Holcim

Strength. Performance. Passion.

Material Requirements Planning (MRP)

Basic Principles

The goals of maintenance materials planning

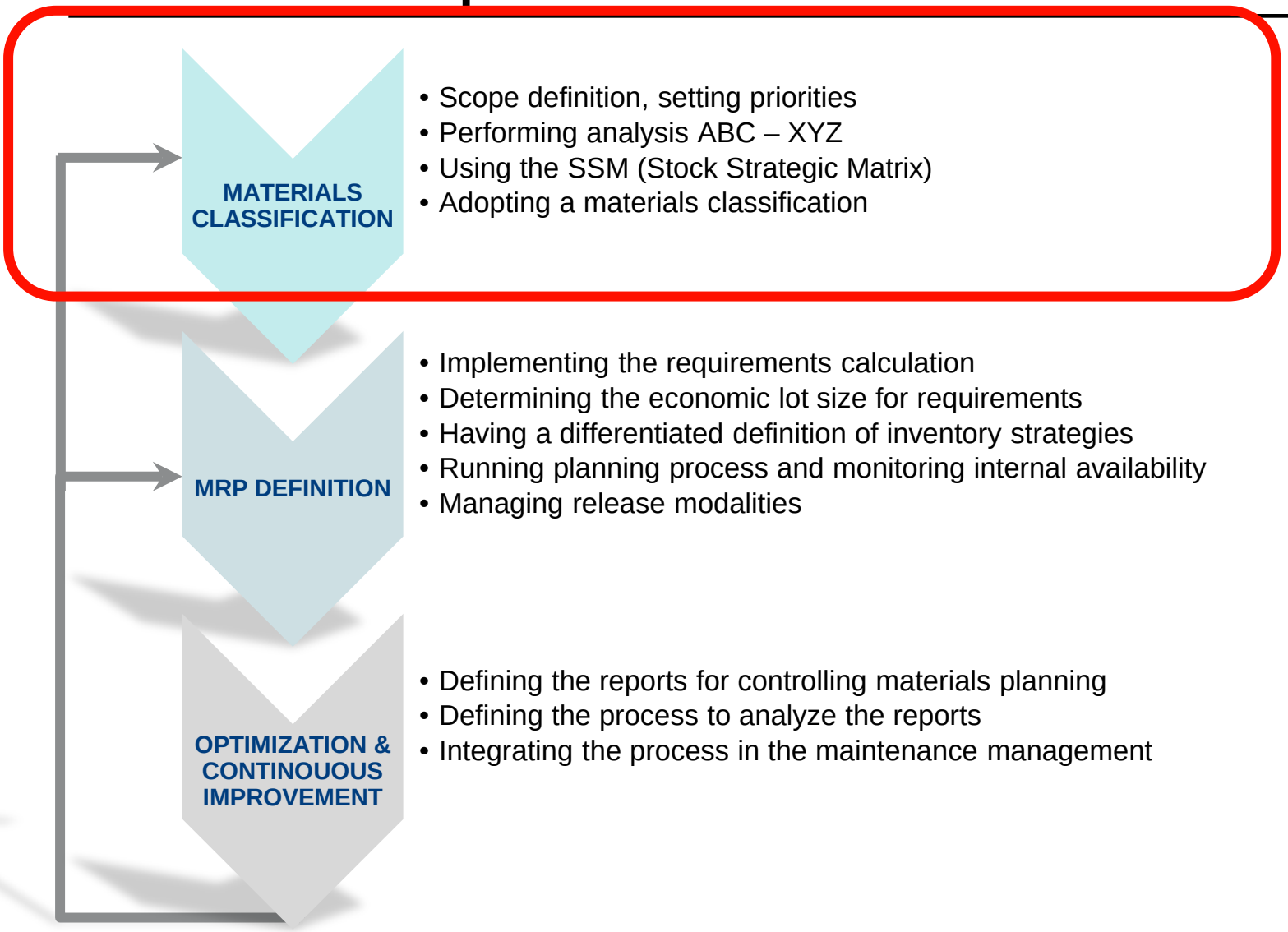
The goal of maintenance materials planning is to ensure an optimum supply of materials to a business, by…

- Maximizing the availability of materials
- Minimizing the warehouse stock
- Maximizing the level of service

- ***To achieve this goals, materials planning must have a cross functional collaboration***

- ***Production, Maintenance and Procurement team work!***

The three main processes in MRP and their main tasks



Why Materials Classification?

If your business doesn't have item classification, it won't have an MRP strategy, and if it doesn't have an MRP strategy, you won't achieve materials planning goals such as a reduction in your inventory.

Materials Classification

Available definitions for classification of maintenance materials:

- PCS
  - 03 Maintenance Spare Parts
  - 04 Wear parts, Consumable Material
- HARP
  - Critical Spare Parts
    - Parts which are not expected to be used within the next 12 months
    - The value is above USD 20’000
  - Obsoletes
    - Parts not used, on stock for years or damaged
- “Critical Spare Parts” from maintenance point of view
  - Stockout of these parts have a considerable impact on production

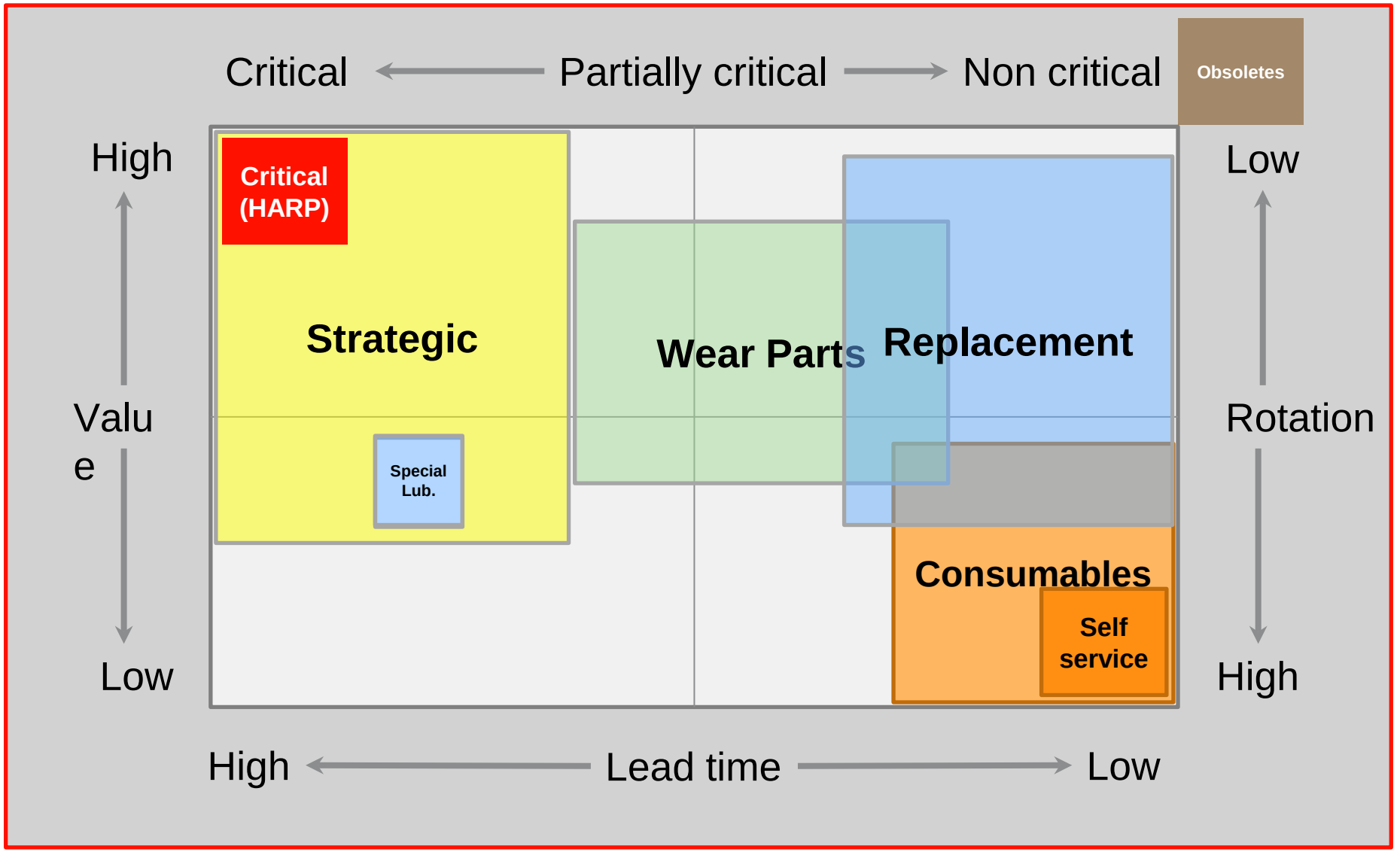
Materials Classification (1 of 2)

