



# Preventive Maintenance

SAP Maintenance Training



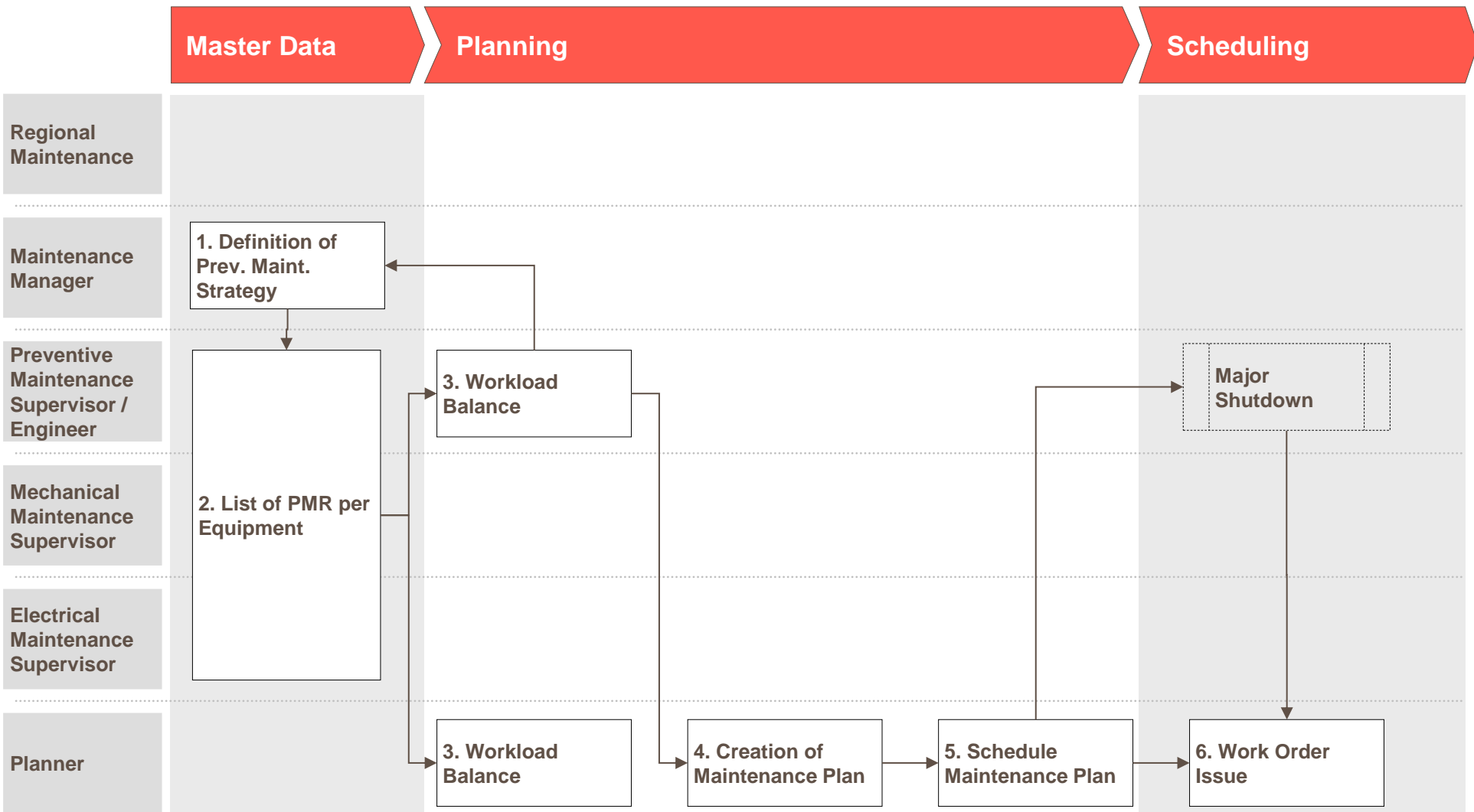
**LafargeHolcim**

# Objectives of the Module

- Understand what are the prerequisites before the preventive maintenance program can be set up in SAP
- Understand which components in SAP are used for preventive maintenance and how they work:



