



Production Planning

Lesson 8: Production Planning
Overview – Process Industries

Lesson Objectives



Objectives -On successful completion of this training module, you should have:

Understood the basics of Production Planning for Process Industries

Definition and Function of Process Order

Process Management

Training Agenda



Production Planning Overview - Process Industries

Introduction- Production Planning for Process Industries

Terminology – Process Industry

Process Flow- Production Planning for Process Industries

Definition and Function of Process Order

Process Order Activities/structure/cycle

Ways of Creating a Process Order

Training Agenda



Configuration of process industries

Master Data

Material type and Industry sector

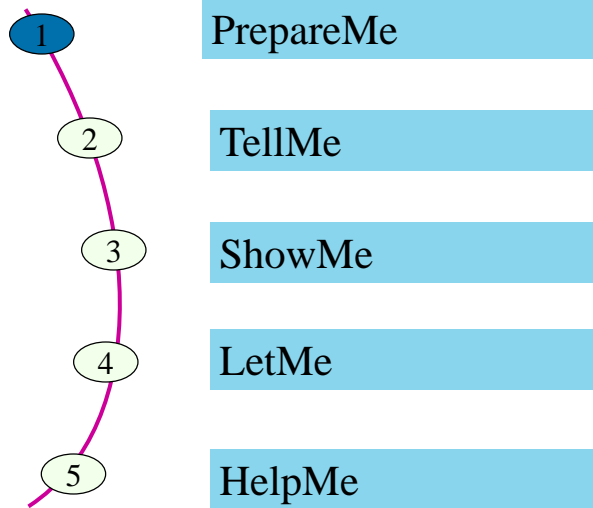
Master Data-Bill Of material

Master data – Master Recipe

Process Management

Integration with other modules

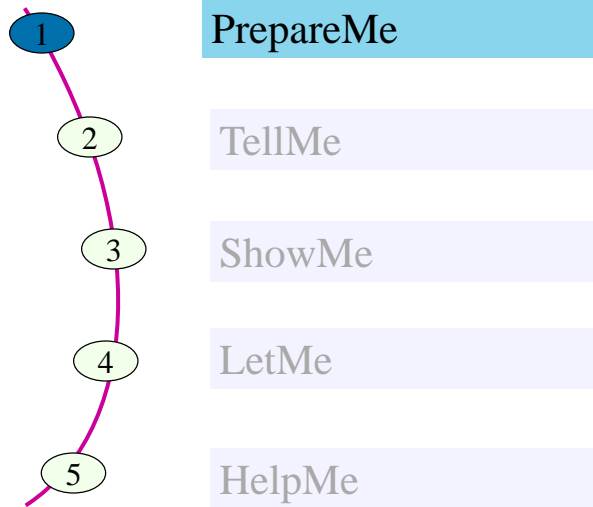
Production Planning Overview - Process Industrie



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Production Planning Overview - Process Industrie



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Introduction



Production planning is combination of planning and manufacturing activity management for products, in manufacturing organization, to meet sales requirements.

The manufacturing industries are classified as follows, by considering the production volume.

Discrete manufacturing – where production lot size is small and will account the

production based on lot size. Ex Customized product manufacturing unit (Pumps).

Repetitive manufacturing – Where production is measured by rate like qty per day

and volume of production is higher than above type and production period also

larger than above type. Ex Automotive Industries.

Process industries – Where production is taken place in dedicated process line for continuous production over entire period. Ex Chemical Industries.

Introduction- Production Planning for Process Industries



With the component SAP R/3 PP-PI (Production Planning for Process Industries), SAP provides an integrated planning tool for batch-oriented process manufacturing.

It is primarily designed for the chemical, pharmaceutical, food and beverage industries as well as the batch-oriented electronics industry.

PP-PI supports:

The integrated planning of production, waste disposal, and transport activities within a plant.

The integration of plants within the company:

- Vertically by means of an information flow, ranging from central business applications down to process control
- Horizontally by the coordination of planning between production plants, recycling and waste disposal facilities, and production laboratories.

Purpose



Plan for production of right quantity of right material at right time to satisfy the sales requirement with in the customer requested date.

To meet purchasing requirements (Ex Lot size, lead time).

To optimize the capacity utilization.

Terminology – Process Industry



➤ Terminology explained here is applicable to process industry and certain elements are generic in nature which are applicable for all kind of production environments.

Material master – Contains all information about materials like drawing, planning data, costing data etc..

Resources - In this area, you manage the capacities, the production resources, and the personnel you need for production.

Bill Of Materials – List of components required to produce finished products.

Alternate BOM - Another version of BOM used to produce the same finished product.

Master Recipe – Where you describe the processes to be used for producing materials in your plant as well as the resources and ingredients required for production.

Production Resource tools – All auxiliary tools used to carry out production like Jigs % Fixtures, Inspection tools etc.

Terminology - Process Industry



Planned Order – Planning work sheet which contains BOM and scheduled date and quantity, to be converted into Production Order.

Process Order – In a process order, you copy the process described in a master recipe and adjust it to the actual production run.

Control Recipe- Using control recipes, we transfer control data from the process order to process control. The information contained in a control recipe and the destination to which it is sent are user-defined

Order release – Releasing the Order to shop floor to start production.

Confirmation – Declaring the completion of Production activities.

Terminology - Process Industry



Goods Receipt – Moving goods into Quality stock/Unrestricted stock.

Goods Issue – Issue of components to Process Order.

Reservation - Document which contains quantity of materials, reserved for particular process Order or Individual requirement. This is created once Process Order is created.

Back flush – Automatic issues of components to Process order when Order is confirmed.

Settlement – Passing the process cost to next receiving object like sales Order.

Terminology - Process Industry



MRP Run :

MRP run is complete estimation of items in terms of quantity, by considering stock and requirements w. r. t. demand. Also it generates the Purchase requisitions or planned orders w. r. t. procurement type.

Procurement :

All procurement proposals are subject to lot size and date of requirements.

Capacity Planning:

Capacity leveling provision is available to get exact available date by considering all existing process orders

Terminology - Process Industry



Production Versions

A production version determines which alternative BOM is used together with which task list/master recipe to produce a material or create a master production schedule.