- For facilitating the set up of MRP process it is recommended to define groups of materials using the previous definitions…
  - Critical Spare Parts according HARP. (PCS 03, 04)
    - Do not need to be considered in the MRP process
    - To be transferred from inventory to PPE
  - Obsolete materials. (PCS 03, 04)
    - Do not need to be considered in the MRP process
  - “Critical” materials from maintenance point of view. (PCS 03, 04)
    - Specific parameters like safety stock are result of risk analysis, equipment history and actual performance
    - Nomenclature can be changed to *Strategic* to distinguish Critical Spare Parts from HARP

Materials Classification (2 of 2)

- Wear Parts. (PCS 04)
  - Replenishment based in max and min when used in different equipment
  - Medium consumption and values
- Maintenance Spare Parts. [PCS 03, 04 (lubricants)]
  - Lubricants + [PCS 03 – (Critical + Strategic + Obsoletes)]
  - Parameters to be set up according its consumption
  - Nomenclature can be changed to *Replacement*
- Consumable Material. (PCS 04)
  - Part of them to be considered in self-service strategy
  - Low value and high consumption by max and min

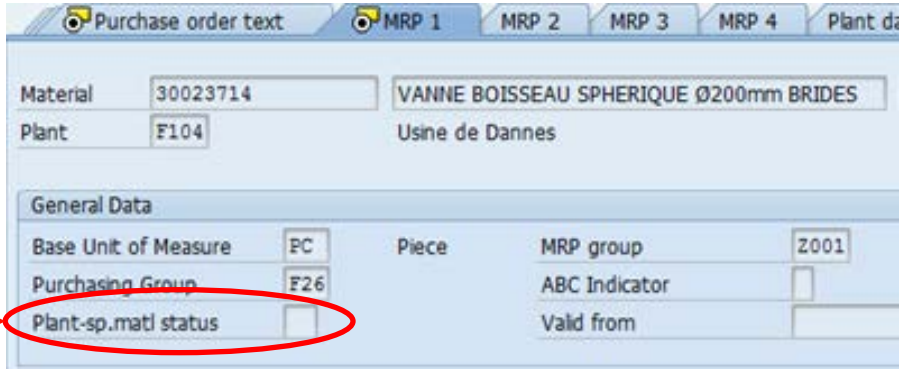
Typical material distribution according the previous material classification



Identifying critical and obsolete materials according HARP

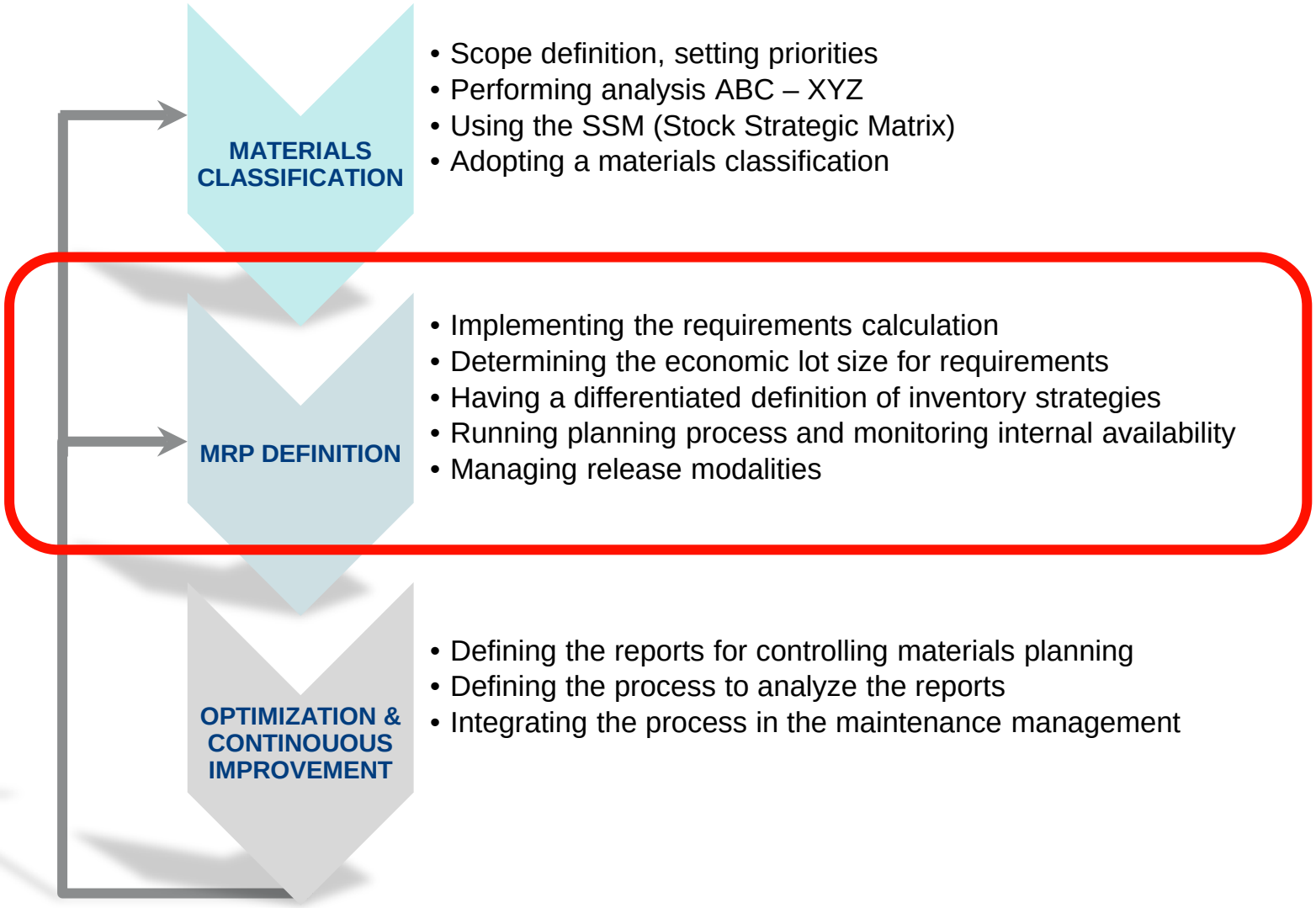
Execute the reports MC46 Slow-moving and MC50 Dead Stock