# Process Map



# Process Overview

<b>Process Objectives</b>	<p>Preventive Maintenance are cost-effective maintenance tasks carried out at predetermined intervals to check the current physical condition, to reduce probability and/or impact of a failure in operation, or to maintain a desired level of performance of an equipment</p> <p>The objective of this process is to establish a systematic approach to implement, control and update the Preventive Maintenance program.</p> <p>This process intends to establish a homogeneous standard system in Holcim to assess it and evaluate the Preventive Maintenance flow in practice and in SAP PM.</p> <p>The main elements of the assessment of the Preventive Maintenance are:</p> <ul style="list-style-type: none"> <li>• Task lists: definition of the sequence of maintenance tasks and resources for work planning and scheduling.</li> <li>• Work load balance: establishing a constant preventive tasks work load taking account the frequency and the risk profile.</li> <li>• Maintenance Strategies: definition of the rules and general scheduling information for preventive maintenance activities.</li> <li>• Maintenance Items: the objects to identify the maintenance tasks required at regular interval.</li> <li>• Maintenance Plans: specification of the dates, sequences and tasks to be performed upon maintenance objects.</li> </ul>
<b>Key Inputs</b>	<ul style="list-style-type: none"> <li>• SAP Master data</li> <li>• Preventive Maintenance Activities definition (manufacturers manuals, existing PMRs, equipment history, FMEAs)</li> </ul>
<b>Key Outputs</b>	<ul style="list-style-type: none"> <li>• Adequate # of PM02 Work Orders (created automatically) for different disciplines of PM (Inspection, Lubrication, Condition Monitoring, etc.)</li> </ul>
<b>Process Indicators</b>	<ul style="list-style-type: none"> <li>• KPI: PMR % (K4) and PMR efficiency (K5)</li> <li>• SPI: PMR Not performed (S5) PM02 manual call ratio (S11)</li> </ul>
<b>Process Owner</b>	<ul style="list-style-type: none"> <li>• HGRS Cement Excellence Manufacturing – Maintenance</li> </ul>

# Process Step Description

#	Step Name	Input	Description of Step	Output
1	Definition of Prev. Maint. Strategy	<ul style="list-style-type: none"> <li>• Packages</li> <li>• Hierarchy</li> <li>• RMSO</li> </ul>	<ul style="list-style-type: none"> <li>• Definition of the general scheduling information for the PMRs. With the packages it will define the when and the frequency of generation of the maintenance calls.</li> <li>• Definition of the PMR to be implemented</li> </ul>	<ul style="list-style-type: none"> <li>• Preventive Maintenance Strategy</li> </ul>
2	List of PMR per Equipment	<ul style="list-style-type: none"> <li>• Data from manufacturers manuals</li> <li>• FMEAs</li> <li>• Existing PMRs</li> <li>• Equipment history</li> <li>• Maintenance strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Definition of activities designed to minimize the risk of unplanned failures</li> </ul>	<ul style="list-style-type: none"> <li>• Task list <ul style="list-style-type: none"> <li>▸ Operations</li> <li>▸ Duration</li> <li>▸ Workforce requirements</li> <li>▸ Recommended Frequency</li> <li>▸ Materials</li> <li>▸ Services</li> </ul> </li> </ul>
3	Workload balance	<ul style="list-style-type: none"> <li>• Task lists</li> </ul>	<ul style="list-style-type: none"> <li>• Task lists distribution through time and based on recommended frequency and risk profile in order not to have weekly workload peaks.</li> </ul>	<ul style="list-style-type: none"> <li>• PMRs Master Schedule</li> </ul>
4	Creation of Maintenance Plan	<ul style="list-style-type: none"> <li>• PMRs Master Schedule</li> <li>• Maintenance Strategy</li> <li>• Task list</li> </ul>	<ul style="list-style-type: none"> <li>• Elaboration of the Maintenance Plan which specifies the dates, sequences, and tasks to be performed upon maintenance objects.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance Item</li> <li>• Maintenance Plan</li> </ul>
5	Schedule Maintenance Plan	<ul style="list-style-type: none"> <li>• Maintenance Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Launch the maintenance plan for work order creation upon the specific details defined in the maintenance plan being schedule</li> <li>• Setup deadline monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• System setup for PM02 Work Orders generation</li> </ul>
6	Work Order Issue	<ul style="list-style-type: none"> <li>• Deadline monitoring for PM02 Work Orders</li> </ul>	<ul style="list-style-type: none"> <li>• Release the work orders through Deadline Monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Automatic release of PM02 Work Orders</li> </ul>

