and variable portions of the cost, not the origins of the costs, are available as separate bases for allocation.

• Management of value fields in CO-PA is simplified.

CO-PA Fields

Characteristics	Invoiced quantity	Revenue - Domestic	Revenue - Internat'l	Revenue - Government	Discounts - Domestic	Discounts - Internat'l	Discounts - Government	Freight - Domestic	Freight - Internat'l	Freight - Government	COGS - Fixed costs	COGS - Variable costs	Variances - Fixed portion	Variances - Variable portion	Variances - OH CCtr (fixed)	Variances - OH CCtr (variable)	Variances - Prod/Engin CCtr (fixed)	Variances - Prod/Engin CCtr (variable)
Value Fields	Revenue										COGS		Variances		CCtr Assessments			
Fixed																		
Document number	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Item number															X	X	X	X
Record type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plan/actual indicator	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Version																		
Controlling area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Company code	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Business area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sales organization	X	X	X	X	X	X	X	X	X	X	X	X						
Distribution channel	X	X	X	X	X	X	X	X	X	X	X	X						
Division	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Plant	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Product	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Customer	X	X	X	X	X	X	X	X	X	X	X	X						
Reference document no.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Reference item	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Sales order	X	X	X	X	X	X	X	X	X	X	X	X						
Sales order item	X	X	X	X	X	X	X	X	X	X	X	X						
Billing type	X	X	X	X	X	X	X	X	X	X	X	X						
Goods issue date	X	X	X	X	X	X	X	X	X	X	X	X						
Invoice date	X	X	X	X	X	X	X	X	X	X	X	X						
Posting date	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fiscal year	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Period	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profitability segment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Subnumber	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Profit center	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WBS element	X	X	X	X	X	X	X	X	X	X	X	X						
Order													X	X				
Cost object																		
Sender cost center															X	X	X	X
Tracing factor															X	X	X	X
Cost element															X	X	X	X
User-Defined																		
Product hierarchy - Lvl 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product hierarchy - Lvl 2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Product hierarchy - Lvl 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Customer group	X	X	X	X	X	X	X	X	X	X	X	X						
Sales district	X	X	X	X	X	X	X	X	X	X	X	X						
Sales office	X	X	X	X	X	X	X	X	X	X	X	X						

The chart above is explained in further detail below.

• Hidden rows for control data are usually not used for analysis.

- The fields in bold indicate that the field is visible in the CO-PA document display; fields that are not in bold are available in the operating concern table and for reporting.

Due to differences in the cost objects that are used for these manufacturing scenarios, there are differences in the fields that are populated in CO-PA.

These differences include:

- In the ETO environment, sales order and invoice information is not populated.

- In all scenarios other than ETO, the project (WBS element) data is not populated.

- Variances can only be classified as fixed and variable portions in the non-customer order scenarios, such as in discrete and repetitive manufacturing, as well as MTO using valuated stock.

  In the ATO, MTO without valuated stock, and ETO manufacturing scenarios, all variances are categorized as variable costs.

Account-Based Profitability Analysis

CO-PA may be set up using a cost-based approach, an account-based approach, or both. In the example for these product costing scenarios, a cost-based approach was used for cost of sales analysis, where costs are matched with revenues in the period when the revenues are generated, regardless of the period in which the costs were incurred. G/L accounts are not analyzed in this approach.

The primary differences between cost-based and account-based CO-PA include:

- Cost-based CO-PA uses value fields to capture information, and account-based CO-PA uses cost elements.

  For management reporting, the cost-based approach provides benefits since value fields are not tied to accounts. For example, this approach provides the ability to break down account-level information into further detail, such as fixed and variable costs for the same cost element, and separating the components of the standard cost into different value fields.

  For reconciliation to FI, the cost elements used in account-based CO-PA allow a more straightforward comparison to the G/L.

- In practice, cost-based CO-PA is used primarily for cost of sales accounting, while account-based CO-PA is used for period accounting.

- Cost-based CO-PA and account-based CO-PA information cannot be combined in a single report.

- Cost center assessments can only be captured in one of the two types of CO-PA.