- For **Critical Spare Parts**
  - Identify critical materials which match with HARP rules and treat them accordingly
    - Valuation Class: 8104 with a PPE account
    - Plant Specific Material Status: CR (to exclude from Slow-moving report)



- For **Obsolete** materials
  - Materials without movement have to be considered in the Inventory Optimization Program
  - Remove them from the books and physically

The three main processes in MRP and their main tasks



MRP. Defining the responsibilities

- To coordinate and monitor the materials more effectively, clear R&R for an MRP controller must be established.
- The main tasks to be performed by the MRP controller, are:
  - Serving as a link between functions
  - Maintaining MRP materials master data (define MRP procedures and lot sizing)
  - Executing materials planning regularly
  - Analyzing materials planning on a quantitative and qualitative basis, and
  - Ensuring the closing of outstanding open objects (e.g. purchase orders, reservations and work orders)

MRP. Requirements calculation

- Its purpose is to determine requirement quantities and delivery dates for materials

- The MRP procedures are determined for each material.

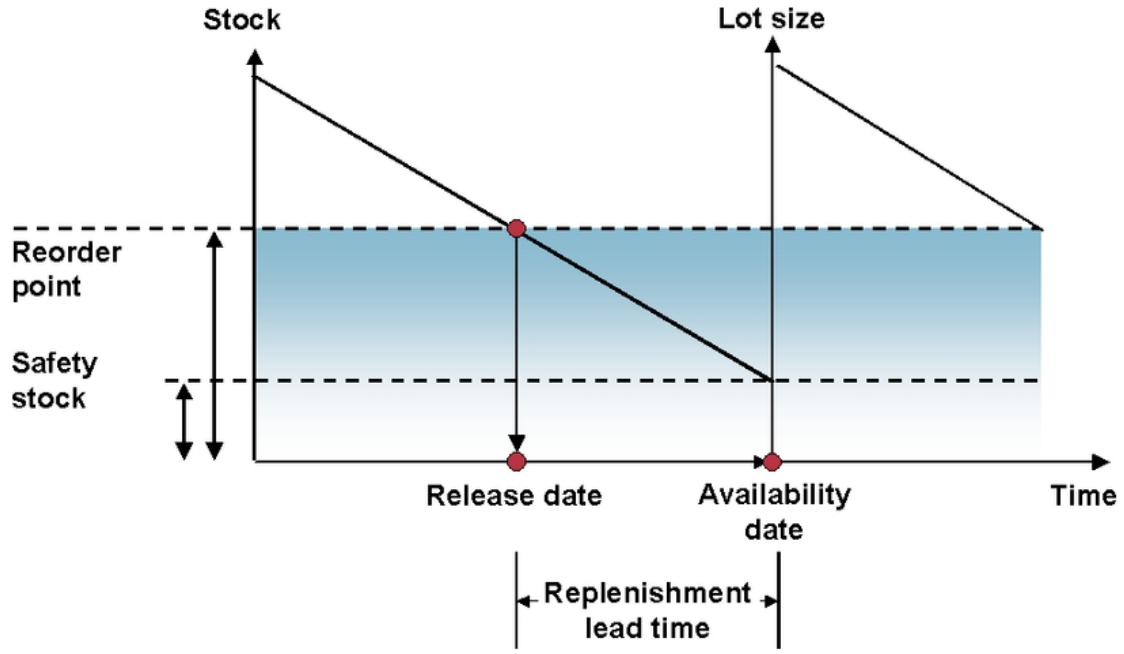
- MRP considers two standard procedures:
  - Traditional Material Requirements Planning
  - Consumption-based planning
    - Reorder Point Method, Manual and Automatic
    - Forecast-based Planning

MRP. Requirements calculation (Procedures)

- The 5 most applicable for maintenance materials are:
  - In traditional Material Requirement Planning
    - MPR **PD** (Plan on Demand). *If there is demand (work order) and the MRP run gets executed, a supply proposal is generated to cover that demand.*
  - In Consumption Based Planning
    - MRP **VB** (manual reorder point: ROP). *Reorder level is set manually and MRP just simply creates a supply proposal when inventory breaks through that level*
    - MRP **V1** (manual reorder point with external requirements). *Also uses external requirements, like a work orders, within the replenishment lead time only, to calculate when the reorder level is broken*
    - MRP **V2**. *This is a variant of the V1 type; it differs only in that the ROP is calculated automatically by the system and its not set manually by the user*
  - MPR **ND** No Planning Materials, *does not trigger any material requirement planning for the material*

The reorder point should cover the average material requirements expected during the replenishment lead time.

- The safety stock exists to cover both excess material consumption within the replenishment lead time and any additional requirements that may occur due to delivery delays. Therefore, the safety stock is included in the reorder level.
- Define both the reorder level and the safety stock level manually in the appropriate material master.



MRP procedures, general recommendations

- MRP type PD for “JIT” strategy, work order reservation:
  - For “strategic” materials (consider stock based in risk analysis)
    - E.g.: electronic components, bearings in critical equipment, etc.
  - High/medium value and low consumption (normally stock zero)
    - E.g.: gear couplings, gear boxes, etc.

- MRP type VB for items with regular consumption (same quantity periodically)
  - Consumables with high/medium consumption which don not have consumption variations
    - Max and min based on yearly consumption

MRP procedures, general recommendations

- MRP type V1 is recommended for items with regular consumption and moderate deviation
  - Materials with seasonal consumption (shutdown)
  - Materials which need to be reserved via work order
  - Max and min based on yearly consumption

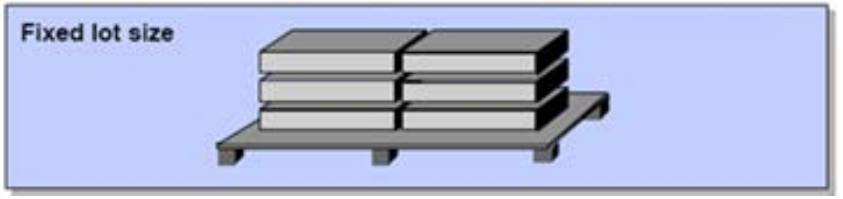
- MRP type V2 is recommended for using the system to calculate de values for min, max, etc.
  - All materials which have had more than 3 consumptions in a year

- MRP type ND is recommended for items in which a stock strategy is not needed
  - Critical materials according HARP
  - Materials for self service strategy (consumables)