For one material, you can have several production versions for various validity periods and lot-size ranges.

Scheduling

Scheduling is useful for planning person to estimate the start date and end date for production.

Terminology – Process Industry



Process Message:

Communication structure that is used to transfer actual process data from process control to one or several destinations of the following types:

User-defined ABAP tables

Users of the SAP office mail system:

Other R/3 components

External function modules

Process Instruction

In the process instructions we can define processing steps, which:

- A process operator to execute manually at a production line

- A process control system to execute automatically

We define the process instructions in the master recipe and in the process order.

Terminology – Process Management



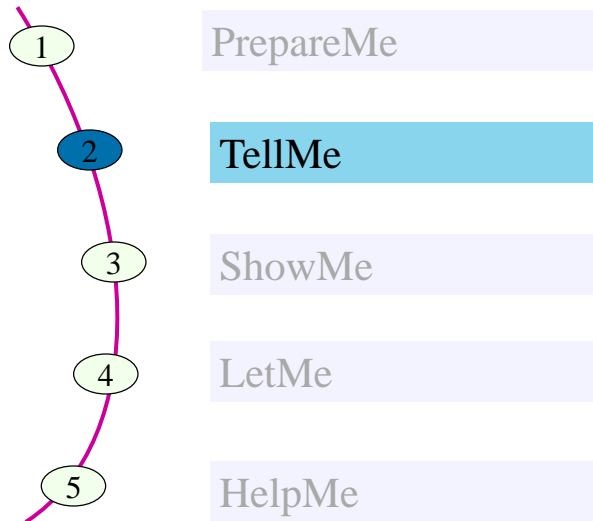
Control Recipes

Using control recipes, we transfer control data from the process order to process control. The information contained in a control recipe and the destination to which it is sent are user-defined

Process Instruction Sheet

We can use PI sheets to exchange data between the partially or completely manually operated production level and the R/3 System (PP-PI). In manually operated production lines, this usually involves a process operator who uses the PI sheet to transfer production-relevant actual data to the R/3 system and receives data from the R/3 System

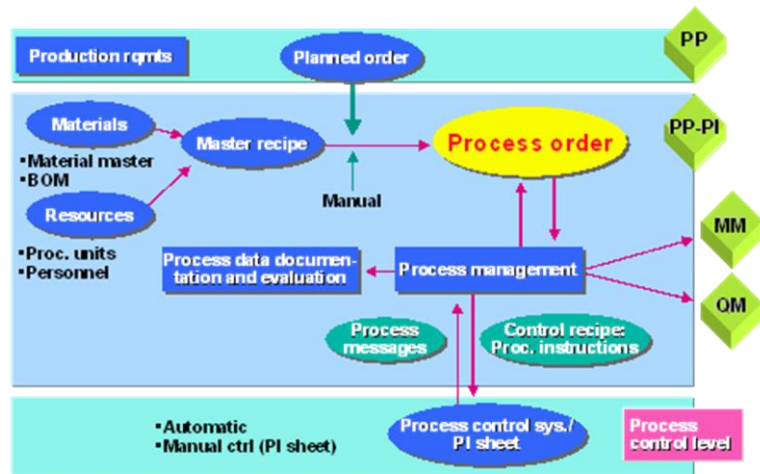
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Process Flow



Definition and Function of Process Order



Definition

A process order describes the actual production of one or more materials or batches in a productionrun. A process order is usually created using a master recipe. It contains all the information specified during production

Function

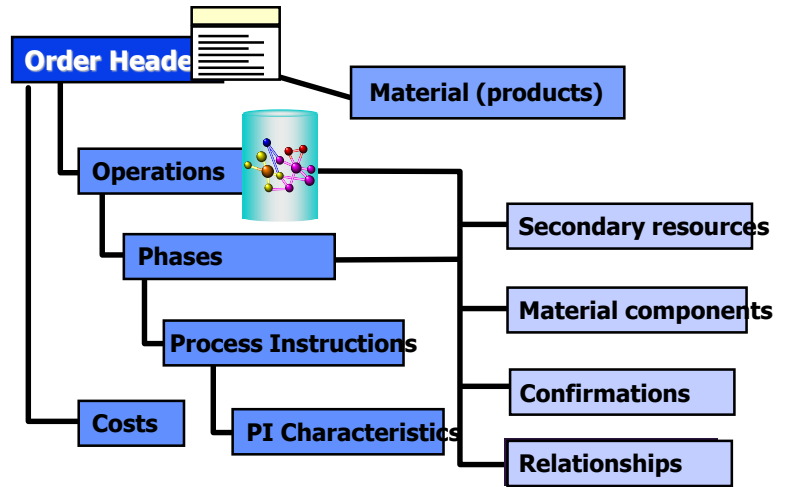
The process order is the main control instrument in production, describing and monitoring all production - relevant planned and actual data.