  The assessment is made from the sending cost center(s) to the receiving profitability segment(s) for either cost-based or account-based CO-PA, but not to both. Once the cost center balances have been assessed to CO-PA, the cost center balances are zero; these balances cannot be assessed a second time to a different type of CO-PA.

Typically, fewer characteristics are captured for account-based CO-PA, for the following reasons:

- There are performance issues when low-level characteristics are captured in account-based CO-PA.

- Since all journal entries in the G/L do not capture the low-level characteristics that are available in CO-PA, no reconciliation at that level, such as product number and customer number, can take place.

Instead, the CO-PA characteristics required for reconciliation usually only include company code, business area, and cost element. For reporting purposes, additional characteristics such as high-level product groups may also be captured.

Differences in Postings for Cost-Based and Account-Based CO-PA

The primary differences between the T-account postings described for cost-based CO-PA, and postings that would occur in account-based CO-PA, for the discrete, repetitive, and MTO with valuated stock manufacturing scenarios, include:

- In cost-based CO-PA, the cost of sales is captured at the time of the invoice, while the financial entry is made at the time of delivery.

  In account-based CO-PA, the entry for the cost of sales in CO-PA is made at the same time as the financial posting. However, in account-based CO-PA, the cost of sales is no longer exactly matched with the revenue that is posted at the time of invoicing.

  In account-based CO-PA, the detail of the cost components that makes up the cost of sales is not available.

- Invoicing a customer does not capture the cost of sales in account-based CO-PA, because this posting was already made at the time of the financial entry.

  During billing, only revenue is posted to CO-PA.

- In cost-based CO-PA, the cost component detail is available for variances for production order settlement and the production cost collector hierarchy.

  In account-based CO-PA, the detail of the variances from the production order settlement and the production cost collector hierarchy is not available. The variance is captured on one cost element, which is the cost element to which the variances are settled.

In account-based CO-PA for the custom order environments, such as ATO, MTO without valuated stock, and ETO, there is no difference in the timing of the postings between cost-based and account-based CO-PA. Based on the results analysis configuration, all revenues and costs are posted to CO-PA at the time that either the sales order (MTO and ATO) or project (ETO) is settled. The difference in these manufacturing scenarios is the detail available in CO-PA reporting.

If both cost-based and account-based CO-PA are active, when the settlement to CO-PA takes place, a posting is made to both types of CO-PA. The account-based CO-PA posting is recorded in a standard controlling document, and the cost-based CO-PA posting is recorded in a CO-PA document.

Appendix H: Special Topics in Setup

Contents

Setup Costs in Discrete Manufacturing

When a standard cost is developed for a finished product, the cost is based on a costing lot size. The setup costs are evenly spread over the entire lot size. In the following example, the setup costs are $20, and a standard cost of $500 is developed with a lot size of 1.

However, when a production order is created for a number of finished products greater than one, the setup cost of $20 will be spread over the entire lot size. If a production order is created for two finished goods, all costs (with the exception of the setup costs and overhead related to setup) are doubled. As shown below, the setup costs remain the same in the production order for one and for two units. Also, since setup is assumed to be labor time, the overhead based on labor is not doubled; only the portion of the overhead based on the labor used during normal, post-setup production is doubled.

Due to the method of calculating setup, note that the planned cost in the production order for two units (below) is not twice the standard cost. However, the finished goods are still received into inventory at standard of $500 each. Since setup costs are evenly spread over the number of units produced. This step means that a variance, based on lot size differences, will occur if a production order is created for a number of units that is different than the number of units used to develop the standard cost estimate.

Setup Costs

		Planned Costs One Unit	Planned Costs Two Units
Raw Material		120	240
Setup Time		20	20
Labor Time		60	120
Machine Time		100	200
OH Material	25%	30	60
OH Labor	25%	20	35
OH Machine	75%	75	150
OH Admin	25%	75	145
Total		500	970

Setup Costs in Repetitive Manufacturing

In the repetitive manufacturing scenario, setup costs for the production line are not included in either the standard cost estimate or the actual cost collection. Since the volume of product is assumed to be high, a per-unit estimate of the setup costs would be close to zero and would have little or no influence on the standard cost. Essentially, the setup costs remain direct costs that are posted to the production cost center, for example as a salary expense since the setup costs are assumed to be labor costs. Since setup costs are not directly handled on the production cost collector in the repetitive manufacturing scenario, these costs remain in the production cost center and may be analyzed as part of the cost center variances.

