SAP MRP
(Materials requirement planning)

By-
Abhijeet Guha
Topics

1. What is MRP
2. Master data for MRP
3. MRP Procedures
4. Planning Process
5. Lot sizing Procedure
6. Traffic lights
7. ATP (Available to Promise)
What is MRP?

The main objective of MRP is to guarantee material availability.

MRP is required to procure or produce the required quantities on time for internal purpose or for SALES.

WHY MRP?

- Optimizing service level
- Minimizing costs and capital lockup.
MRP can be done in several ways:

**MRP at plant or MRP Area level**
- With MRP at plant level, the system considers stocks from the storage locations within the plant, excluding the stocks already reserved.
- In case of MRP area level, the stocks from the storage locations belonging to this MRP area as defined can be taken for planning to generate the requirements.
- MRP area planning helps in cases where one wants to restrict the planning to certain storage locations.

**Lot-Sizing and MRP Procedures**
Different lot sizing can be combined with different MRP’s.

**Automatic Planning Run**
- This is done automatically wherein the requirements are generated.
- The system generates messages in case of critical situations which can be addressed later after the run.
Process flowchart
MRP Process flow

S & D gives concrete customer requirements from the market.

In Demand Management, sales are planned in advance via a sales forecast. The result is the independent requirement, i.e., the requirement for the finished product.

In order to cover these requirements, MRP runs and calculates procurement quantities and dates as well as plans the corresponding procurement elements.

If a material is produced in-house, the system also calculates the dependent requirements, that is, the quantity of components required to produce the finished product or the assembly, by exploding the BOM. If a material shortage exists, planned orders are created at every BOM level to cover requirements.

Production orders or Purchase orders are created.
Topics

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Master data for MRP

The following elements are required for MRP:

- Material master
- Bills of material
- Work centre (in-house production)
- Routings (in-house production)
- Demand management
- Sales and distribution (optional)
Topics

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MRP Procedures

Material requirements planning

Master production scheduling

Consumption based planning
Material requirements planning

1. It uses current and future sales figures.

2. The system calculates the requirements based on the warehouse stock, receipts, etc.

3. If externally procured then procurement proposals; if internal production then it leads to creation of planned orders, and also dependent requirements are calculated.

4. The best thing about this is that it leads to minimization of inventory, which leads to reduction of costs involved.
Master production scheduling

1. It is for used specifically for critical resources.

2. A separate run occurs for the MPS items, they are not included in the MRP run.

3. Basically, it ensures the availability of the critical resources which should not hamper the production by maintaining the stock.

4. It also provides the facility to work on the production plan interactively.
## Master production scheduling

### Master Production Scheduling Planning Run

<table>
<thead>
<tr>
<th>Scope of planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
</tr>
</tbody>
</table>

### MRP control parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing key</td>
<td>NETCH</td>
<td>Net change for total horizon</td>
</tr>
<tr>
<td>Create purchase req.</td>
<td>2</td>
<td>Purchase requisitions in opening period</td>
</tr>
<tr>
<td>Schedule lines</td>
<td>3</td>
<td>Schedule lines</td>
</tr>
<tr>
<td>Create MRP list</td>
<td>1</td>
<td>MRP list</td>
</tr>
<tr>
<td>Planning mode</td>
<td>1</td>
<td>Adapt planning data (normal mode)</td>
</tr>
<tr>
<td>Scheduling</td>
<td>1</td>
<td>Basic dates will be determined for plan</td>
</tr>
</tbody>
</table>

**Planning date**: 16/24/2008

**Process control parameters**

- Parallel processing: **on**
- Display list: **off**

**User exit: select materials for planning**

<table>
<thead>
<tr>
<th>User exit key</th>
<th>User exit parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>
Consumption based planning

1. It uses the past consumption data to calculate the future requirements.

2. It has no relation with the independent or dependent requirement instead it is triggered when the stock falls below the reorder point or by forecast requirements.

It has three types of MRP procedures:

- Re-order point planning.
- Forecast based planning.
- Time phased planning.
Re-order Point Planning

- Procurement is triggered when the sum of plant stock and firmed receipts fall below the reorder point.

- Reorder point covers the material requirements during replenishment lead time.