# RACI matrix (Responsible, Accountable, Consulted, Informed)

#	Step Name	Plant Manager	Maintenance Manager	Preventive Maintenance Superv. / Eng.	Mechanical Maintenance Supervisor	Electrical Maintenance Supervisor	Planner <sup>2</sup>
1	Definition of Prev. Maintenance Strategy	C, I	A <sup>1</sup>	C, I	I	I	I
2	List of PMR per Equipment		A	R	R	R	C, I
3	Workload Balance		A	R	C, I	C, I	R
4	Creation of Maintenance Plan			A	C, I	C, I	R
5	Schedule Maintenance Plan			A	C, I	C, I	R
6	Work Order Issue			A	I	I	R

<sup>1</sup> Input Head of Regional Maintenance

<sup>2</sup> Planning function may be covered by supervisor

# The way maintenance is performed in the field does not depend on SAP

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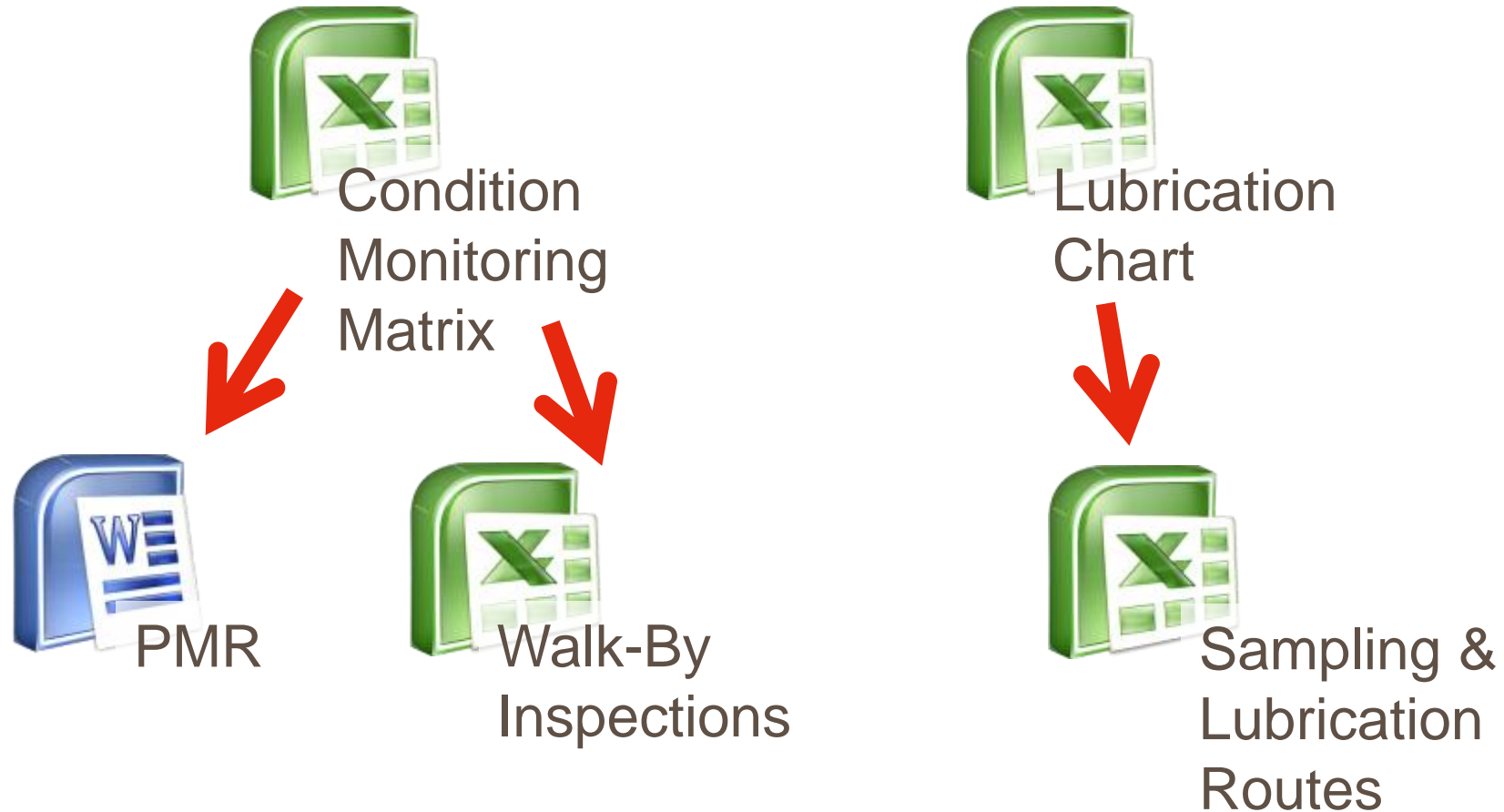


SAP **only supports** the maintenance team to perform their maintenance tasks but does **not influence** them!