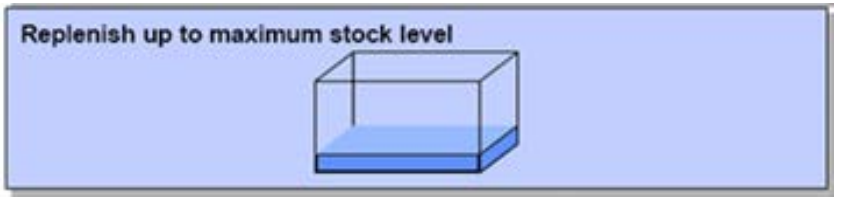
MRP. Determining lot – sizing procedure

There are 3 possibilities to calculate the quantity to be purchased

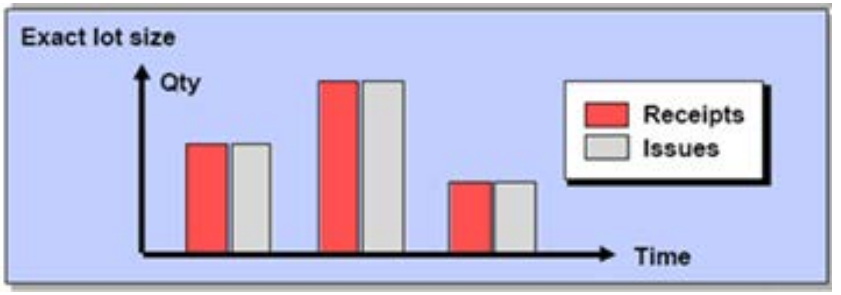
- **Lot size "FX":**
  - For ordering a fixed standard quantity in the event of a shortage



