ABC Group of Companies

Business Blueprint
Production Planning

Document Approval

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BUSINESS PROCESS DESIGN DOCUMENTS

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1.1ABC – FABRICATION SHOP PROCESS

The Processes involved in Production order execution which is having external process will be handled as shown in the below flow chart. This process will be followed mostly for Galvanizing process, Cement Lining etc.,

In ABC CORP. workshops certain process are not performed with in the plant, so that they will send the materials to a vendor and finish the required service process.

To handle above process, we need to create the service provider as vendor in the SAP system.

Maintain the Relevant External process data in the Routing operation and maintain relevant control key for that operation which will go for the external services.

After releasing the production order, system will create a purchase requisition for the operation which was marked for the external services. Check the schedule dates of the operation. Confirm the all the preceding operations. Then MM department will convert the purchase requisition to service purchase order. The external service vendor is shown in separate storage location of the ABC CORP. Plant. The vendor will finish the activity and send the goods back to requesting plant.

MM department will do the GR against the service PO.

Production department will confirm the operation which is marked for external services and subsequent operations and post the Goods Receipt for the production order.

1.1.1. OVERVIEW

ABC CORP. is one of the leading manufacturing companies being operated in over 150 countries.

ABC CORP. has got two manufacturing plants.

ABC CORP. maintains an extensive range of equipment with a dedicated and skilled Workforce that offers a wide variety of capabilities in design, fabrication, machining, blast cleaning, painting, cement lining & transportation.

ABC CORP.'s business lines are:

Design & Development, Detailed Engineering, Manufacture and Supply of Pressure Vessels, Power Piping, Heat Exchanger – Air Cooled, Shell & Tube, and Metering Skids.

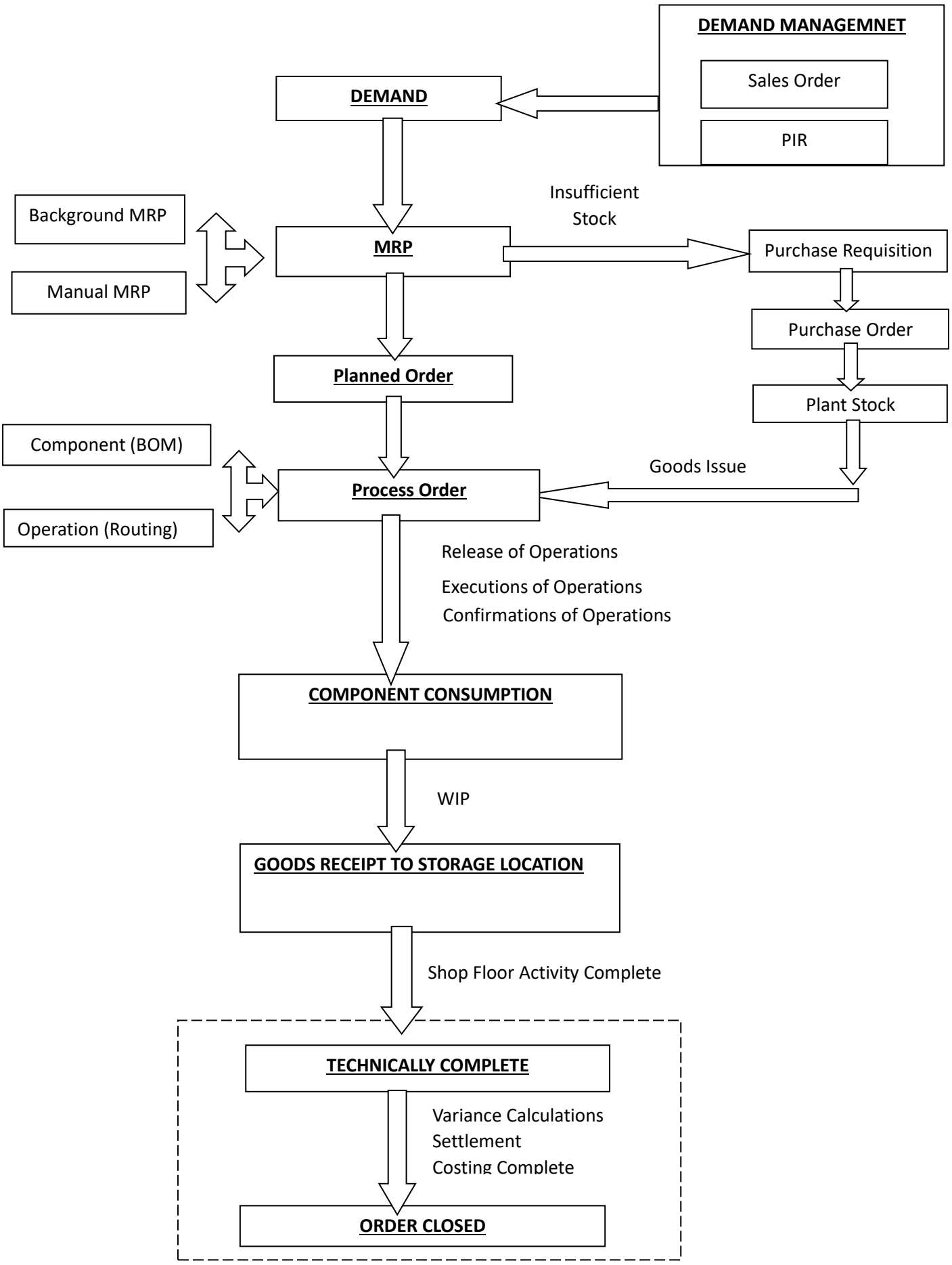
Manufacture and Supply of Cement Lined Fittings, Storage Tanks, Structural and Miscellaneous Works to Relevant Codes / Standards and Clients Requirements for Power Plants, Process and Industry Sectors.