Process Order Activities

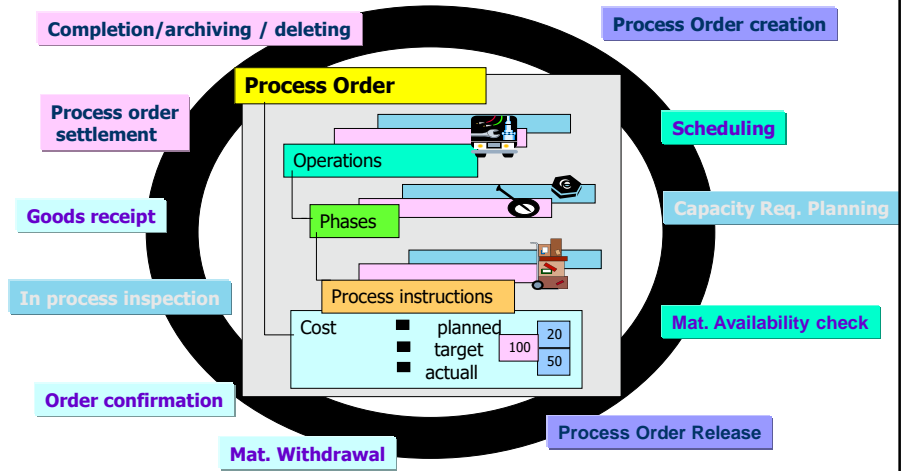


What is Produced?	<input type="checkbox"/>	- Products
	<input type="checkbox"/>	- Activities
For what Dates?	<input type="checkbox"/>	- Basic Order Dates
	<input type="checkbox"/>	- Scheduled Dates
	<input type="checkbox"/>	- Confirmed Dates
	<input type="checkbox"/>	- Release dates
Which Quantities do you want to produce?	<input type="checkbox"/>	- Process Order Quantity
	<input type="checkbox"/>	- Confirmed Quantity
For Whom do you produce(Cost Object)?	<input type="checkbox"/>	- Material (Stock)
	<input type="checkbox"/>	- Cost Center
	<input type="checkbox"/>	- Sales Order
Which Resources and Methods do you use?	<input type="checkbox"/>	- Ingredients
	<input type="checkbox"/>	- Resources and capacities
	<input type="checkbox"/>	- Inspections data
What Costs are Involved in Production?	<input type="checkbox"/>	- Planned Costs
	<input type="checkbox"/>	- Actual Costs

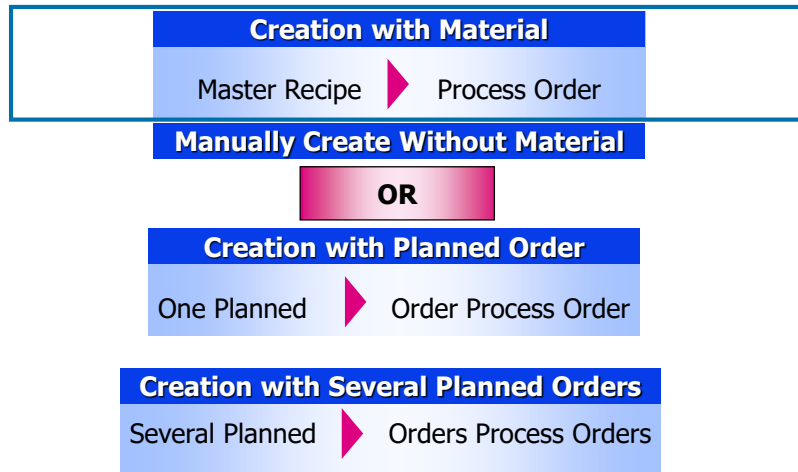
Process Order Structure



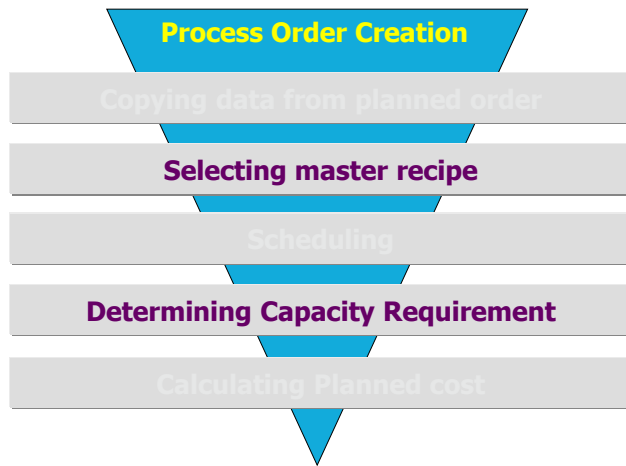
Process Order Cycle



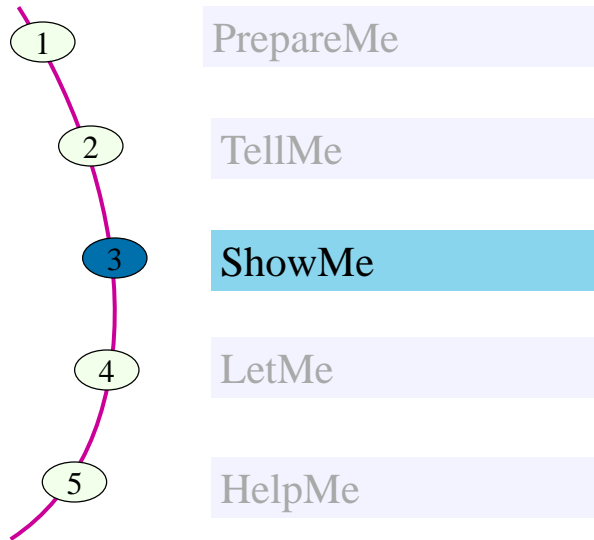
Ways of Creating a Process Order



Activities involved in Process Order Creation



Production Planning Overview –Process Industries



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In this followings are explained in details

Environment

Prerequisites

Master Data



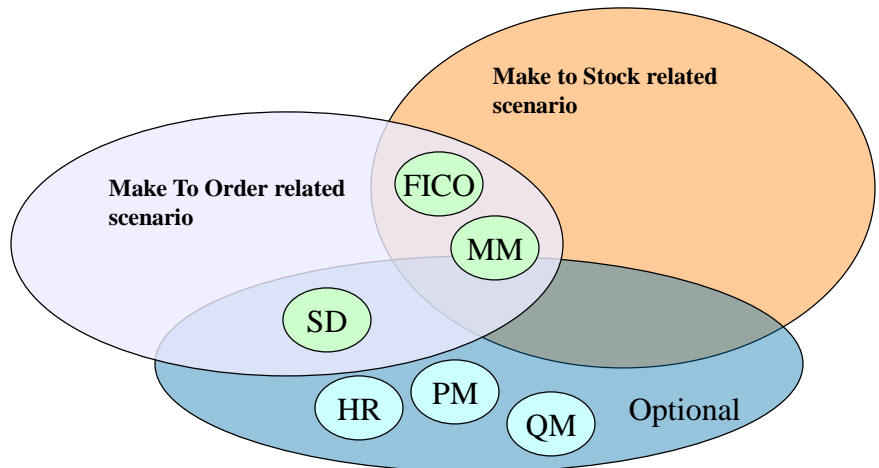
The environment in which PP PI works
is

SAP R/3

Prerequisites



The following modules should be implemented before implementing PP-PI



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Configuration



Configuration is, setting up of the options to suit the application without modifying the software

The following are the some important Configurations.