- **Lot size "HB":**
  - For replenishment to the maximum stock level

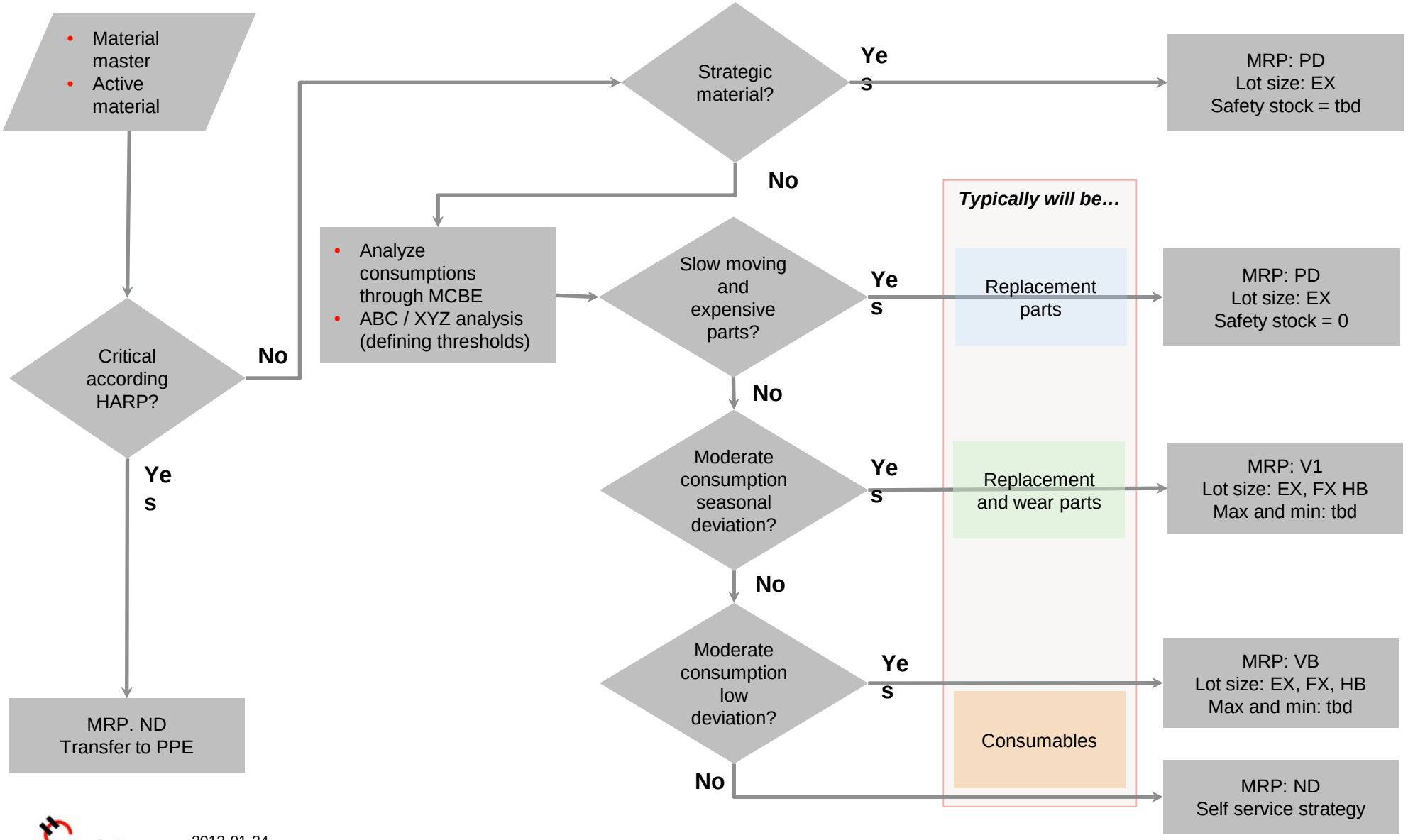


- **Lot size "EX":**
  - For ordering a lot-for-lot order quantity

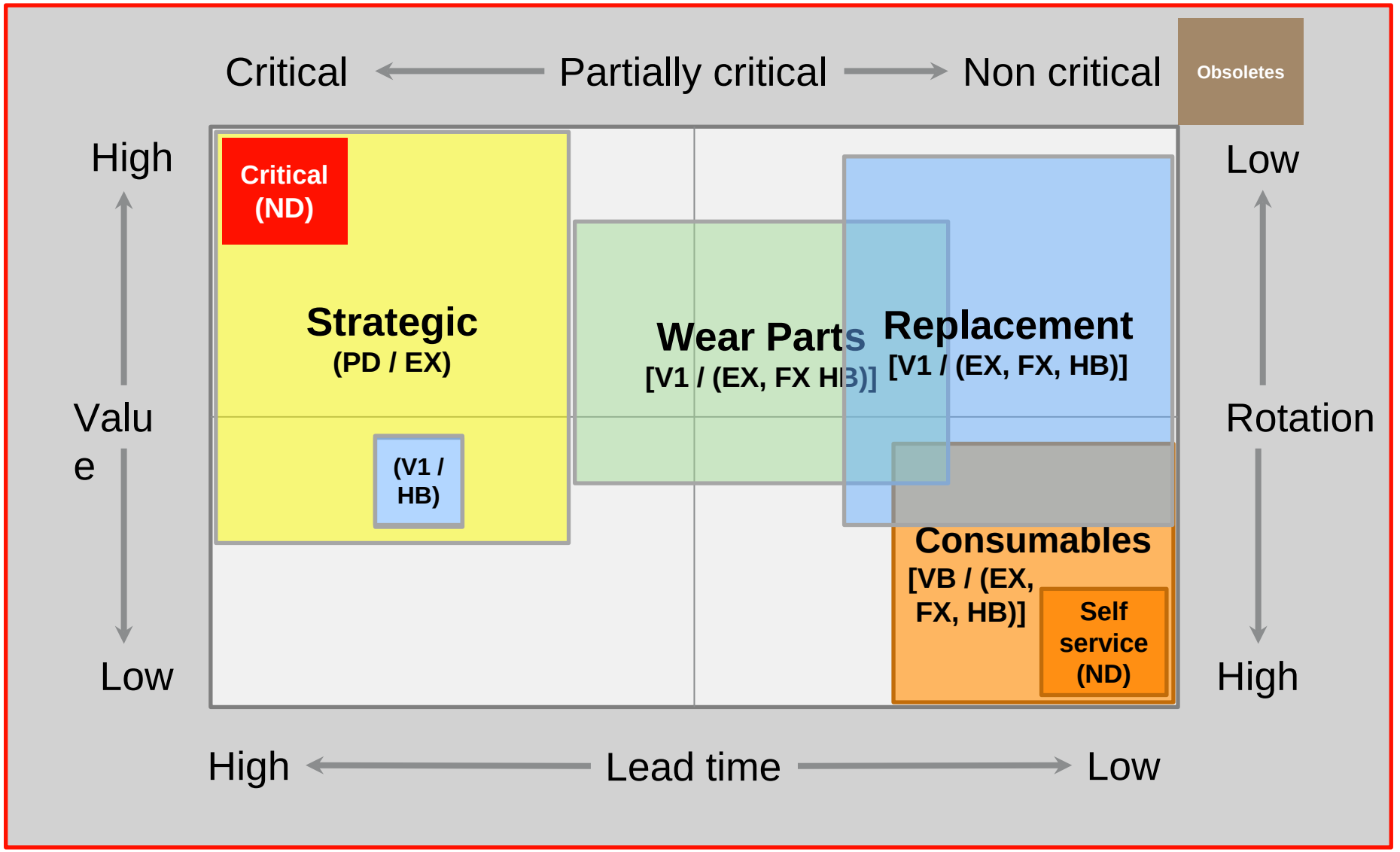


- *(To fix the quantity or level in each material, specific formulas as Reorder Point, EOQ (Economic Order Quantity) must be used)*

Setting MRP and lot sizing procedures



Proposed MRP procedures according to a Stock Strategy Matrix in function of a Materials Classification



MRP. Defining the values for max, min, safety stock

- Probably one of the major concerns is how to set up the right and safe values for each material, without compromising its availability on the attempt to optimize the inventory levels
- In a first approach, it is important to know for each material its annual consumption and decide whether or not it is needed to have it in stock. For such analysis the MCBE transaction can be used

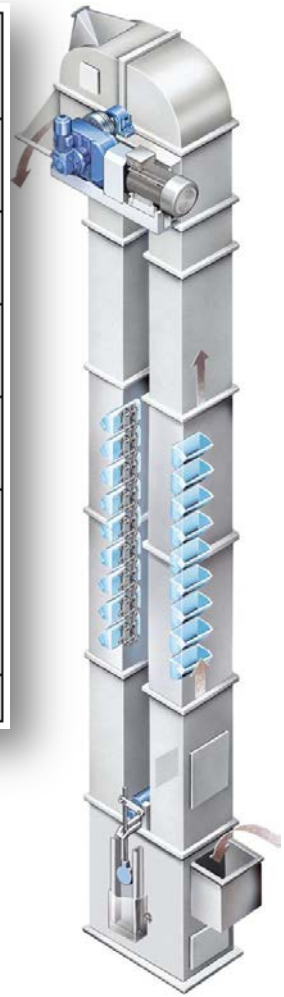
Material	CtdEntrStkVal	CtdSalidStkVal	Consumo total
Total	798,000 UN	24,000 UN	184,000 UN
30255393	691,000 UN	0,000 UN	160,000 UN
30238651	102,000 UN	22,000 UN	22,000 UN
30238648	2,000 UN	2,000 UN	2,000 UN
30315404	1,000 UN	0,000 UN	0,000 UN
30314079	2,000 UN	0,000 UN	0,000 UN

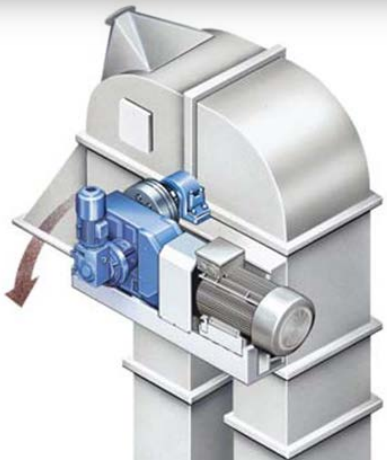
Example for consumptions of some materials in a period of one year using MCBE transaction.

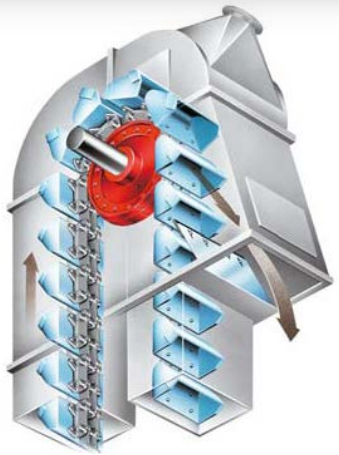
- As a general rule can be established that if a specific material has more than 3 consumptions in a year, it is necessary to have it in stock
- The MRP procedure V2 can be used for those materials just for getting the proposal of the system for the min and max values using the MP38 transaction

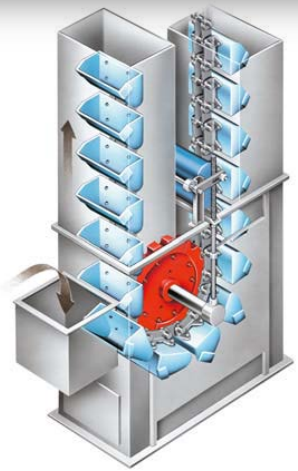
Example for a bucket elevator

	CROWS	Unit	MRP	Lot size	Reorder point	Min lot size	Max lot size	Max stock level	Safety stock	Remarks
Motor	R	pc	PD	EX						Highly predictable
Motor bearings	R	pc	V1	HB	2			3		In several equipment
Hydraulic coupling	S	pc	PD	EX					1	Dificult to predict
Gear box	CR	pc	ND							According HARP
Oil for gearbox	R	lt	V1	HB	360	180	900	900		In several equipment
High speed train	S	set	PD	EX					1	Lead time higher than some P-F interval
Geared coupling	R	pc	PD	EX						No stock required
Bearing housing	R	pc	V1	EX	1	1	1	2		In other equipment / low consumption
Sprocket wheel	W	pc	V1	EX						Highly predictable
Chain	W	mts	V1	FX	4	2	8	8		Min and max required for unexpected events
Buckets	W	pc	V1	FX	6	1	6	12		
Bucket screws and nuts	C	pcs	VB	HB	100	50	100	200		In several equipment
Body screws and nuts	C	pc	ND							Self service strategy