1.1.2 Business Requirement:

SAP helps the ABC CORP. team with the following:

- Accelerate the entire manufacturing process – from planning and scheduling to monitoring and analysis – while improving efficiency across the value chain.
- Proactively identify and fix potential issues with real-time tracking and analysis.
- Improve plant performance with real-time visibility into shop floor processes.
- Identify and fix problems using real-time tracking and analysis
- Ensure product quality and regulatory compliance
- Optimize production control and costing processes by capturing actual production information from the shop floor.
- Improve visibility and transparency across all shop-floor processes

1.1.3 To Be Process Flow Diagram Repetitive Manufacturing:



1.1.4 To Be Process Flow Diagram Repetitive Manufacturing:

4.1 DEMAND:

Demand management in SAP is an important function of a planner. It is important to anticipate the demand from the customers and satisfy that demand by ensuring the availability of materials in a timely manner. Demand management mainly focuses on forecasting the demand and balancing it. Forecasting tools are important for demand management. In today's business environment, sales, production, procurement, and distribution play a vital role. Managing the above areas will determine how effective and efficient an organization can respond to demand.

When it comes to demand management in SAP, planning strategies and planned independent requirements play a vital role. We will look at each of these areas in the next sections.

Planning Strategies in SAP Demand Management

A planning strategy is a unique identifier that is used to determine how a product is manufactured and the manufacturing process it follows. At a higher level, there are two main planning strategies in SAP.

- **Make-to-order (MTO)**
- **Make-to-stock (MTS)**

The make-to-order (MTO) strategy is based on the customer demand which is received through a sales order. Production, procurement, and inventory management will be done against the sales order. This is useful if you want to track your production process individually for each order. After completing the production, finish good stocks will be delivered against the sales order.

The make-to-stock (MTS) strategy is based on the process where manufacturing is done for a forecasted demand and the production is done for stock. There is no specific sales order requirement at the production starting point. When the customer order is received, it will be fulfilled with the available stock.

A planning strategy group is used to maintain the planning strategy for a material. Follow the below steps to maintain the planning strategy group:

1. Execute the transaction MM03 to view the material master.
2. Enter the material and the plant.
3. Select the MRP 3 tab of the material master and locate the planning strategy group field.

Below are the most commonly used planning strategies.

- 10 – MTS production
- 20 – MTO production
- 40 – Planning with final assembly
- 50 – Planning without final assembly
- 60 – Planning with planning material

Strategy Group

A planning strategy group can be used to define alternative planning strategies for a material. The system will always use the main strategy by default in the planning run. An alternative strategy needs to be manually selected.

E.g., if a material must follow both make-to-order and make-to-stock processes, we can define one strategy as the main strategy and define the other as the alternative strategy. When the sales order is received, we can determine the required type, and the planning strategy will be picked for the material.

It is possible to assign a strategy group to an MRP group. This is useful if we want to use the same strategy group for multiple materials which share a common method of production planning. If there are any exceptions, they can be maintained in the MRP 3 view of the material master, and the settings in the MRP 3 view will have priority over the MRP group.