# Before the preventive maintenance program is implemented in SAP all documents need to be ready

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Including Work Load Balancing



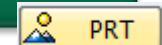
# Task lists contain all information about work that is performed on a recurrent basis



Non object specific tasks  
e.g. lubrication routes

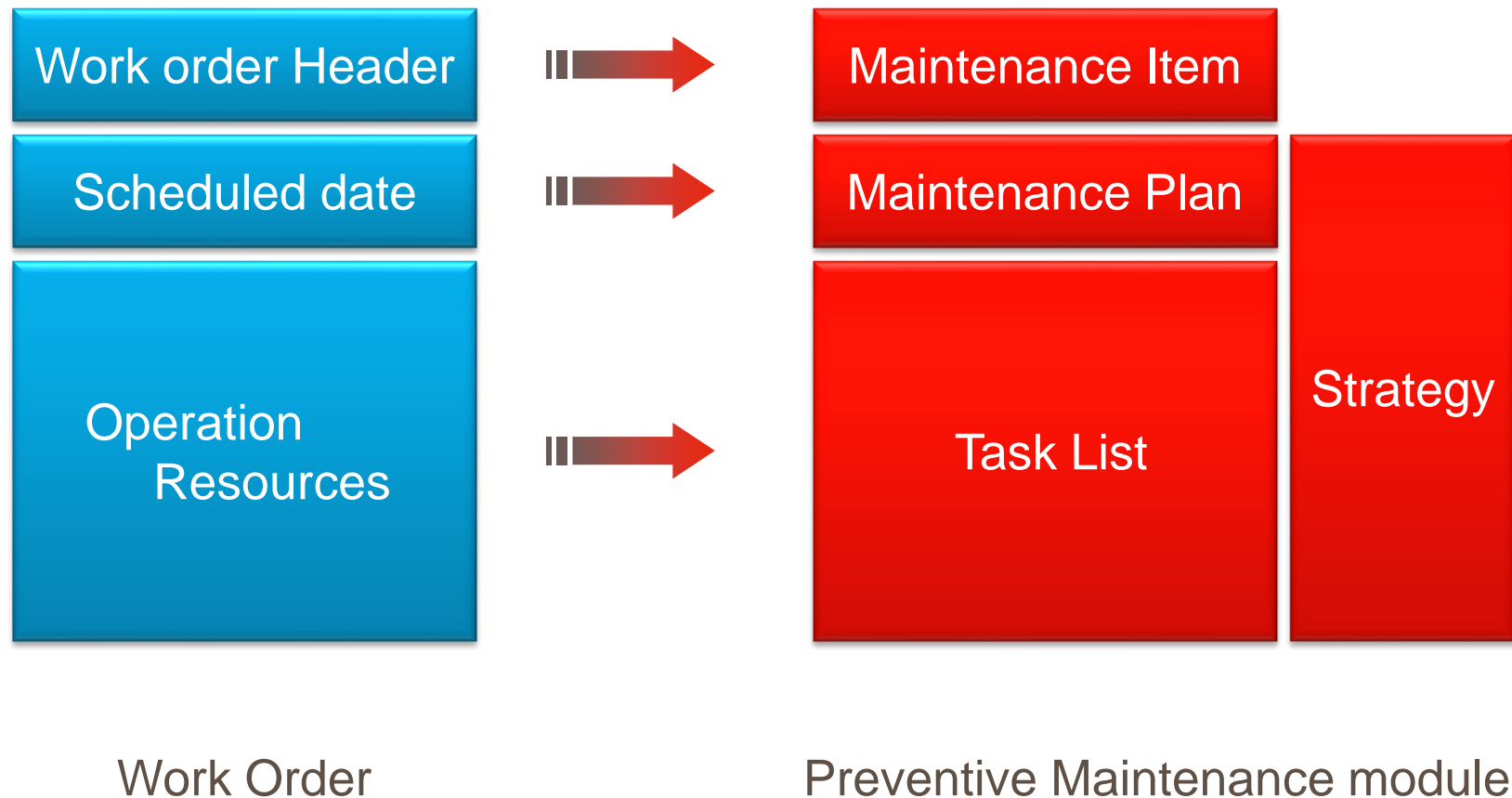
Object specific tasks  
e.g. PMR on VRM

Use DMS to attach Excel/Word documents to operations



# In the PM module the same components are available as in a corrective work order

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# Maintenance item corresponds to the work order header