There are several other ways to handle setup costs. The most important consideration is that the level of detail captured in the standard cost estimate is at the same level as the actual costs that are captured on the production cost collector. If there is a difference in the amount of information being captured in the standard and actual costs, variances will result. For example, if setup costs are included when developing the standard cost estimate, but are never posted to a cost collector, a variance posting will occur. Alternatively, a variance will also occur if setup costs are left out of the standard cost estimate and are then directly posted to a cost collector.

Setup Included in Standard Cost

Setup can be included in the standard cost, either because the costs are unusually high or because frequent changeovers are expected on the production line. There are two ways to include setup in the standard cost in the repetitive manufacturing environment:

- Include the setup costs in the overhead allocation to the product

  Setup time is usually included in the costs that are directly posted to the production cost center. For example, if setup primarily involves labor time, production employee salaries have already been posted to the cost center. The setup time can then be included in the overhead calculation for the production cost collectors, either as a separate overhead cost element or consolidated with the other overhead costs. Including setup in the overhead calculation usually increases the overhead percentage that is allocated to each production cost collector.

- Develop a per-unit estimate of the setup cost as an activity

  If the setup costs are managed as a resource provided by the cost center, an activity may be used to represent the setup time. In developing a standard cost, setup time is estimated for a particular lot size. For actual postings, setup is spread over the entire quantity of finished products that are confirmed in one backflush operation for the production cost collector. In Release 3.x, setup will be posted each time backflushing occurs, regardless of whether setup actually occurred. In Release 4.x, the setup can be adjusted to reflect actual resource (activity) usage. If there are lot size fluctuations in the regular confirmations, compared to the lot size assumed by the standard cost, the standard setup time still does not change and a variance will be incurred on the production cost collector.

Setup Not Included in Standard Cost

If setup costs are reasonably low, they can be left out of the product's standard cost. In this case, setup costs will not be automatically posted to the production cost collectors. Instead, one of the following approaches may be used to handle setup:

- Allow the setup costs to remain in the production cost center

This option was used for the repetitive manufacturing scenario. Setup time is usually included in the costs that are directly posted to the production cost center. For example, if setup primarily involves labor time, production employee salaries have already been posted to the cost center. If the setup costs are not allocated to the cost collectors, a labor variance results in the production cost center. This variance is then settled to CO-PA as a cost center variance.

- Manually allocate the setup costs to the production cost collectors

  If the setup costs are managed as a resource provided by the cost center, an activity may be used to represent the setup time. In this case, setup is not included in the standard product cost as an activity in a routing, so it is not automatically posted to the production cost collector when finished products are confirmed. Instead, it is possible to manually post an activity allocation to the cost collector. This step is possible because the cost collector is a CO production order that allows this type of posting.

  The drawback to this approach is that if these costs are not part of the standard cost of the finished product, a manual posting of the setup costs to the cost collector creates a variance. Alternatively, the standard cost may be developed using a manual entry to the standard cost component layout. In this case, the setup costs would not automatically be backflushed but are still included in the standard cost, and the manual activity allocation would be required for the actual setup costs to be reflected on the production cost collector.

Setup Using the Cost Object Hierarchy as a Cost Collector

For the repetitive manufacturing scenario, the cost object hierarchy was used to report and centrally control the month-end processing for the production cost collectors that were linked to the hierarchy. The cost objects that make up the cost object hierarchy were not used to directly capture costs in this scenario.

If the cost object hierarchy were used to directly capture costs, two additional options are possible to allocate setup costs to the production cost collectors:

- Post setup costs to the cost object hierarchy

  Setup costs may be posted to the cost object hierarchy. Since these costs usually reside in the cost center, this process is usually accomplished using a cost center assessment to the cost objects or using manual activity allocations. It is possible to directly post financial entries to a cost object, but such a process is rare. Once the setup costs are allocated to the cost objects in the hierarchy, these costs can be analyzed as part of the complete production picture.