Planned Independent Requirements (PIR)

The PIR is an important planning method when it comes to demand management in SAP. During the MRP run, the system will check for the active version of the PIR, and procurement proposals will be generated. The PIR can be created independently.

The MD61 transaction code can be used to directly call the PIR creation program. PIR can be maintained based on different time intervals such as days, weeks, and months. PIR quantities can be entered manually or be copied from other planning tools. It can be copied from sales plans, production plans, or even from a simulative plan. By using the version function, it is possible to have multiple plans and make them active or inactive. It is possible to maintain simulative plans and simulate the MRP.

PIR is automatically reduced in the system. But it is important to check the PIR status in the system and remove or reduce the PIR. This ensures that non-relevant PIRs are not considered during the planning run.

Planned Independent Requirement Reduction

PIR is reduced during the goods issue rather than being consumed. During the make-to-order strategy 10, the oldest PIR is reduced first. PIR reduction can be used in planning strategies such as 40, 50, and 60.

During the planning strategy 40, PIR can be reduced when a sales order is placed. If the strategy is configured correctly and when the VSF requirement type is used, PIR is reduced. Consumption mode in the material master MRP view can also be used to further control the reduction. By maintaining the consumption mode, we can give a time limit. If a sales order is placed within this time limit, it will reduce the PIR. This suggests that PIR has a direct link with the planning strategy used.

Production Execution in SAP Demand Management

The demand management process ends with the production execution process. Once the demand is created in the system, it will be captured through a production order or purchase order. Plan orders will be converted into production orders. Purchase requisitions will be converted into purchase orders.

Production orders will be used to carry out production-related activities. A production order confirmation will create inventory in the system. Once the inventory is built into the system, PIR will be reduced, marking the completion of demand fulfilment. The delivery of manufactured items to the customer marks the completion of a successful demand management cycle in SAP.

4.2 MRP

Materials Requirement Planning (MRP)

The objective of MRP is to ensure material availability for the requirements. Requirements could be of two types – internal requirements and external requirements. External requirements originate from customer requirements which are entered into SAP as a sales order (for example). Internal requirements are to manufacture components on the same plant which could be supplied as components to finished goods or to satisfy the customer requirements.

SAP MRP checks the stock level of the respective material and generates procurement proposals or planned orders which could be either converted to purchase requisitions or production orders based on the MRP settings in material master records.

Master Data for MRP

The following master data is required to carry out SAP MRP process:

- Material master

- Bills of material
- Work center (in-house production)
- Routings (in-house production)
- Demand management
- Sales and distribution (if required)

For SAP MRP process to be carried out, material master would need to be maintained accordingly. Material master has several views related to MRP viz. MRP1 to MRP4.

MRP 1 view has fields like purchasing group, plant special material status, MRP procedure, and lot size

In material master **MRP 2** view, fields like procurement type, special procurement, scheduling margin key, and planned delivery time are located. There is a separate tab available for net requirements calculation which includes safety stock, minimum safety stock which helps to calculate the required quantity at the right time.

Material master **MRP 3** view includes fields like strategy group which is used to decide between Make-To-Order (MTO) or Make-To-Stock (MTS) scenarios.

Also, Availability check filed is available which is used to maintain the checking rule for checking the material availability and update it for available to promise dates and quantities.

In material master **MRP 4** view, fields for BOM explosion and dependent requirements are available. There is a separate tab available for Repetitive Manufacturing which helps to maintain REM profile that is used to enter and record transactions for repetitive manufacturing.

If a material is subject is to in-house production, then work scheduling view would need to be maintained. If a material is subject to MRP planning, then all the four views of MRP would need to be maintained in material master.