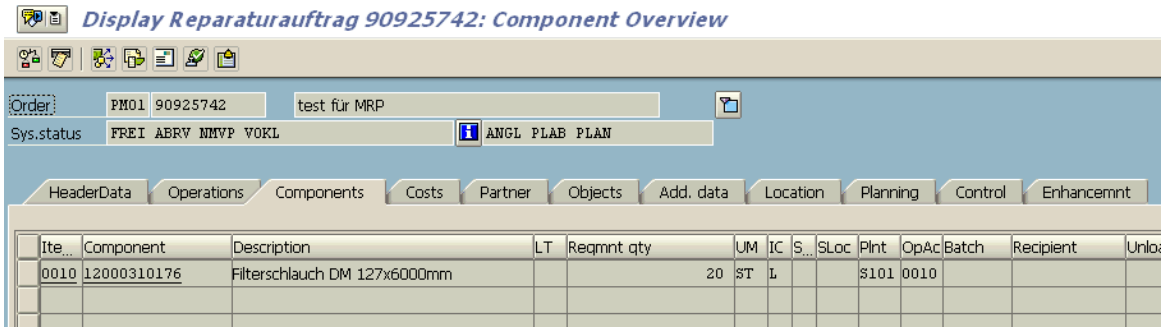
MRP examples

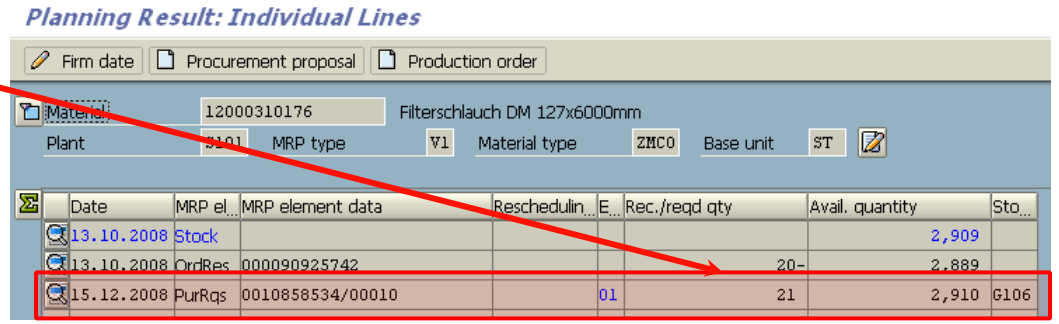
MRP Characteristics

- MRP V1 (ROP + ext. requirements)
- Lot size EX, exact amount to cover the necessities
  - (ROP – stock) + ext. requirements = 21

MRP Settings		Test Data	
MRP type	V1	Stock level	2909
Reorder Point	2910	Ext. Requirements	20
Lot size	EX		
Min lot size	1		
Max lot size	2920		
Max stock level	-		

Operation of the work order





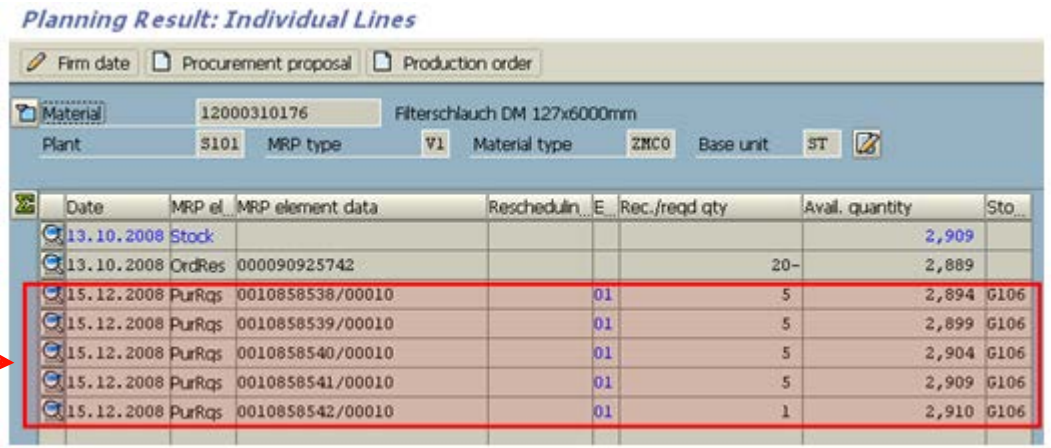
MRP examples

MRP Characteristics

- MRP V1 (Same as previous with the variants in lot size)

MRP Settings		Test Data	
MRP type	V1	Stock level	2909
Reorder Point	2910	Ext. Requirements	20
Lot size	EX		
Min lot size	1		
Max lot size	5		
Max stock level	-		

- The system generates several PR due to the max lot size field is set in 5, instead of create only one for 21



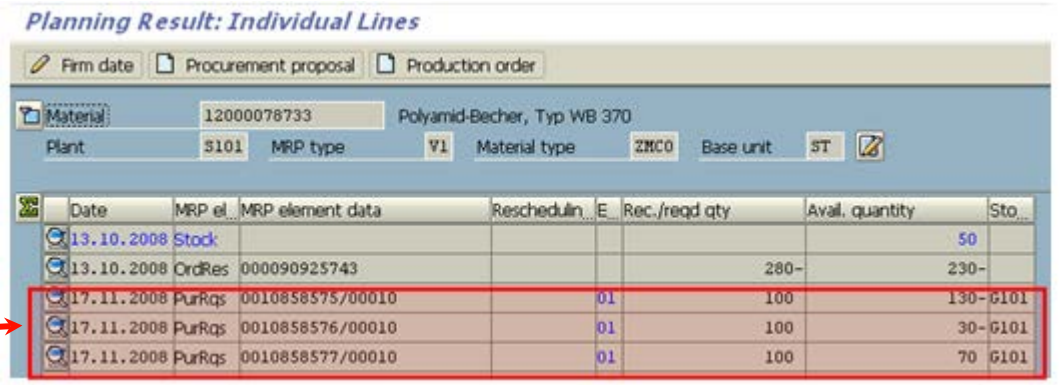
MRP examples

MRP Characteristics

- MRP V1, ROP and external requirements
- Lot size FX (fixed lot size)

MRP Settings		Test Data	
MRP type	V1	Stock level	50
Reorder Point	50	Ext. Requirements	280
Lot size	FX	Fixed Lot Size	100
Min lot size	-		
Max lot size	-		
Max stock level			

- Notice that the system cannot generate a PR for 30 due to the limitation of the fix lot size which is equal to 100