## Work order header

Order	PM01	%000000000001	Exchange of Motor		
Sys.Status	CRTD MANC NTUP				1crt

HeaderData	Operations	Components	Costs	Objects	Additional Data	Location	Planning	Control
------------	------------	------------	-------	---------	-----------------	----------	----------	---------

Person responsible		Notifctn	
PlannerGrp	EL1 / B100	Jean-Pierre Geerae	
Mn.wk.ctr	ELEC1 / B100	Equipe Electrique	
		Costs	EUR
		PMActType	Z31 Repair/Replacement
		SystCond.	

Dates		Priority	2-Medium Impact	
Bsc start	28.10.2012 00:00			
Basic fin.	00:00	Revision		

Reference object			
Func. Loc.	OB.562-BB2	BROYEUR FINISSEUR M2	
Equipment	1000548	BROYEUR FINISSEUR M2	
Assembly			

## Maintenance Item

Maintenance item	1485	Change of Motor W STG
Strategy	EBM-WW	General weeks hierarchy
Maint. plan cat.	Maintenance Order	

Item	Object list item	Item location
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Reference object	
Functional loc.	OB.562-BB2 BROYEUR FINISSEUR M2
Equipment	1000548 BROYEUR FINISSEUR M2
Assembly	

Planning Data					
Planning plant	B100	Usine d'Obourg	Maint. Planner Group	EL1	Jean-Pierre Geerae
Order Type	PM02	Maintenance preventive order	MaintActivityType	Z33	Preventive Maintenance Ro...
Main WorkCtr	ELEC1 / B100	Equipe Electrique	Business Area	1000	Clinker & Cement without A.
Priority	R-Regular				
Sales Document					

# Maintenance plan corresponds to the basic start date

Work Order  
Basic Start Date

Order PM01 %00000000001 Exchange of Motor  
Sys.Status CRTD MANC NTUP 1 crt

HeaderData Operations Components Costs Objects Additional Data Location Planning Control

Person responsible  
PlannerGrp EL1 / B100 Jean-Pierre Geerae  
Mn.wk.ctr ELEC1 / B100 Equipe Electrique

Notifctn  
Costs EUR  
PMActType Z31 Repair/Replacement  
SystCond.

Dates  
Bsc start 28.10.2012 00:00  
Basic fin. 00:00

Priority 2-Medium Impact  
Revision

Reference object  
Func. Loc. OB.562-882 BROYEUR FINISSEUR M2  
Equipment 1000548 BROYEUR FINISSEUR M2  
Assembly

Administrative data  
Entered by SSCHILLI  
Created on 23.10.2012  
Changed by  
Changed on

Maintenance Plan

**Change Maintenance Plan: Strategy plan AL-3-MT-INSP**

Maintenance plan AL-3-MT-INSP Monthly Raw Mill Inspection

Maint. plan header

Maintenance plan cycle 23.10.2012 Maintenance plan scheduling parameters Maintenance plan addition

Scheduling List

Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status
5	01.03.2013			1M	Scheduled Called
6	29.03.2013	23.03.2013		1M	Scheduled Hold

# Task lists corresponds to work order operations and components

Work order

Task list

**Create Maintenance order : Operation Overview**

Order PM01 %000000000001 exchange of motor  
Sys.Status CRTD MANC NTUP 1crt

OpAc	SOp	Work ctr	Plant	Con...	StTextK	S... Operation short text
0010		ELEC1	B100	ZPMI		exchange of motor

**Create Maintenance order : Component Overview**

Order PM01 %000000000001 exchange of motor  
Sys.Status CRTD MANC 1crt

Item	Component	Description	LT
0010	30016072	MOTEUR ASYN CAGE 525V 0.36KW 1500TR/MN P	