Basic data

- All Master data.

Production Planning.

- Demand management.

Capacity planning.

- Capacity related data for master data.
- Operations.
- Evaluations.

Materials requirement Planning.

- Plant Parameters
- Control key.

Configuration



Process Order

- Order type
- Order type dependent parameters
- Availability Check
- Scheduling Parameters
- Confirmation Parameters

Master Data



The following are the Master data used in PP-PI (Details given in next slides)

Material master

- MRP data
- Work Scheduling data

Bill Of materials

Resources

- Basic data
- Default Values
- Capacity
- Scheduling

Master Recipe

Production Resource Tools

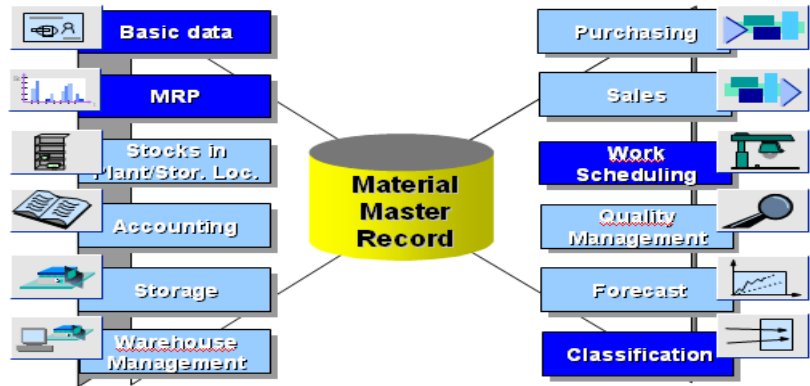
Master data – Material Master



Material

Substance or commodity that is bought or sold on a commercial basis, or is used, consumed, or created in production; a material can also be a service

Master data – Material Master



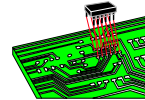
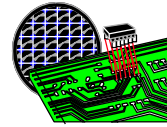
Highlighted are the master data used in PP-PI

Material Type and Industry Sector



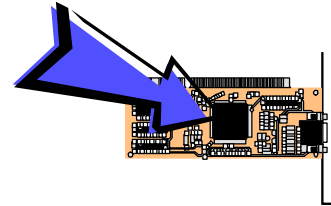
Material Type:

- Finished (FINH)
- Semi-Finished (SEMI)
- Raw Material (RAW)



Industry Sector:

- Cement Industry (I)



Master Data- Material: Basic data



Material: FINISH1 finished good

Basic data 1 Basic data 2 AFS Basic Data Classification Sales...

General data

Base Unit of Measure EA each Material Group 04

Old material number Ext. Mat. Group

Division Lab/Office

Product allocation Prod.hierarchy

X-plant mat. status Valid from

Assign effect vals GentlemCatGroup NORM Standard Item

Material authorization group

Authorization Group

Dimensions/EANs

Gross Weight Weight unit KG

Net Weight

Volume Volume unit

Size/dimensions

EAN/UPC EAN Category

Packaging material data

Mat. Orp Pack.Mats

Ref. mat. for pkg

Other Data

Prod./Insp. memo Ind. Std Desc.

Page format CAD Indicator

Basic material

Environment

D/G indicator profile Environmentally rvt

Highly viscous In bulk/liquid

Design documents assigned

No link

Design Drawing

Document Document type Doc.vers.

Page number Doc.ch.no. Page format No. sheets

Client-specific configuration

Cross-plant CM Material is configurable

Variant Configure variant

Additional

Fabric

Master Data- Material: MRP data



Purchase order tab: MRP 1 MRP 2 MRP 3 MRP 4 AF

Material: FINISH1 finished good

Plant: BP01 BP01 Plant

General Data

Base Unit of Measure: EA each MRP group:

Purchasing Group: ABC Indicator:

Plant-sp.matl status: Valid from:

MRP procedure

MRP Type: PD MRP

Reorder Point: Planning time fence:

Planning cycle: MRP Controller: 001

Lot size data

Lot size: EX Lot-for-lot order quantity

Minimum Lot Size: 1 Maximum Lot Size: 1.000

Fixed lot size: Maximum stock level:

Ordering costs: Storage costs ind:

Assembly scrap (%): Takt time:

Rounding Profile: Rounding value:

Unit of Measure Grp:

MRP areas

☐ MRP area exists

Procurement

Procurement type: E Batch entry:

Special procurement: Prod. stor. location:

Quota arr. usage: Default supply area:

Backflush: Storage loc. for EP:

JIT delivery sched.: Stock det. grp:

☐ Co-product

☐ Bulk Material

Scheduling

In-house production: 12 days Planned Deliv. Time: days

GR Processing Time: days Planning calendar:

SchedMargin key: 000

Net requirements calculation

Safety Stock: Service level (%):

Min safety stock: Coverage profile:

Safety time ind.: Safety time/fact.cov: days

STime period profile:

Master Data- Material: MRP data



MRP MRP 3 MRP 4 MRP 3 MRP 4 Forecasting

Material FINISH1 finished good
Plant BP01 BP01 Plant

Forecast Requirements
Period Indicator M Fiscal Year Variant Splitting Indicator

Planning
Strategy group 40 Planning with final assembly
Consumption mode 2 Bwd consumption per. 20
Fwd consumption per. 20 Mixed MRP
Planning material Planning plant
Plng conv. factor Planning mat BUnit

Availability check
Availability check 02 Tot. repl. lead time days
Cross-project

Plant-specific configuration
Configurable Material
☐ Variant
☐ Planning variant

BOM explosion/dependent requirements
Selection method Component scrap (%)
Individual coll. Requirements group
☒ Version Indicator MRP dep requirements

Discontinued parts
Discontin. ind. Eff-out Follow-up mat

Repetitive manufacturing / assembly / deployment strategy
☐ Repetitive mfg REM profile Action control
Fair share rule Push distribution Deployment horizon

☐ Material memo exists

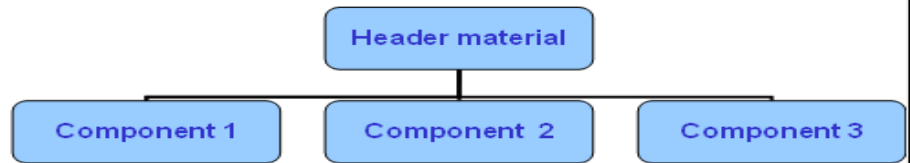
Master data – Bill of materials



BOM

A bill of material is a complete, formally structured list of the components which make up a product or assembly. The list contains the description and object number of each component together with the quantity and unit of measure.