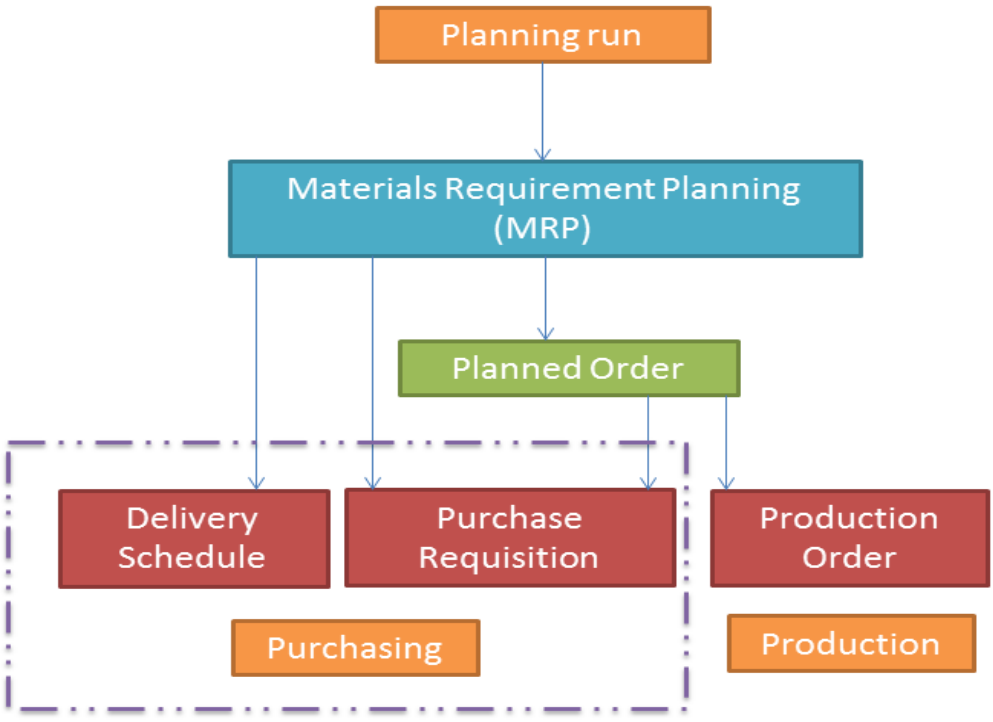
SAP MRP Process Flow

SAP MRP process flow starts with customer requirement, which originates from the sales department or marketing department. The customer requirements are entered in SAP via sales orders. The customer requirements are entered as demand in demand management system.

The output of demand management is Planned Independent Requirements which would be used in long-term planning.

Now, materials requirement planning comes into picture. The input to MRP is from sales order and planned independent requirement, if applicable. When the MRP run is carried out, planned order or purchase requisition would be generated based on the planning run settings. Planned order could be converted into purchase requisition (PR) or Production order. Purchase requisition is for external procurement and production order is for in-house production. SAP will then convert all the dependent requirements of planned order into reservations in the production order. When planned order is created for external procurement, it would need to be reviewed by planners, and if required planners would convert the planned order to purchase requisition. Otherwise, the purchase requisition would be generated automatically and available for purchasing.

In SAP MRP process, the system calculates the net requirements while considering available warehouse stock and scheduled receipts from purchasing and production. During MRP process all levels of the bill of material are planned.



SAP MRP Planning run can be executed at plant level or MRP area level. This planning run can be executed for a single material or a material group. Planning run can be total planning for a plant, single-item single level planning, or multi-level single item planning. The SAP system creates procurement proposals which could be planned orders, purchase requisitions, schedule lines based on the planning run settings. Planning file entry contains details of the materials that are to be included for the MRP run.

SAP MRP Planning run type depends on the processing key in the MRP run screen. There are three types of processing key:

- NETCH – Net change planning in total horizon.
- NETPL – Net change planning in the planning horizon.
- NEUPL – Regenerative planning.

SAP MRP Planning Run

There are several fields which come under MRP control parameters control data.

- Processing key field – net change in the planning horizon.
- Create Purchase Requisition – This field has an option for creating purchase requisitions or planned orders.
- Scheduling Agreement (SA) delivery schedule lines – This field has an option for creating schedule lines / no schedule lines. To create a scheduling agreement there should be settings maintained in a source list.
- Create MRP list – MRP list would be created and displayed when the planning run is executed and saved.
- Planning mode – In this field, the planning mode would be maintained whether to run normally or delete and create all planning data or re-explode BOM and routing, if there are any changes made to those master data.

Transactions for SAP MRP Planning Run

Transaction code: MD01

SAP Menu -> Logistics-> Production-> MRP -> Planning -> Total Planning -> Online

With this transaction code, we would be able to carry out planning run at a plant level. As this would consume a lot of time for the output to be displayed, it could be executed as a background job.

MD02 – This transaction code is used to execute a planning run for a material and used to explode multi-level materials.

In this planning run, MRP would be carried for a material and for the first level of BOM, the other components will not be included for planning.

In the transaction code MD04, we could get the latest stock / requirement list for a particular material and plant wise. Enter the material and plant; this would give you the current stock with requirements or receipts.

