

Material Requirements Planning

With its accurate and up-to-date inventory management application and ordering system, SAP R/3 System Materials Management can provide you with the ideal foundation for precise material requirements planning (MRP).

The main function of MRP is to monitor stocks and automatically generate order proposals for the purchasing department. This is achieved by implementing various requirements planning methods.

Net Change Planning

The planning run is usually done at the end of the day using the net change planning procedure. This procedure only plans those materials whose stock or requirements situation have undergone a change relevant to the planning run and which have been flagged with the appropriate indicator in the planning file. A relatively short runtime enables the MRP controller to repeat the net change planning procedure in short intervals. The runtime can be shortened even further by defining a planning horizon. This means that the MRP controller always has current planning results at his disposal. Information concerning important parts and exceptional situations are automatically generated by the system which means that the MRP controller is also relieved of routine monitoring procedures. To improve performance even more, you can use parallel processing functions.

During a planning run, the system performs the following steps:

Processing Steps

- ☐ Calculates net requirements
- ☐ Calculates lot size
- ☐ Scheduling
- ☐ Creates purchase order proposals
- ☐ Creates exception messages

The MRP list automatically created by the system can be adapted by the MRP controller using interactive planning. Individual materials can be planned again online immediately.

Since MRP is always performed at plant level, all stock that is available in the plant is included in the planning run.

Planning at Plant Level

Storage location MRP enables you to exclude stock in individual storage locations from the planning run at plant level or you can plan this stock separately at storage location level. Stock that is planned separately is not included in planning at plant level.

Storage Location MRP

The planning procedures of consumption-based planning are simple and easy-to-use. Therefore, they are used in companies without in-house production or in production plants for planning B- and C-parts and operating supplies.

MRP without a BOM explosion is also available as a special function in the MM System. In contrast to the consumption-based planning procedure, this function operates using existing sales orders and material reservations.

MRP

You can determine which MRP procedure should be used for each material and plant. Naturally, materials can also be excluded from automatic requirements planning.

Order Proposals The type of order proposal that is automatically created by the planning run depends on the material's procurement type. For materials produced in-house, a planned order is automatically created. For materials that are externally procured, the MRP controller can decide between a planned order, a purchase requisition, or a delivery schedule.

Planning Procedures

The procedures for consumption-based planning include:

- ☐ Reorder point planning
- ☐ Forecast-based planning
- ☐ Time-phased planning

Reorder Point Planning

In reorder point planning, the system compares available warehouse stock with the reorder level. If available stock falls below the reorder level, an order proposal is created. If, however, a purchase order for the required quantity has already been created by the purchasing department, the system will not create another order proposal.

Reorder Level The reorder level (sometimes known as the reorder point) is calculated by adding the safety stock plus the expected average material consumption within the replenishment lead time. When determining the reorder level, you must consider safety stock, previous consumption values or future requirements, and the replenishment lead time.

Safety Stock Safety stock must be set at a level that covers both excess material consumption within the replenishment lead time and any additional requirements that may occur because of delivery delays. Therefore, you must consider previous consumption or future requirements, and vendor delivery/production timeliness when determining the safety stock level.

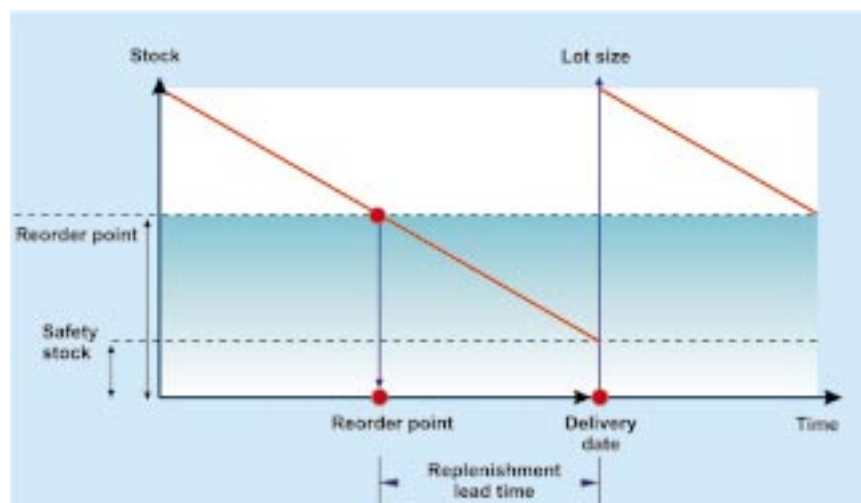


Fig. 4-1: Reorder Point Planning

Consequently, the reorder level and the safety stock level are key control parameters within reorder point planning. They can be determined automatically by the system or manually by the MRP controller.