Master data – Bill of materials



Sample view

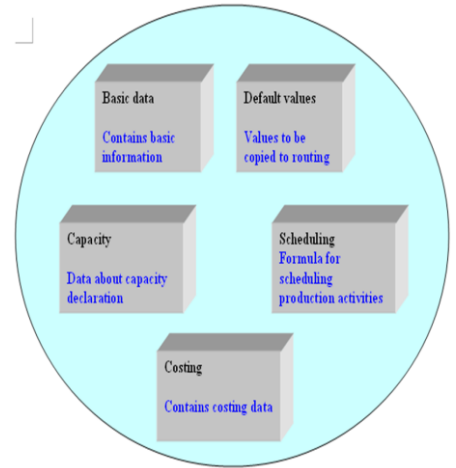
Item	Component	Component description	Quantity	Unit	Exp. Date	Valid From	Valid To	Change No.
000001	BODY	Body of Car	1	EA		24.01.2008	31.12.9999	
000002	BODY_R	Body of Car_Rwd	1	EA		24.01.2008	31.12.9999	
000003	ENGINE	Engine of Car	1	EA		24.01.2008	31.12.9999	
000004	TYRE_S	Tyre of Car	4	EA		24.01.2008	31.12.9999	
000005	TYRE	Tyre	4	EA		24.01.2008	31.12.9999	
000006								
000007								
000008								

Master data – Resource



Resources are means of production and persons in the production process which have capacities assigned to them.
A resource can have several capacities allocated to it.
To calculate costs, execution time and capacity requirement, formulas can be defined for resources

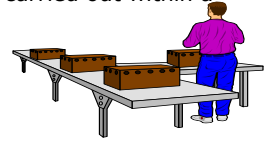
In PP-PI, resources perform the same function as work centers do in PP.



Resource



A resource is where an operation or activity is carried out within a production plant.



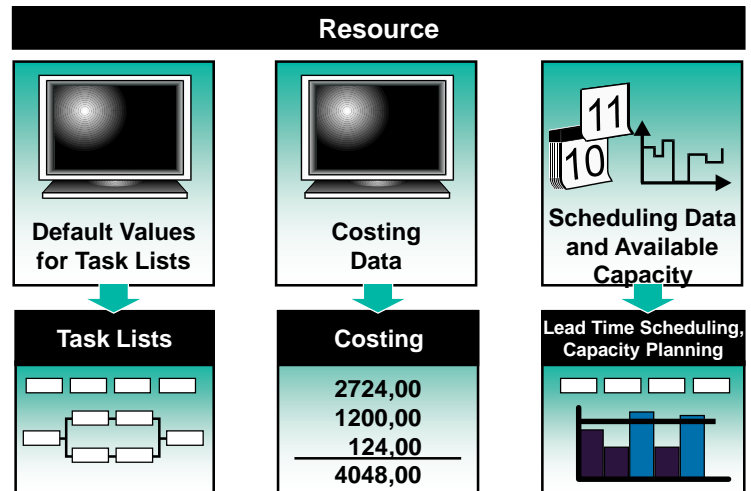
A resource can be a machine or a group of machines



A resource can be a person or a group of people



Primary Function of Resource



Master data – Resource



SAP

Create Resource: Basic Data

Resource: N281KL02 KIN-2

Basic data | Default values | Capacities | Scheduling | Costing

General data

Resource category	6806	Processing unit	
Person responsible	F41	Production Incharge for Clinker & CM	
Location			
GDR system			
Supply area			
Usage	003	Master recipe = process order	
Transition matrix			
Stor. loc. res.			
<input type="checkbox"/> MixMat. allowed			
<input type="checkbox"/> Backflush			

Standard value maintenance

Standard value key	Z827	OT+30*H+DT+DT+48T+NHV
	Rule for maint.	
Oper. time	should be enter...	
Electrical consumpt	should be enter...	
Internal down time	no checking	
ExternalCTT/dieTime	no checking	
No. of stoppages	no checking	
Net HV	no checking	

Descript. | Admin. data | Classification | Subsystems

Master data - Master Recipe



In the master recipe, you describe the processes to be used for producing materials in your plant as well as the resources and ingredients required for production.

Master recipes are mainly used for planning the manufacture of products. However, you can also use them to describe the clean-out or changeover of a production line.

Master recipes are used as a reference for process orders as well as the basis for product costing

Master data - Master Recipe

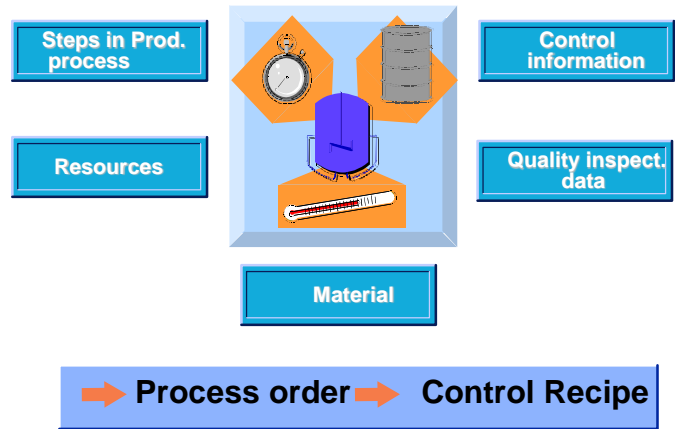


A master recipe consists of a header and several operations, each of which is carried out at a primary resource. An operation is subdivided into phases.