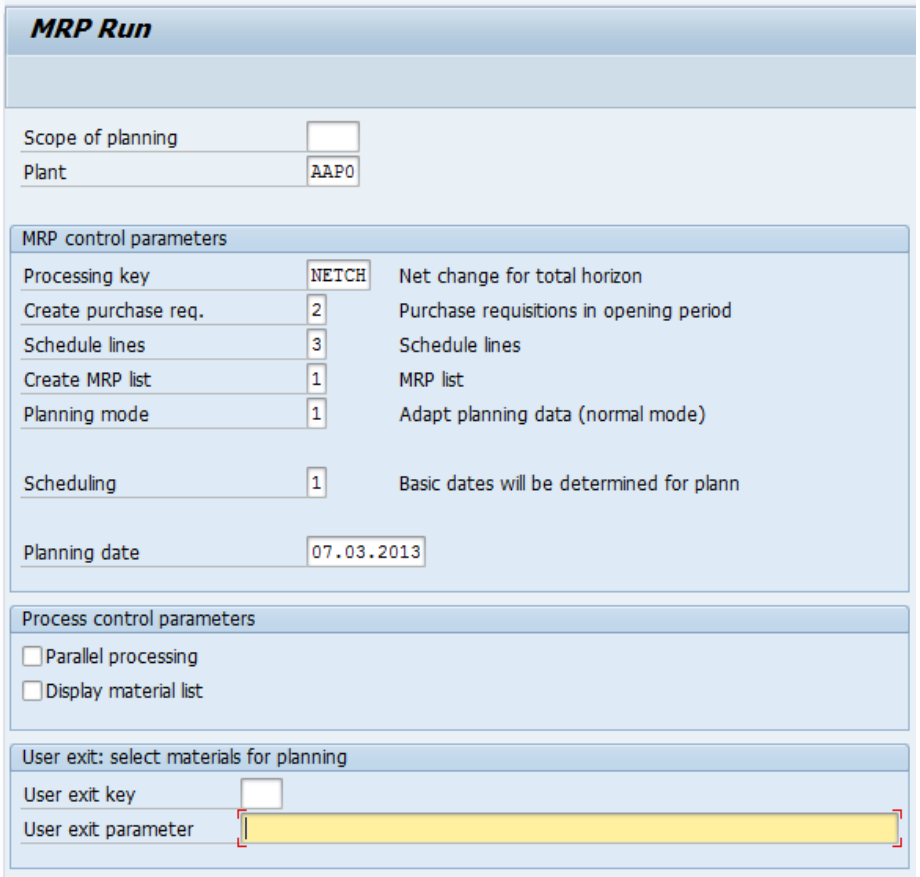
MRP Planning process. MD01

- **Planning run type:** for choosing whether all materials are to be planned or only those with MRP relevant changes.

- **Creation indicator for procurement proposals for materials that are procured externally:** for choosing whether planned orders, purchase requisitions or schedule lines should be created for materials that are procured externally.

- **Creation indicator for MRP lists**: for defining whether MRP lists are to be created.

- **Planning mode:** for determining how the system is to deal with procurement proposals (planned orders, purchase requisitions, scheduling agreement lines) from the last planning run, which are not yet firmed, in the next planning run.



Evaluation of the Planning results

During the planning process, the system automatically creates **procurement proposals**.

- They specify when the good receipt should be posted and the expected stock quantity.
- The most important order proposals for maintenance are Purchase Requisitions.
- The system creates MRP lists during the planning run
- These lists contain the planning result for the material.
- The MRP list always displays the stock/requirements situation at the time of the last planning run and it also provides a work basis for the MRP controller (static list)

MRP. Releasing modalities

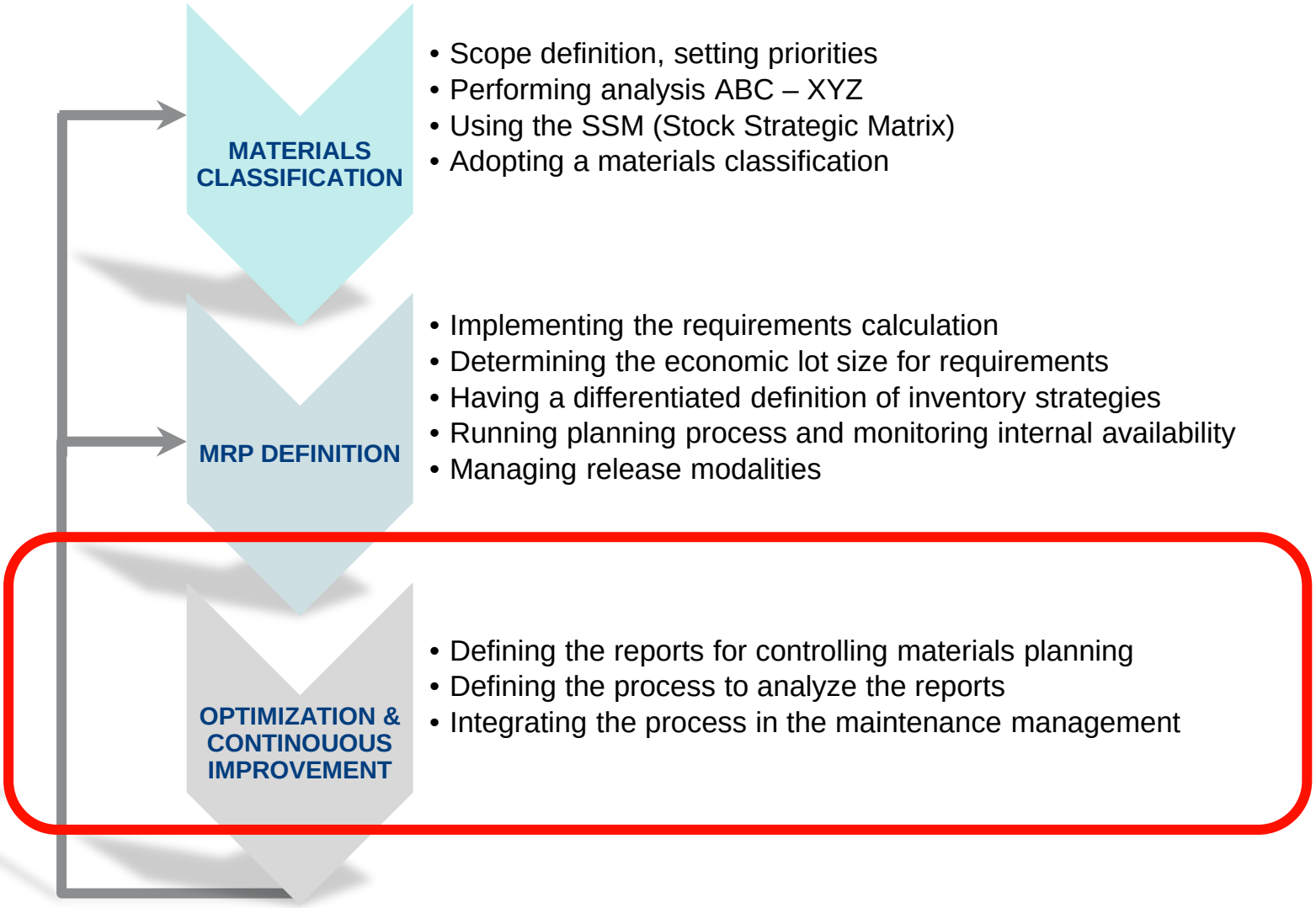
To ensure the optimal function of the system, it's necessary to review and install (if needed) new approval processes

- For instance, materials with high cost – low movement, must be approval at least for managerial level. *(Approval policies can vary from region to region.)*
- It's compulsory that prior of approval of a purchase request status on inventory must be reviewed using inventory management cockpit by MRP controller

Basic and MRP Data Report

Material	Plant	Material Description	MTyp	Unit	Matl Group	High Stock	OverStock
40008450	B100	FUSIBLE COUTEAU 400A 690V+PERCUT.BUSSMAN	ZCON	PC	030705	8	481,76

The three main processes in MRP and their main tasks



MRP Optimization.