  This analysis occurs without the setup costs being:
  - Directly posted to the production cost collectors
  - Settled to the manufacturing variance account for the finished product

  The costs in the cost object hierarchy are settled to a different variance account in the G/L, and to a higher level in CO-PA, usually at a product line level that mirrors each cost object. This settlement separates the setup costs from other manufacturing costs on the cost collector, yet allows analysis of the manufacturing process (including setup) on the cost object hierarchy.

- Post setup costs to the cost object hierarchy and distribute these costs to the production cost collectors

  Setup costs, after they have been posted to the cost object hierarchy (see above), may be distributed from the cost object hierarchy to the production cost collectors. The distribution is based on the target costs in each production cost collector. The target cost is calculated by multiplying the standard cost by the actual quantity backflushed. If the target costs in one cost collector are higher than in another, it will

receive a higher proportion of the distribution. If the standard cost did not include setup costs, this step will again result in a variance on the production cost collectors, unless setup is manually included in the standard cost estimate.

Setup in Customer Order Scenarios

Setup is not addressed separately in the manufacturing scenarios in which finished products are custom ordered. In the assemble-to-order (ATO) and make-to-order (MTO) with valuated stock scenarios, setup is handled in the same way as in the discrete manufacturing process. Since a standard cost exists for the finished product in ATO, and the sales order item cost estimate is used as the standard in the MTO with valuated stock environment, the production process involves normal setup time.

In the MTO without valuated stock and engineer-to-order (ETO) scenarios, actual costs are used in valuing the finished products, so a discussion of variance postings based on setup costs that are spread over different lot sizes is not relevant. In these MTO and ETO environments, the product is considered to be unique, so a standard cost is not developed. Instead, setup costs can be planned specifically for this unique product according to the same quantity that is ordered, and the difference between the planned and actual setup costs is not based on a lot-size difference but on actual variances in the manufacturing process.

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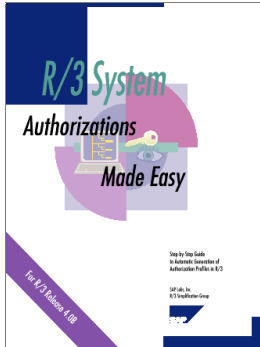
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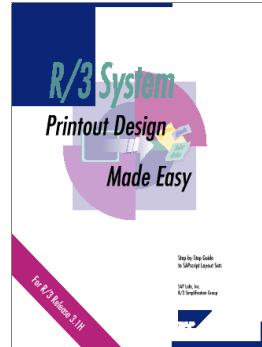
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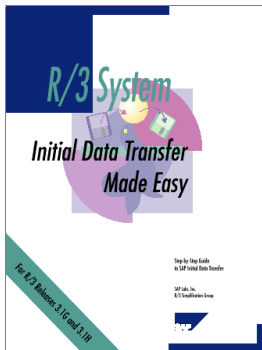
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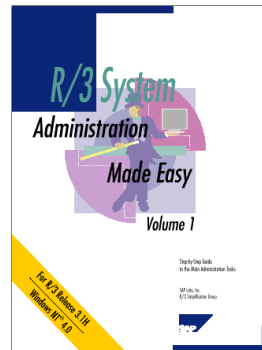
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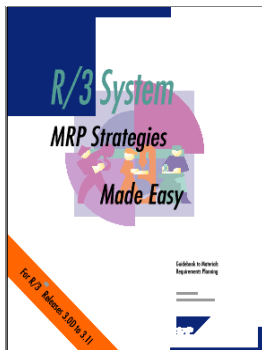
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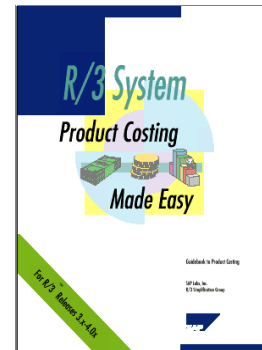
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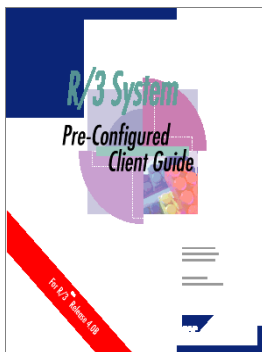
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