- The safety stock takes care of both excess material consumption within the replenishment lead time and any additional requirements that may occur due to delivery delays.
Re-order Point Planning

Re-order point is defined by :-

- Safety stock
- Replenishment lead time.
- Average consumption.

Safety stock is defined by :

- Past consumption data.
- Vendor/ production delivery timelines.
- Service level.
- Forecast error.
Re-order Point Planning
Re-order Point Planning

• Manual Reorder point planning
  Formula = (procurement processing time + planned delivery time + GR processing time) + Safety stock

• Automatic reorder point planning
Brief of some MRP Types

Some of the major types:

MPS
M0 – MPS

MRP
PD – MRP

Time phased
R1 – Time-phased planning
R2 – Time phased w. auto. reo. pt

Consumption based
V1 – Manual reorder pt
V2 – Auto. reorder pt
VV – Forecast based planning
Forecast based planning

• It is also based on historical data, or the past material consumption data.

• Here the forecast values form the basis of the planning run.

• Based on the consumption pattern the system changes the forecast requirements for future.
Time phased planning

1. This is used specially in case if the planning cycle is known.

2. The materials planned using this is given an MRP date in the planning file.

3. This date is set when creating the material
Planning file

1. The Planning file contains the details of the materials that are to be included for the MRP run.

2. MRP is to be activated for the plant, an entry for the material is to be made in the planning file for the specific plant for the MRP to happen.

3. MRP Run for a material occurs taking the information from the planning file.

T-Code for creating planning file → MD20 & in the background → MDAB
Activate MRP & setup planning file → OMDU
## Planning run type

Planning run type depends on the processing key in the MRP run screen.

<table>
<thead>
<tr>
<th>Processing key</th>
<th>Typ</th>
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</thead>
<tbody>
<tr>
<td>NETCH</td>
<td>N</td>
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<tr>
<td>NETPL</td>
<td>P</td>
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<tr>
<td>NEUPL</td>
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</table>

<table>
<thead>
<tr>
<th>Processing key</th>
<th>Net change for total horizon</th>
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<tbody>
<tr>
<td>NETCH</td>
<td>Net change planning in total horizon</td>
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<tr>
<td>NETPL</td>
<td>Net change planning in the planning horizon</td>
</tr>
<tr>
<td>NEUPL</td>
<td>Regenerative planning</td>
</tr>
</tbody>
</table>

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)
Planning Run Type- NETCH

1. In this run, the system considers those materials in the planning run from their last MRP run in the total horizon.

2. But then it depends if there was any change in

   Change in stock.
   Creation of PR’s; PO’s; etc.
   Any changes pertaining to receipts & issues.
1. In this run, the system considers those materials in the planning run which have undergone any change in the planning horizon as defined.

2. Here the number of materials to be taken for MRP Run can be restricted by defining the planning horizon.
Planning Run Type- NEUPL

1. It plans all the materials for the MRP Run irrespective of the changes they undergo.

2. This plan is not so widely used. It takes a long time to obtain the final result.
MRP 3

Material 20004442  Material for MRP demo
Plant 1035  Eastman Kodak Co Plant 1035

Forecast requirements
Period indicator M  Fiscal Year Variant  Splitting indicator

Planning
Strategy group
Consumption mode
Fwd consumption per. 0
Planning material
Pllng conv. factor
Bwd consumption per. 0  Mixed MRP

Availability check
Availability check 02  Tot. repl. lead time 0 days
Cross-project

Plant-specific configuration
ConfigurableMaterial
Variant  Planning variant
Configure variant  Configure planning variant
# MRP 4

<table>
<thead>
<tr>
<th>Material</th>
<th>20004442</th>
<th>Material for MRP demo</th>
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</thead>
<tbody>
<tr>
<td>Plant</td>
<td>1035</td>
<td>Eastman Kodak Co Plant 1035</td>
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**BOM explosion/dependent requirements**

- **Selection method**: 3
- **Component scrap (%)**: 0.00
- **Requirements group**: 
- **MRP dep.requirements**: 

**Discontinued parts**

- **Discontin. ind.**: 
- **Eff.-out**: 
- **Follow-up matl**: 

**Repetitive manufacturing / assembly / deployment strategy**

- **Repetitive mfg**: 
- **REM profile**: 
- **Action control**: 
- **Deployment horizon**: 0

**Average plant stock**

- **Material memo**: 
- **Material memo exists**: 

**Storage location MRP**

- **SLoc MRP indicator**: 
- **Reorder point**: 0
- **Spec.proc.type: SLoc**: 
- **Replenishment qty**: 0
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Planning Process

- The system checks the planning file
- The system calculates the net requirements for every material.
- The system calculates procurement proposals.
- Scheduling happens.
- The system determines the type of procurement proposals.
- During MRP run, the system checks some critical situations which need to be worked manually and hence it creates exception messages.