4.3 Planned Order

AP Planned Order is an important component in the production and planning module in SAP. The planned order is considered as a procurement proposal in SAP. This means it is an intermediate state of a demand or procurement request.

When production demand is entered in SAP, material requirement planning (MRP) is run. The result of MRP is the procurement proposals. For materials that are produced internally, MRP creates planned orders and for materials that are procured from external sources, MRP creates purchasing requisitions.

As mentioned above, MRP created planned orders for components based on the procurement type maintained in the material master. There are four procurement types in SAP.

1. E – Inhouse production
2. F – External procurement
3. X – Both procurement types
4. No procurement

For materials that are indicated as E or X in the material master, MRP creates planned orders. Materials that are indicated as "X", can be produced in-house, or can be procured externally.

SAP Planned Order Creation

SAP Planned Orders can be created, changed, and displayed from the transaction codes MD11, MD12, and MD13. SAP has the option of creating a planned order manually. For that, we can use the transaction code MD11. Below are the contents of a planned order:

1. Planned order number – This is a unique number that is allocated for the planned order, and it is used to identify the planned order. This number will be determined from a number range that is defined in the configuration. When the planned order number range is depleted, MRP will not create new planned orders. We can define a number range for manually created planned orders separately.
2. Order quantity – Based on the production demand, SAP creates a planned order, and the order quantity will be based on the production demand. Based on the material master parameters, production demand can be split among multiple planned orders.
3. Basic dates – Basic production start and end dates will be determined by the system based on the MRP parameters.
4. Production plant – The plant in which the planned order is created.
5. Production version – This is the production version that has been picked for the planned order. This is important because the bill of material (BOM) will be picked for the planned order based on the version.
6. Planned order firming indicator – Based on the MRP parameters, the planned order number will change when MRP is executed. If we want to prevent MRP from

changing the planned order, we can firm the planned order by selecting this indicator.

7. Component overview – This shows the components in the planned order. This is based on the bill of material. The production version determines which BOM is applied for the planned order.
8. Sales order – If the planned order is created for a make-to-order scenario where a sales order creates demand in the system, the relevant sales order number will be available in the planned order.

SAP Planned Order Conversion

The SAP Planned Order can be converted into production orders or purchase requisitions based on the requirement. If a planned order is converted into a production order, the content of the planned order will be copied to the production order.

Transaction code MD16 can be used to view planned orders created for a material.

4.4 Production Order

SAP Production Order is a transactional data object that belongs to the production and planning module. Production orders are used to capture the quantities and cost-related to production.

How to Create SAP Production Orders

If the production planning process is MRP-driven, once the MRP run is executed, planned orders will be created. For the items that are produced in-house, it is possible to convert these planned orders into production orders.

SAP Production Order creation can be done after evaluating the stock requirement list in SAP. Transaction to view the stock requirement list is MD04. From this interface, we can view the planned orders created and we can convert the planned orders into production orders. Other than the above transaction code, there are many options and transaction codes available to create production orders in SAP. Some of these are CO01, CO08, CO41, and MD16. Any of these transactions can be used depending on the requirement.

When a production order is created, the following actions are carried out:

- A routing is selected. Its operations and sequences are transferred to the order.
- The bill of materials is exploded and the items in the bill of materials are transferred to the order.
- Reservations are generated for stock items in the bill of material.
- The planned costs for the order are generated.
- Availability check for the components.
- Purchase requisitions are generated for items procured externally and externally processed operations.
- Generation of Settlement Rule.

The MRP will no longer make automatic adjustments to production orders.

How to Release SAP Production Order

The release production order process is an important business process, which confirms that the order is ready to be worked on the shop floor. In this process, the production supervisor releases the production orders (shop floor orders) for execution.

During the release the following functionalities will be taken place:

- If the produced material is a batch-managed Item, it will be goods receipt-based batch number.
- Availability check for the components will be done. This depends on the configuration settings.
- Batch determination for the components – If the backflush is enabled for the components.
- In-process inspection lot creation – If the In-Process Inspection has been activated.
- Printing shop floor papers.
- Confirmation.
- Consumption recording.