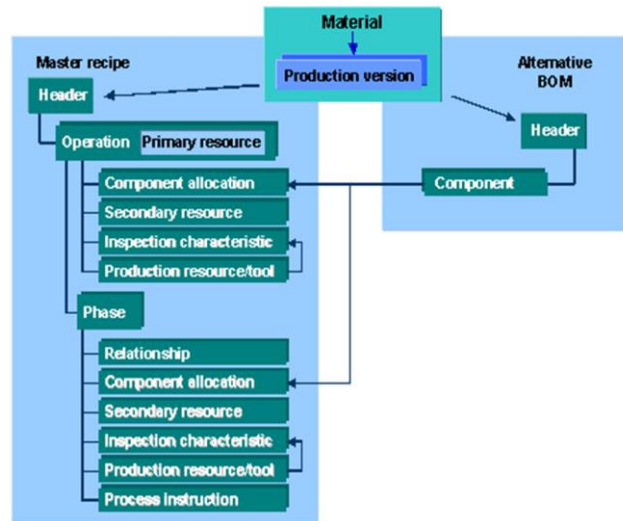
A master recipe contains process control data that can be stored in the following way:

- in the form of characteristic-based process instructions, which you define in the operation overview for the phases.
- in the form of X Steps, that you maintain in the XStep editor (XSteps).

Master Recipe



Master data — Master Recipe structure



Master Recipe



Definition

A recipe describes the processing steps required to produce a material or provide a service in the process industries

Examples

The following is a typical recipe.