Planning can also happens at:
- Storage location
- MRP Areas
- Multi Plant/Site planning
Planning Run

- It can be run for a plant, group of plants, an MRP area, or several MRP areas.
- For a single material or product group.

Planning run can be:

- Total planning
- Single-item, single level planning
- Multi-level, single item planning
- Interactive planning
- Multi-level, make-to-order production
- Individual project planning

The system creates procurement proposals which can be planned orders, purchase requisitions, schedule lines.
Planning time fence & planning horizon

- This is specially useful in case of MPS scenario where one can save the procurement proposals from undergoing any change since the last planning run.
- No automatic changes happen to the procurement proposals once they enter in the planning time fence.
- Planning horizon is the period in which the materials which have undergone any changes are taken into MRP run.
Stock requirement list (T-Code—MD04)
Create PIR (T-Code—MD61)

Create Planned Independent Requirements: Initial Screen

Planned independent requirements for
- Material: 66
- Product group
- Remps Plan

Plant: 1835

Define version
Version: 00
REQUIREMENTS PLAN

Planning horizon
Planning period: M Month
## Create PIR

### Planning Table

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</tbody>
</table>

Planning start: 01.10.2008
Planning finish: 26.11.2009
Stock requirement list after creating PIR

<table>
<thead>
<tr>
<th>Date</th>
<th>MRP el.</th>
<th>MRP element data</th>
<th>Rescheduling d</th>
<th>Rec./recd. qty</th>
<th>Available qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.10.2008</td>
<td>Stock</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
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<tr>
<td>01.10.2008</td>
<td>IndReq</td>
<td>LSF</td>
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<td>IndReq</td>
<td>LSF</td>
<td></td>
<td>30-</td>
<td>50-</td>
</tr>
</tbody>
</table>
### MRP RUN (T-Code—MD02)

#### Single-Item, Multi-Level

<table>
<thead>
<tr>
<th>Material</th>
<th>66</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant</td>
<td>1035</td>
</tr>
</tbody>
</table>

#### Scope of planning

- [ ] Product group

#### MRP control parameters

<table>
<thead>
<tr>
<th>Processing key</th>
<th>Metch</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create purchase req.</td>
<td>2</td>
<td>Purchase requisitions in opening period</td>
</tr>
<tr>
<td>Delivery schedules</td>
<td>3</td>
<td>Schedule lines</td>
</tr>
<tr>
<td>Create MRP list</td>
<td>1</td>
<td>MRP list</td>
</tr>
<tr>
<td>Planning mode</td>
<td>1</td>
<td>Adapt planning data (normal mode)</td>
</tr>
<tr>
<td>Scheduling</td>
<td>1</td>
<td>Determination of Basic Dates for Planned</td>
</tr>
</tbody>
</table>

#### Process control parameters

- [ ] Also plan unchanged components
- [ ] Display results before they are saved
- [ ] Display material list
- [ ] Simulation mode
### Statistics
- Materials planned: 2
- Materials with new exceptions: 1
- Materials with terminated MRP list

### Parameters
- Pint: 1035
- Processing Key: NETCH
- Create Purchase Requisition: 2
- Sched. Agreement Schedule Line: 3
- Create MRP List: 1
- Planning Mode: 1
- Scheduling: 1

### Database statistics
- Planned orders created: 2
- Dependent requirements created: 2

### Run-time statistics
- Start of planning run: 20:16:24
- End of planning run: 20:16:25
- Planning run time: 00:00:01

### Ranking List of Materials with Highest CPU Times (in ms)
## Stock requirement list after MRP Run

### Stock/Requirements List as of 20:17 Hrs

<table>
<thead>
<tr>
<th>Material</th>
<th>Plant</th>
<th>MRP type</th>
<th>PD</th>
<th>Material Type</th>
<th>HALR</th>
<th>Unit</th>
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<th>Available qty</th>
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<tr>
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<th>Rescheduling d.</th>
<th>Rec./reqd qty</th>
<th>Available qty</th>
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<td>22.10.2008</td>
<td>Stock</td>
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</table>
Topics

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Lot Sizing Procedure

Lot Sizing procedure gives the quantity either to be procured or to be produced.