How to Execute and Close SAP Production Order

During production order execution, the below activities take place:

- Material Request from Store – The production order will have a list of components that are required to carry out the production. There, the materials can be semi-finished goods or raw materials.
- Consumption of Components – Once the components are received from the stores, those will be issued against the production order. This can be done manually or automatically.
- Confirmation of Production Activities – Production order is confirmed when the production activities are completed. This will create inventory in the system. This process will also capture the activity costs based on the routing given for the produced component.
- Delivery Tolerances – tolerances can be maintained in the production order so that excess quantities produced can be captured.
- QM Integration – If the produced material is quality-related, confirmation of the production order will create an inspection lot in the system. This will then be used by the quality department to record the quality results.
- Technical Completion – Once the production order is complete, we need to set the technical complete status for the order. This makes the production order available for settlement and variance calculations.

4.6 Good Receipt

Good receipt is performed when the material is produced as per Production order and goods are placed at the storage location. The stock quantity is increased and the movement type 101 is entered.

Creating Goods Receipt

Use T-code: MIGO. Select the Goods Receipt, Order and Production order number.

Enter manufacturing data and click Item OK. Click the Check button at the top of the screen.

To save the document, click the save button at the top of the screen. You will get a confirmation material document posted message.

4.7 TECO (Technically Complete)

Technical completion means ending a production order from a logistical viewpoint.

The following actions are executed if an order is set to Technically complete.

- The order is not relevant for MRP planning
- Reservations are deleted
- Capacity requirements are deleted
- Purchase requisitions for external operations or non-stock materials are deleted
- The order and its operations receive the system status Technically Completed (TECO)

After technical completion you can still make postings for the order. For instance, material withdrawal or a confirmation can be posted if they were previously forgotten.

1.1.16 GAP AND SOLUTION

1.1.18 CONFIGURATION

Repetitive Manufacturing profile

- GI Backflush at GR posting
- Errors correcting for Backflushing
- Cost accounting
- Planned Order Reduction
- Firming Logics
- Creating Planned order when reversing
- Material Requirement
- Movement Type

Master Data Setup

MM01/02 Material Master MRP4 View

CA21 Rate Routing

MM01/02 Production Version with Repetitive Manufacturing

Repetitive Manufacturing

SAP IMG -> Production -> Repetitive Manufacturing -> Control -> Create Repetitive Manufacturing

Strategy Group

SAP IMG -> Production -> Production Planning -> Demand Management -> Planned Independent Requirement -> Planning Strategy -> Assign MRP Group to Strategy Group

Follow the below menu path to create a PIR.

SAP Menu -> Logistics -> Production -> Production Planning -> Demand Management -> Planned Independent Requirements -> Create

To reduce the PIR, follow the below menu path or execute the transaction MD74.

SAP Menu -> Logistics -> Production -> Production Planning -> Demand Management -> Environment -> Independent Requirement Reorganization -> Adjust Requirements.

1.1.25Integration with other modules

MM-PP Integration:

- Material Master Creation for all the finished goods
- Raw material procurement by converting purchase requisition to purchase orders
- Goods Issue to Production order for Production execution
- Converting purchase requisition to service PO for External services

QM-PP Integration

- Quality Inspection during Production
- Quality Inspection for Finished Goods Inspection

CO –PP Integration

- Standard cost calculation for all FG materials
- Work in progress calculation
- Production variance calculation
- Settlement of production orders

SD-PP Integration

- Sales order creation
- Dispatch the Finished goods to customers

Information System in PP

The Production Planning Information System is a flexible, comprehensive information system you can use to monitor and control your production data. You can evaluate production orders. The system includes overview reports and reports offering various degrees of detail.

The following reports are available directly from standard SAP.

- COOIS - Order Information System
- MMBE - Stock Overview
- MD05 - MRP List – Material
- MD06 - MRP List - Coll. Display.
- MDLD - Print MRP Lists
- MD04 - Stock/Requirements List
- MD07 - Stock/Requirements: Collective Display
- CO09 - Availability Overview
- CO24 - Missing Parts Info System
- MB52 - Display Ware house stock

Standard Analyses

- MCP3 - Production Order
- MCRE - Material Consumption
- MCRI - Product Costs
- CO20 - Orders by Numbers

- CO21 - Orders by Material
- CO22 - Orders by MRP Controller
- CO23 - Orders by ProdSched.
- CM01 – Capacity Planning
- CM05 – Capacity planning: over load at work center

List of Important Transaction codes in Production planning

- CO01 - Create Production order
- CO08 – Create Production order with sales order item
- CO02 – Change Production order
- CO03 – Display Production order
- CA01 – Create Routing

1.1.27Authorization / Security Considerations:

Activity	Key Use / Manager	Executive	Supervisor
Order Create			
Release			
Change			
Display			
Confirmation			
Good Receipt			
TECO