Work Step

0010 Crushing

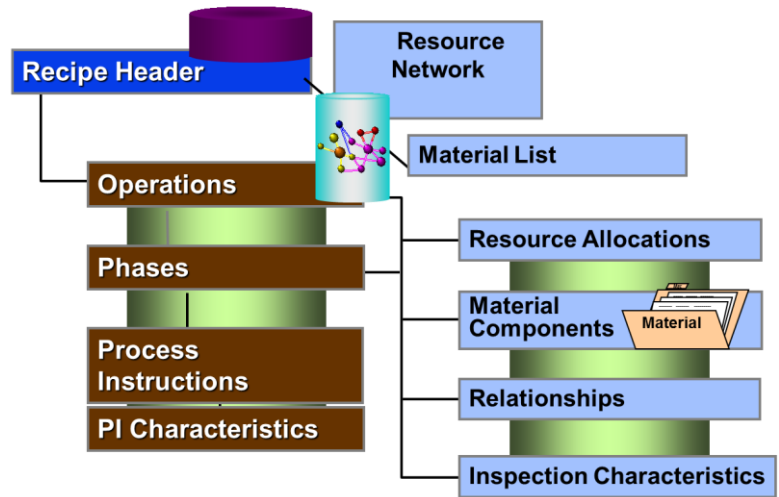
0020 Grinding

0030 Checking

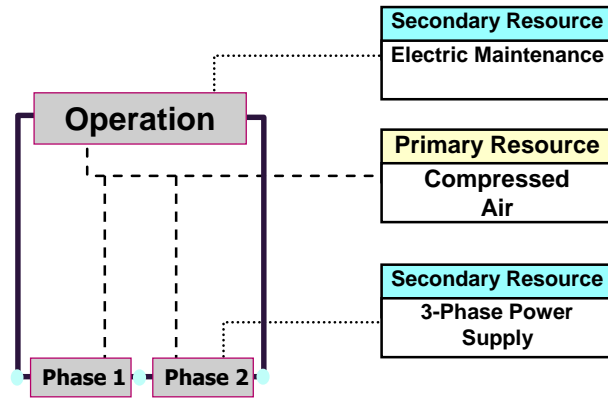
0040 Fine Grinding

0050 Final Check

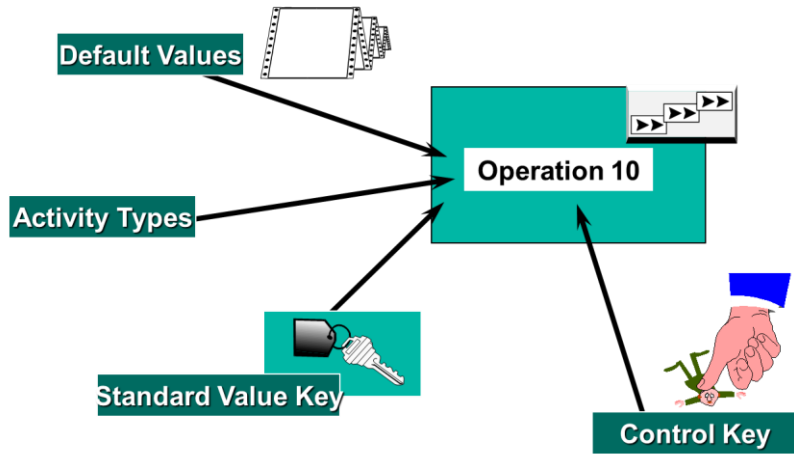
Master Recipe Structure



Recipe Resource Requirements



Relationship between Resources and Operation

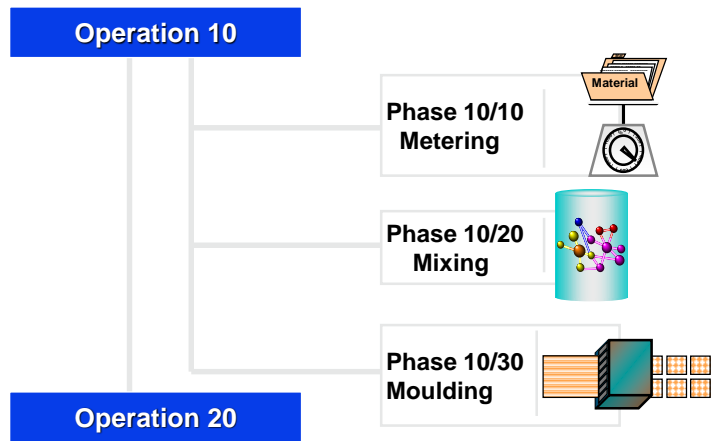


Recipe Materials

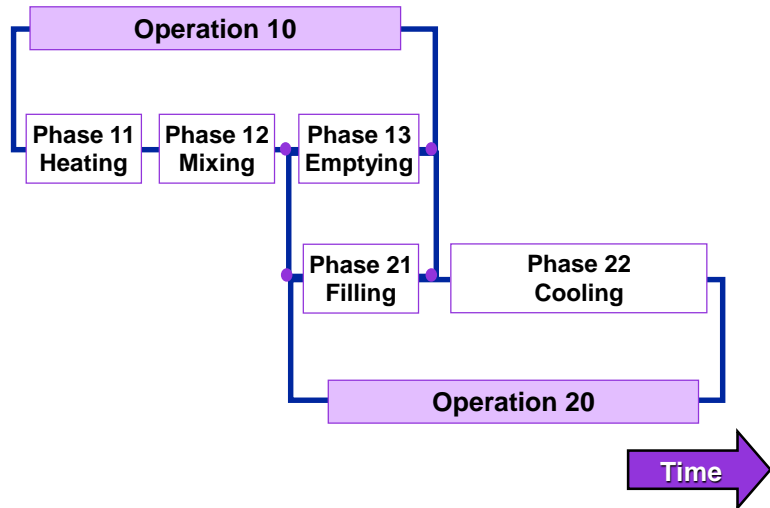


Material List Of Recipe
Semi 1
Raw 1
Raw 2
Raw 3
Semi 2
Co-Prod 1

Phases



Operations/Phases/Relationships



Master data – Master Recipe view



Recipe Edit Goto Extras System Help

Create Master Recipe: Recipe

Recipe group: N201RP ☐ Deletion flag ☐ Long text exists

Recipe: 2 LS-WKS-CRUSHED

Plant: N201 UK-Lakhori

Recipe header Operations **Materials** Administrative data

Opera...	P...	Sup...	De...	Resource	Co...	Lo...	Standa...	Description	Len...	Rel...	Clas...	Obj...	Base qty	Un...	1st st...
0010	<input checked="" type="checkbox"/>			N201CR01	P101									100%	
0020	<input checked="" type="checkbox"/>	0010	01	N201CR01	P101			LIMESTONE PRIMARY CRUSHER	X					100%	
0030	<input checked="" type="checkbox"/>			N201CR02	P101									100%	
0040	<input checked="" type="checkbox"/>	0030	01	N201CR02	P101			SECONDARY CRUSHER	X					100%	
0050	<input checked="" type="checkbox"/>			N201CR03	P103									100%	
0060	<input checked="" type="checkbox"/>	0050	01	N201CR03	P103			Crusher Dummy	X					100%	
0070	<input checked="" type="checkbox"/>				P101				X					100%	
0080	<input checked="" type="checkbox"/>				P101				X					100%	
0090	<input checked="" type="checkbox"/>				P101				X					100%	
0100	<input checked="" type="checkbox"/>				P101				X					100%	
0110	<input checked="" type="checkbox"/>				P101				X					100%	
0120	<input checked="" type="checkbox"/>				P101				X					100%	
0130	<input checked="" type="checkbox"/>				P101				X					100%	
0140	<input checked="" type="checkbox"/>				P101				X					100%	
0150	<input checked="" type="checkbox"/>				P101				X					100%	
0160	<input checked="" type="checkbox"/>				P101				X					100%	

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Master data – Master Recipe view



Display Master Recipe: Operation

Recipe group: 50000042 | Vanilla Ice Cream

Recipe: 1 | Plant: 3100 | Chicago

Oper./Act.: 1200 | ☒ Ph | Pack Ice Cream

Sup. operation: 1000 | ☐ LongText | Standard text key

General data | Standard values | User fields | Process instructions | Relationships

Control key: PI01 | Master recipe/process order

Base Quantity: 100 | KG

Charge Quantity: 1 | KG | Equals | Operation Qty: 1 | KG

Resource: T-VI300 | Mixer 3

Plant: 3100

Duration: 10 | MIN | Activity Type: 1420

☐ Flex. duration

Header
Data

Operatio
n data

Process Management



Purpose

You can use this component to coordinate the exchange of production-relevant data between the SAP R/3 System and the SAP R/3-independent production level. The production level can be controlled as follows:

Manually

The planned production steps are carried out manually by the process operator

Automated

The planned production steps are carried out automatically by the process control system.

Partially-Automated

The planned production steps are carried out both manually by a process operator and automatically by a process control system

Process Management



To settle a process order, the actual quantities produced and the time needed must be confirmed from production. Process management supports the direct confirmation from the PI sheet and process control system to the process order by sending process messages to predefined message destinations.

Process Management



Functions supported by Process management;

- Receiving control recipes from released process orders

- Sending control recipes to process operators or process control systems.

- Preparing process instructions as texts so that they can be displayed

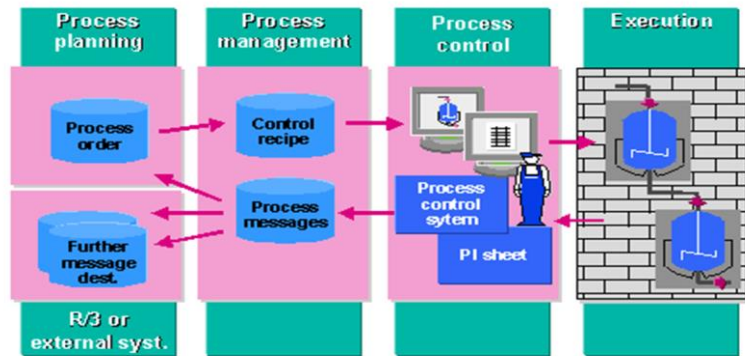
 - and edited on the screen by the process operator

- Receiving, checking, and sending process messages with actual process data

- Monitoring process messages and control recipes

- Manually creating process messages

Process Management



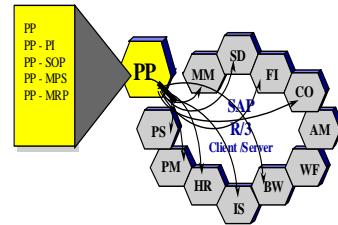
Integration with other modules



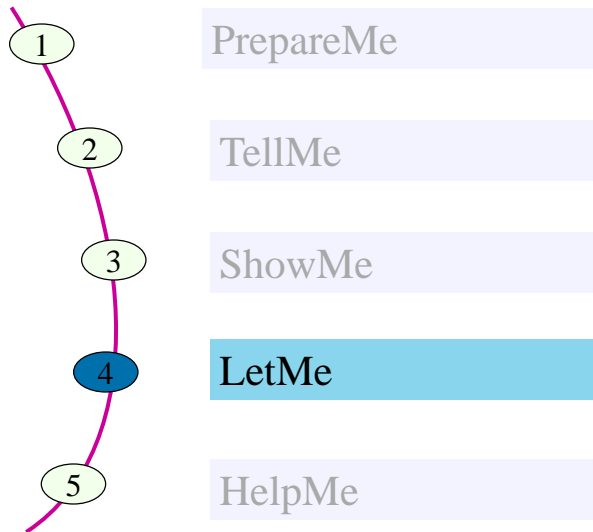
The SAP PP-PI module interfaces with:

- Sales and Distribution (SD)
- Materials Management (MM)
- Controlling (CO)
- Project System (PS)
- Human Resources (HR)
- Finance (FI)
- Plant Maintenance (PM)
- Investment Systems (IS)
- Business Warehouse (BW)

PP Integration with the R/3 System



Production Planning Overview –Process Industries



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Practice & Exercise



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Step 1

Production Planning activities starts as given below.

- Creating demand in case of Make to stock scenario
- Referring from Sales information systems/Sales Order in case of make to stock scenario.

Illustration



Step 2

MRP execution

Based on demand like Planned independent requirements in case of MTS or Sales Order in case of MTO, material requirements are planned thro MRP run.

Planned Orders for items to be produced at In-house and Purchase requisitions for external procurable items are generated.

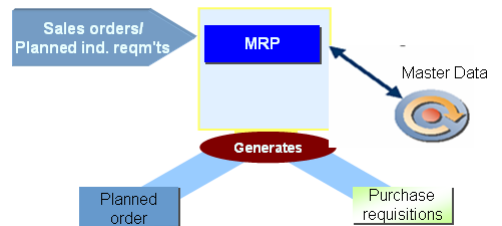
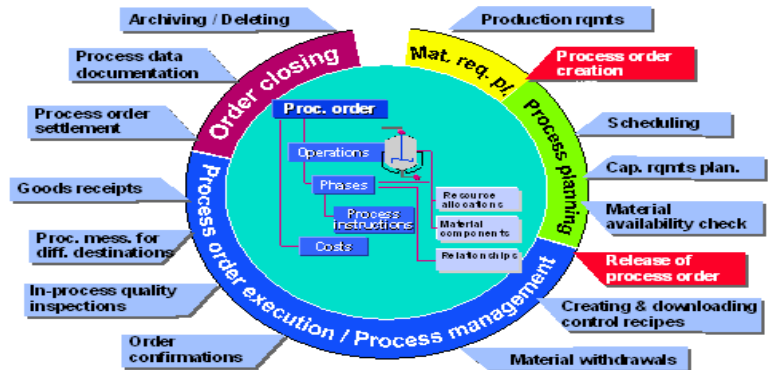


Illustration – Process Order Execution



Step 3

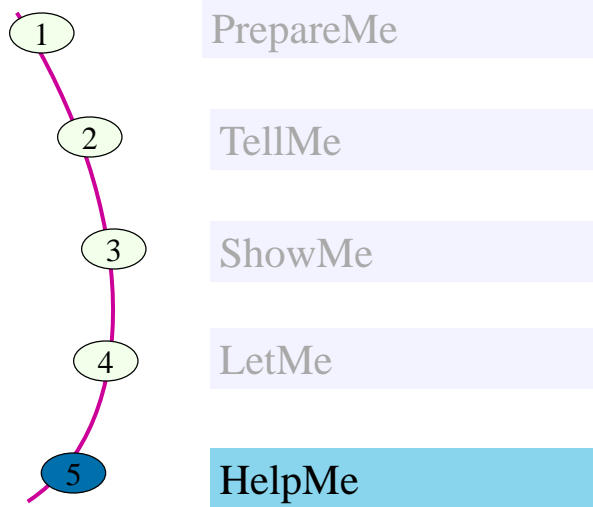


List of Transactions



CRC1	Create Resource
C201	Create Recipe
MD61	Create PIRs
MD02	MRP Run
MD04	Stock Requirement List
COR1	Create Process order
CORK	Confirm Process order

Production Planning Overview –Process Industries



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References – Table info



Production Planning –Process Industries
is distributed in following tables

MAST-Material BOM
STKO-BOM Header
STOP-BOM Positions (detail)
MAPL-Assignment for Task Lists to Materials
PLKO-Recipe Group Header
PLSO-Recipe Group Sequence
PLPO-Recipe Group Operations
AFKO-Process Order Header
AFPO-Process Order Position (details)

Reference



For details refer other training materials as listed below, subject to availability.

Document #	Description
PP0002	PP Master Data Overview
PP1001	Long Term Planning
PP1002	Master Production Scheduling (MPS)
PP1003	Materials Requirement Planning (MRP)
PP1004	Capacity Planning
PP1005	Repetitive Manufacturing (REM)
PP1008	Material Master - PP Master Data
PP1009	Bills of Materials
PP1010	Work Centers
PP1011	Routings
PP1012	SOP
PP1013	Demand Management
PP1014	Production Order Management
PP2002	Variant configuration
PP2002	Eng change management

Add instructor notes here.

Summary



Process industries – Where production is taken place in dedicated process line for continuous production over entire period. Ex Chemical Industries.

Master Recipe – Where you describe the processes to be used for producing materials in your plant as well as the resources and ingredients required for production.

Process Order – In a process order, you copy the process described in a master recipe and adjust it to the actual production run.

Control Recipe- Using control recipes, we transfer control data from the process order to process control. The information contained in a control recipe and the destination to which it is sent are user-defined

We can use PI sheets to exchange data between the partially or completely manually operated production level and the R/3 System (PP-PI).

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Add the notes here.

Add instructor notes here.

Review Questions



1. We can use PI sheets to exchange data between the partially or completely manually operated production level and the R/3 System (PP-PI).

Check whether the statement is true or false

- a. True
- b. False

2. Using control recipes, we transfer control data from the process order to process control

Check whether the statement is true or false

- a. True
- b. False

3. Master recipes are used as a reference for process orders as well as the basis for product costing

- a. True
- b. False

Add the notes here.