This can be defined in the lot sizing procedure in customizing for MRP in Check Lot-sizing procedure OR directly can be defined using T-code – OMI4.

Three groups of Lot Sizing procedures are available:

1. Static lot-sizing procedures
2. Period lot-sizing procedures
3. Optimum lot-sizing procedures
## Lot Sizing Procedure

<table>
<thead>
<tr>
<th>LS</th>
<th>LS</th>
<th>LI</th>
<th>Pds</th>
<th>LLP</th>
<th>LLI</th>
<th>LPer</th>
<th>Description</th>
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<td>0</td>
<td>LLP</td>
<td>0</td>
<td>0</td>
<td>Dynamic lot size creation</td>
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<td>EX</td>
<td>S</td>
<td>E</td>
<td>0</td>
<td>LLP</td>
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<td>0</td>
<td>Lot-for-lot order quantity</td>
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<tr>
<td>FS</td>
<td>S</td>
<td>S</td>
<td>0</td>
<td>LLP</td>
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<td>0</td>
<td>Fixing and splitting</td>
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<td>S</td>
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<td>Groff reorder procedure</td>
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<td>S</td>
<td>H</td>
<td>0</td>
<td>LLP</td>
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<td>0</td>
<td>Replenish to maximum stock level</td>
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<tr>
<td>MB</td>
<td>P</td>
<td>M</td>
<td>1</td>
<td>LLP</td>
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<td>0</td>
<td>Monthly Period Start = Delivery Date</td>
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<tr>
<td>MD</td>
<td>P</td>
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<td>S</td>
<td>E</td>
<td>0</td>
<td>LLP</td>
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<td>1</td>
<td>LLP</td>
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</tr>
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<td>P</td>
<td>K</td>
<td>1</td>
<td>LLP</td>
<td>0</td>
<td>0</td>
<td>Period lot size acc. to plng calendar</td>
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<td>O</td>
<td>S</td>
<td>0</td>
<td>LLP</td>
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<td>0</td>
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<td>P</td>
<td>T</td>
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<td>LLP</td>
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<td>W</td>
<td>2</td>
<td>LLP</td>
<td>0</td>
<td>0</td>
<td>Bi-weekly (Finish=Rqts Date) (Kodak)</td>
</tr>
<tr>
<td>WB</td>
<td>P</td>
<td>W</td>
<td>1</td>
<td>LLP</td>
<td>0</td>
<td>0</td>
<td>Weekly lot size</td>
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<td>WF</td>
<td>P</td>
<td>W</td>
<td>1</td>
<td>LLP</td>
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<td>0</td>
<td>Weekly-Delivery Date=Week End Date</td>
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<tr>
<td>WI</td>
<td>O</td>
<td>W</td>
<td>0</td>
<td>LLP</td>
<td>0</td>
<td>0</td>
<td>Least unit cost procedure</td>
</tr>
<tr>
<td>Z1</td>
<td>P</td>
<td>K</td>
<td>1</td>
<td>LLP</td>
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<td>0</td>
<td>Lot sz acc.to plng clndr:Start=dely dt</td>
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<tr>
<td>ZK</td>
<td>P</td>
<td>K</td>
<td>1</td>
<td>LLP</td>
<td>P</td>
<td>K</td>
<td>Lot sz acc.to plng clndr:dely dt=CalStDt</td>
</tr>
</tbody>
</table>
Static Lot Sizing Procedure

- In this, the procurement quantity is calculated based on the specifications mentioned in the material master.

- The different procedures in this are:-
  1. Lot for lot
  2. Fixed lot size
  3. Fixed lot size with splitting & overlapping
  4. Replenishment up to maximum stock level.
Period Lot Sizing Procedure

- In this, the system groups the requirements in the defined period and creates a lot.