The advantage of automatic reorder point planning is that the reorder level and the safety stock level are automatically adapted to the current consumption and delivery situation. This helps greatly to keep stock levels low.

The continuous monitoring of available warehouse stock in reorder point planning is accomplished by inventory management. Every time a material is withdrawn from the warehouse, the system checks whether this has caused the stock level to fall below the reorder level. If this is the case, an entry is made in the planning file for the next planning run.

Forecast-Based Planning

Material consumption is also the key to forecast-based planning. As in the automatic reorder point planning procedure, the integrated forecasting program is used to determine forecast values for future requirements. The main difference between reorder point planning and forecast-based planning is that these forecast values are actually used for planning in forecast-based planning.

You also have the option of combining time-phased planning with reorder point planning. In this case, the material is not only planned on the planning date but also if a goods issue causes the stock level to fall below the reorder point.

Time-Phased Planning
and Reorder Point
Planning Combined

Net Requirements Calculation

The requirement quantities forecast by the system are used in the planning run and the net requirements calculation is made. In this calculation, every period is checked to make sure that forecast requirements are covered either by available warehouse stock or by firmed receipts from purchasing. If a forecast requirement is not covered by existing receipts, an order proposal is created.

By entering a range of coverage profile in the material master record, the system considers the ranges of coverage defined in Customizing for the net requirements calculation and creates a safety stock based on actual requirements.

Days' Supply
(Range of Coverage)

Lot-Sizing Procedures

The purpose of material requirements planning is to generate an order proposal when a requirements shortage is calculated in the planning run. The lot size for the order proposal is calculated according to the lot size entered by the MRP controller in the material master record.

The SAP Standard System supports the most modern lot-sizing procedures. User-specific formulas can also be integrated with relatively little effort. The procedures in the R/3 System for determining the lot size are divided into three groups: static, period, and optimum.

In static lot-sizing procedures, the lot size is calculated exclusively using the quantity specifications entered in the material master record. The lot size can be calcu-

Static Lot-Sizing
Procedures

	lated according to three different criteria:
	<input type="checkbox"/> Lot-for-lot order quantity <input type="checkbox"/> Fixed lot size <input type="checkbox"/> Replenish to maximum stock level
Period Lot-Sizing Procedures	<p>In period lot-sizing procedures, the required quantities from one or several time periods are grouped together to form a lot. The SAP System supports various periods. You can determine the number of periods to be grouped together in an order proposal. You have the following choices:</p> <input type="checkbox"/> Daily lot size <input type="checkbox"/> Weekly lot size <input type="checkbox"/> Monthly lot size <input type="checkbox"/> Lot size according to flexible period lengths (based on accounting periods) <input type="checkbox"/> Lot size according to a planning calendar (definable period)
Optimum Lot-Sizing	<p>In optimum lot-sizing procedures, the required quantities for several periods are grouped together to form a lot. An optimum cost ratio is determined between lot size, independent costs, and storage costs. The only difference between the various optimization procedures is the calculation of the minimum costs. The following optimum procedures are usually used:</p> <input type="checkbox"/> Part period balancing <input type="checkbox"/> Least unit cost procedure
	<p>The following procedures are also available:</p> <input type="checkbox"/> Dynamic lot size creation <input type="checkbox"/> Groff reorder procedure
	<p>You can influence the grouping of requirement quantities into a lot size using additional restrictions in the material master record:</p> <input type="checkbox"/> On the one hand, you can enter limit values (minimum lot size and maximum lot size) <p>These limit values are considered during lot-size calculation. This means that the lot size is either rounded up to the minimum quantity or the system does not group required quantities that exceed the maximum lot size.</p> <input type="checkbox"/> On the other hand, you can enter a rounding value or a profile <p>This means that during the lot-size calculation, the lot size is rounded to a multiple of the defined value if necessary, depending on defined threshold values.</p>
Short and Long-Term Lot Size	<p>The long-term lot size is used to split the time axis for materials planning into a short-term and a long-term area. In these two areas, the system calculates the lot-size using two different lot-sizing procedures. Consequently, you can instruct the system to group requirements over a larger period in the long-term area simply to produce a rough picture of the future master plan. In the short-term area, you can select a smaller, more precise lot size to suit your requirements.</p>

In consumption-based planning, sales orders and reservations are not usually included in the net requirements calculation. However, you can set the system so that these requirements are considered in the planning run in reorder point planning and time-phased planning.