- Materials planning generally has a high potential for optimization
- MRP controller is often responsible for lots of items
- Due to the numerous MRP parameters and interactions, key reports must be integrated in the management system to ensure its systematic analysis
- Materials requirement planning optimization is a continuous process that is used to keep materials management up to date and enhance the usage of the MRP

- SAP offers many reports for optimization, the following are only some which can have big impact in achieve the main goal

MRP Optimization. Key reports

MRP list and stock requirements (MD15)

- In MRP execution, this is the first report used to analyze the current stock/requirements
- This report allows the MRP controller to assess the current planning situation or the result of an MRP execution
- Recommended frequency for analysis: same time of MRP
- Output: revision of…
  - Purchase requisitions
  - Purchase orders
  - Schedule agreements
  - Stock reservations
  - Stock levels

MRP Optimization. Key reports

Materials reserved vs. materials issued report (ZMM512)

- This is a simple report which shows the materials reserved by a work order which are still in the warehouse after the required date. *(Note that it is not a SAP standard report but is used in some plants.)*
- Recommended frequency for analysis: Weekly in the maintenance planning meeting
- Output:
  - Actions for improving the planning process
  - Revision of the approval process for work orders

REPORTE DE INVENTARIOS: ENTRADAS y SALIDAS

FECHA DE EJECUCION: 14. Enero 2013

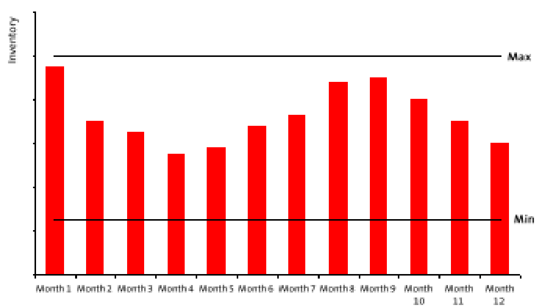
PERIODO: 01. Enero 2013 TO 20. Enero 2013

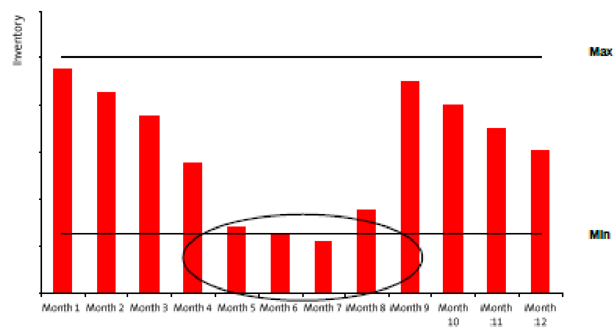
Material	Texto breve material	Clase de v	Cantidad I	Importe E	Cantidad S	Importe S	Ent. Vs Sal. ML	Responsable
30283491	ELEMENTO CONEXION 3SB14 00-0A	NUEVO	1	335.03	0	0	335.03	Enrique Rosales
30375594	FILTRO ACEITE P16 5705	NUEVO	1	547.5	0	0	547.5	Guillermo Cruz
30388859	HYS FILTRO 1624654	NUEVO	1	3,523.91	0	0	3,523.91	Guillermo Cruz
30378089	ACO FILTRO 2906700200-QD390	NUEVO	1	8,305.55	0	0	8,305.55	Ivan García

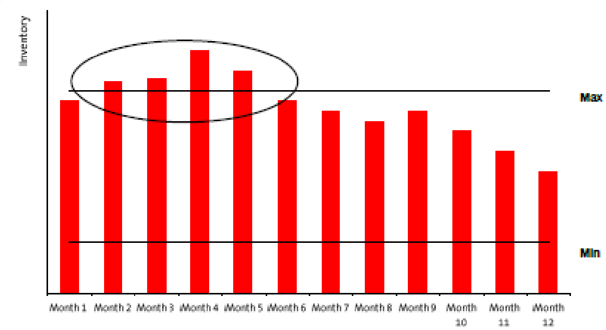
MRP Optimization. Key reports

Maximum – Minimum stock value analysis (MP38)

- This analysis is intended for monitoring and tracking the stock value trend of materials ordered using MRP
- Recommended frequency for analysis: Monthly
- Output:
  - Redefinition of Min – Max in agreement with maintenance
  - Revision of lead time settings
  - Revision the consistency of MRP



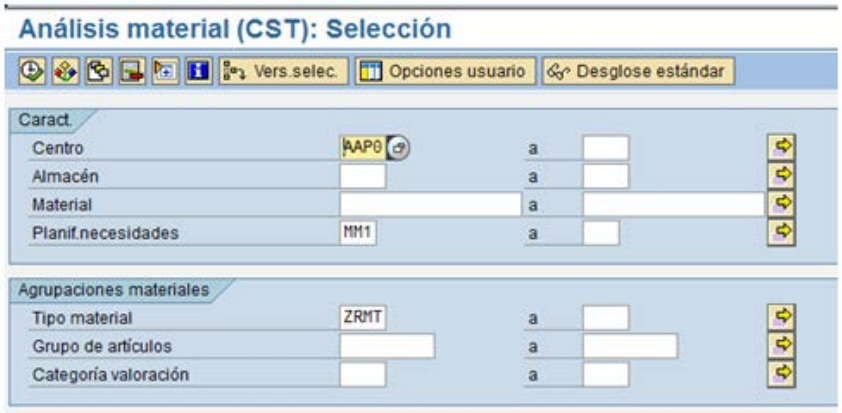


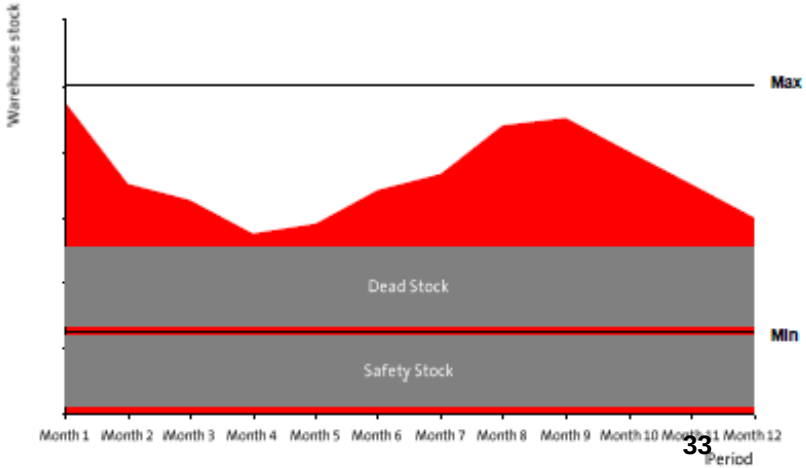


MRP Optimization. Key reports

Dead stock analysis (MCEB)

- Relates to that part of the warehouse stock that has not moved for a certain period of time
  - It helps to identify excessively high stock levels
  - It generally occurs when slow-moving items are continually replenished even when they are not needed
- Recommended frequency: every six months
- Output:
  - Recalculation of safety stock parameters





Conclusion, remarks

- Prior any attempt to formalize an MRP, it is compulsory to have a material definition & classification
- Consumption-based planning requires a well functioning inventory management system that is always up to date
- An approval Purchase Requests process must be considered
- The lead time is one of the most sensitive parameters, as its proper selection or calculation affects the overall planning in the system
- MRP must be executed in a systematic manner and its frequency must fulfill the requirements
- A monitor system to measure the performance must be in place as part of the maintenance management system

Conclusion, remarks

This is neither Procurement nor Maintenance task, it is a cross-functional task and hence its key success is the Team Work

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How to get a sustainable maintenance spare parts management?

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