- The period can be defined in days, weeks, months, periods of flexible length equal to posting period, freely definable periods according to planning calendar.

- Splitting and overlapping can also be done.

- The system sets the availability date to the first requirement date within the period, or the availability date can be set either at the beginning or at the end of the period.
Optimum Lot Sizing Procedure

- In the static or period lot sizing, the cost are not taken into consideration.

- Here the requirements are grouped together in a way which will reduce the cost.
Traffic lights
Traffic lights

- Materials are defined by traffic lights in the stock requirement list to indicate the urgency of the materials to be processed.

- Traffic lights can be defined based on the ranges of coverage and exception groups which can be customized based on the priority.

- To define the traffic light, go to stock requirement list (MD04), then push the overview tree button at the top left corner, it will show the traffic lights against the material. Right clicking the traffic light will pop up the dialog screen where-in the ranges of coverage and exception group can be defined.
Topics

1. What is MRP
2. Master data for MRP
3. MRP Procedures
4. Planning Process
5. Lot sizing Procedure
6. Traffic lights
7. ATP (Available to Promise)
ATP (Available to Promise)

1. During ATP, the system checks that all issues are covered by existing receipts.

2. Hence, if any quantities are left to cater new issues. This is **ATP** Quantity.
ATP (Available to Promise)

It can be done at various stages, in the business:

At Sales and distribution ➔ When creating the Sales order, availability check is carried to know whether the delivery can be done at the required date.

Planned order processing ➔ When converting a planned order into a production order, to know the material availability to fulfill the production order.

Production order processing ➔ When processing production orders, to know the material availability.

Inventory Management ➔ When changing reservations, or doing goods issue, an availability check can be done to know whether it can fulfill the requirement and also whether it affects the availability of other elements.
ATP (Available to Promise)

ATP calculation is as follows:

The receipts (warehouse stock, planned orders, purchase requisitions) are dynamically allocated to the issues (customer requirements, PIR’s, reservations), which lie directly after them on the time axis. The calculation is carried out in such a way that the issue is allocated to the receipt that lies nearest to it and that still has a positive ATP quantity.

If the ATP quantity of this receipt does not cover the issue then the system will search for and check the next nearest receipt (always in a backwards direction) for a positive ATP quantity, which will then also be allocated to the issue.

If receipts do not cover the issue, you must then decide whether you reduce the requirements quantity as necessary or whether you move the requirements date so that requirements coverage can be reached again.
Availability check

Availability Check at Plant Level

<table>
<thead>
<tr>
<th></th>
<th>Quantity Received</th>
<th>Issue Quantity</th>
<th>ATP Quantity</th>
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<tr>
<td>Plant Stock</td>
<td>1000 pc.</td>
<td></td>
<td>300 pc.</td>
</tr>
<tr>
<td>Receipt 1</td>
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<td></td>
<td>0 pc.</td>
</tr>
<tr>
<td>Issue 1</td>
<td></td>
<td>1200 pc.</td>
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</tr>
</tbody>
</table>
## Availability check

### Availability Check at Storage Location Level

<table>
<thead>
<tr>
<th></th>
<th>Quantity Received</th>
<th>Issue Quantity</th>
<th>ATP Quantity</th>
</tr>
</thead>
<tbody>
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<td>Plant stock</td>
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<td>300 pc.</td>
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</tr>
<tr>
<td>Receipt 1</td>
<td>500 pc.</td>
<td></td>
<td>0 pc.</td>
</tr>
<tr>
<td>Issue 1</td>
<td></td>
<td>1200 pc.</td>
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<tr>
<td>Storage 1</td>
<td>800 pc.</td>
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<tr>
<td>Issue 2</td>
<td></td>
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</tr>
<tr>
<td>Storage 2</td>
<td>200 pc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Availability check

Availability Check at Batch Level

If only one batch is entered, the check is carried out on two levels, first against the batch and then against the plant stock.

If a batch and a storage location are entered, the check is carried out on four levels, first against the batch storage location, then against the batch, the storage location and the plant stock.

Availability Check for Individual Customer Stocks and Project Stocks

Individual customer stocks and project stocks are maintained separately in the system and are not contained in plant stock. If an issue is made from individual customer stock or project stock, the availability is checked only for this particular customer stock.