External Requirements

Quota Arrangements

If several sources of supply exist for a material (for example, several vendors or delivery schedules), then you can define quota arrangements for set periods. These quota arrangements are considered during the planning run.

MRP Result

The results of the planning run for a material are summarized in both the MRP list and in the stock/requirements list. You can display these lists in a period split of your choice.

The MRP list displays the stock/requirements situation at the time of the last planning run. It provides a work basis for the MRP controller and is available in printed form as well as online. The MRP controller can easily select a particular MRP list by using various selection parameters. You can also create an overview of several MRP lists according to various selection criteria.

MRP List

The structure of this list corresponds in content to the MRP list. However, the stock/requirements list displays the most up-to-date stock/requirements situation and includes any manual changes you have made since the last planning run. All activities which are relevant to MRP, such as, goods receipts or goods issues, can be immediately accessed by the MRP controller, providing that person with an accurate overview of material availability. You can also create an overview of several stock/requirements lists according to various selection criteria (for example, product group, class, MRP controller, vendor or production line).

Stock/Requirements List

During a planning run, the system automatically recognizes conflict situations and records these as exception messages. Thus, the MRP controller is made aware of exceptional situations that may require attention.

Exception Messages

Exception messages may refer to one of the following:

- ☐ Scheduling delay
- ☐ Rescheduling and cancellations
- ☐ Stock level fallen below the safety stock level

Material Forecast

The forecast is a procedure which uses various mathematical models and historical data to determine future values. In consumption-based planning, the forecast is used to:

- ☐ Determine requirements
- ☐ Determine basic data for calculating the safety stock and reorder level

In general, the forecast is performed for all materials in the background mode. However, you can also carry out the forecast for an individual material online.

Historical data provides the basis for the forecast. Therefore, the accuracy of the forecast depends on the extent and the quality of your historical data. In the analysis of a series of consumption values, certain patterns can usually be detected from which the various forecast models are derived (see Figure 4-2).

Constant Model The constant model applies if consumption values remain constant over a long period of time, with little variation from a stable mean value. However, occasional fluctuations may occur.



Fig. 4-2: Constant Model

Trend Model The trend model applies if consumption values rise or fall constantly over a long period of time. Occasional fluctuations may occur.

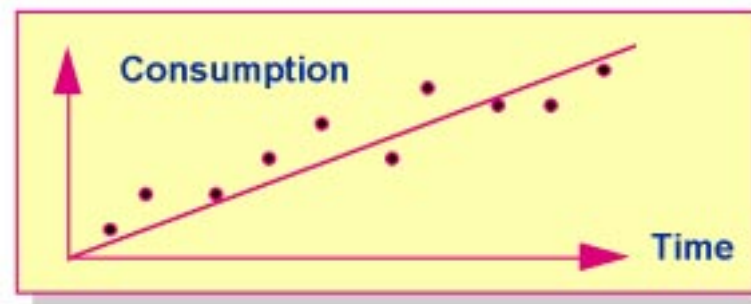


Fig. 4-3: Trend Model

Seasonal Model

The seasonal consumption model applies if the consumption values rise and fall significantly, deviating from a stable mean value.

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Seasonal Model



Fig. 4-4: Seasonal Model

A seasonal trend consumption model is characterized by seasonal deviations and an increasing or decreasing mean value.

Season Trend Model

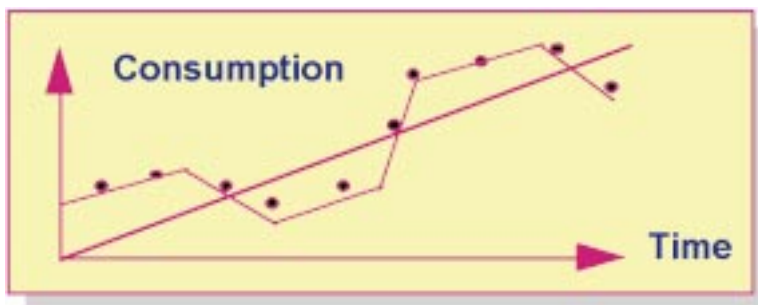


Fig. 4-5: Seasonal Trend Model

Before a forecast is made, an analysis of historical data must be conducted to establish the appropriate model. You either define the forecast model yourself or it is selected automatically by the system during initialization. The model which is selected here is continually monitored by the system in subsequent forecasts, ensuring that the model remains valid.

Model Selection and
Model Monitoring

The system creates exception messages every time a forecast is made. These messages inform you of any exceptional situations (for example, problems concerning model monitoring). The exception messages are used later to reprocess the forecast result.

Reprocessing