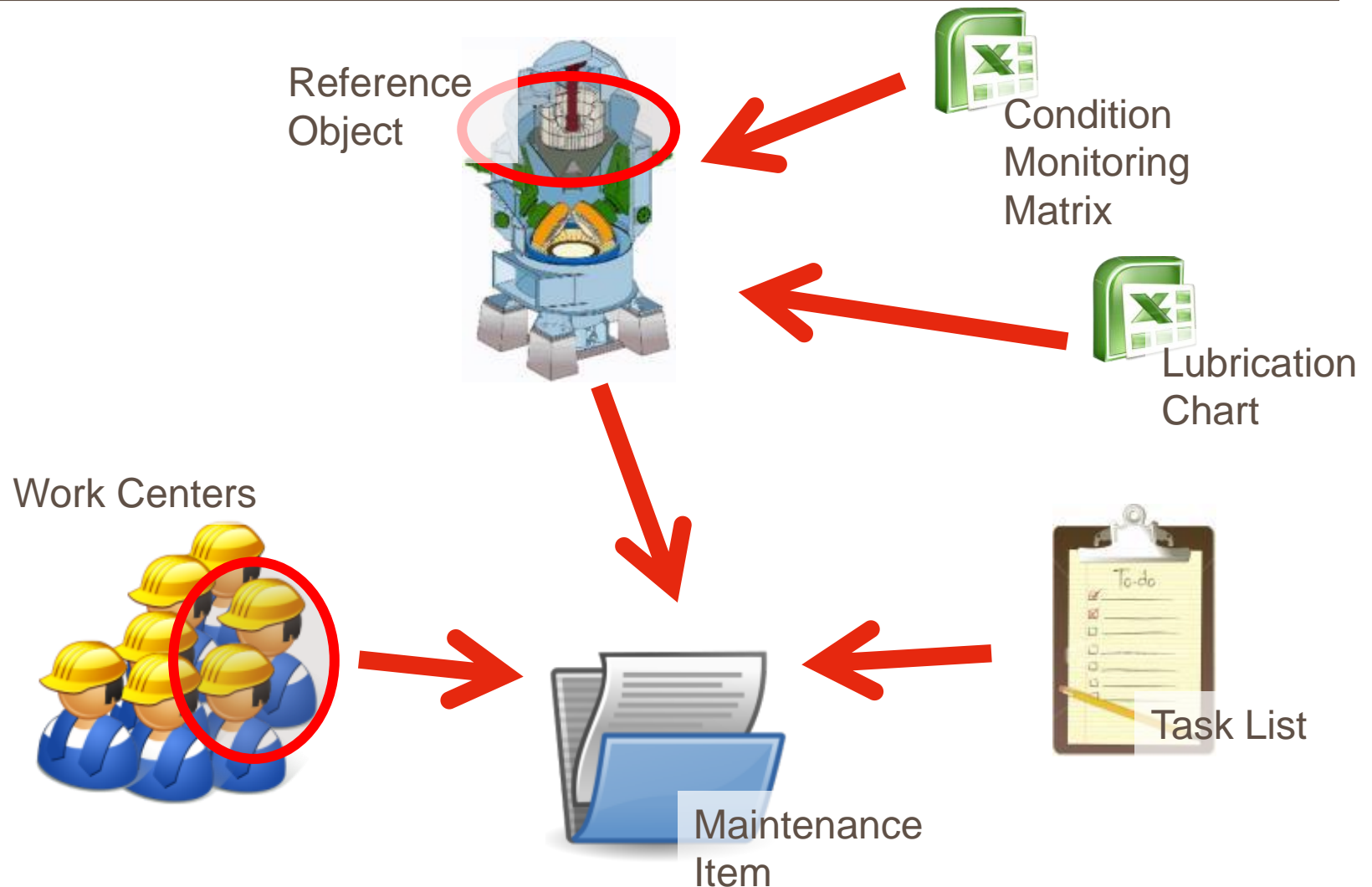
**Task List for Funct. Location Change: Component**

Func. Loc. OB.562-BB2 BROEUR FINISSEUR M2  
Group 251 BROEUR FINISSEUR W STG Grp.Countr 3

Operation/Activity 0010 Change of Motor

Material	Quantity	Un	B	M...	Component
30016072	00	PC			MOTEUR A

# The maintenance item defines where and by whom the tasks defined in the task list should be planned and executed

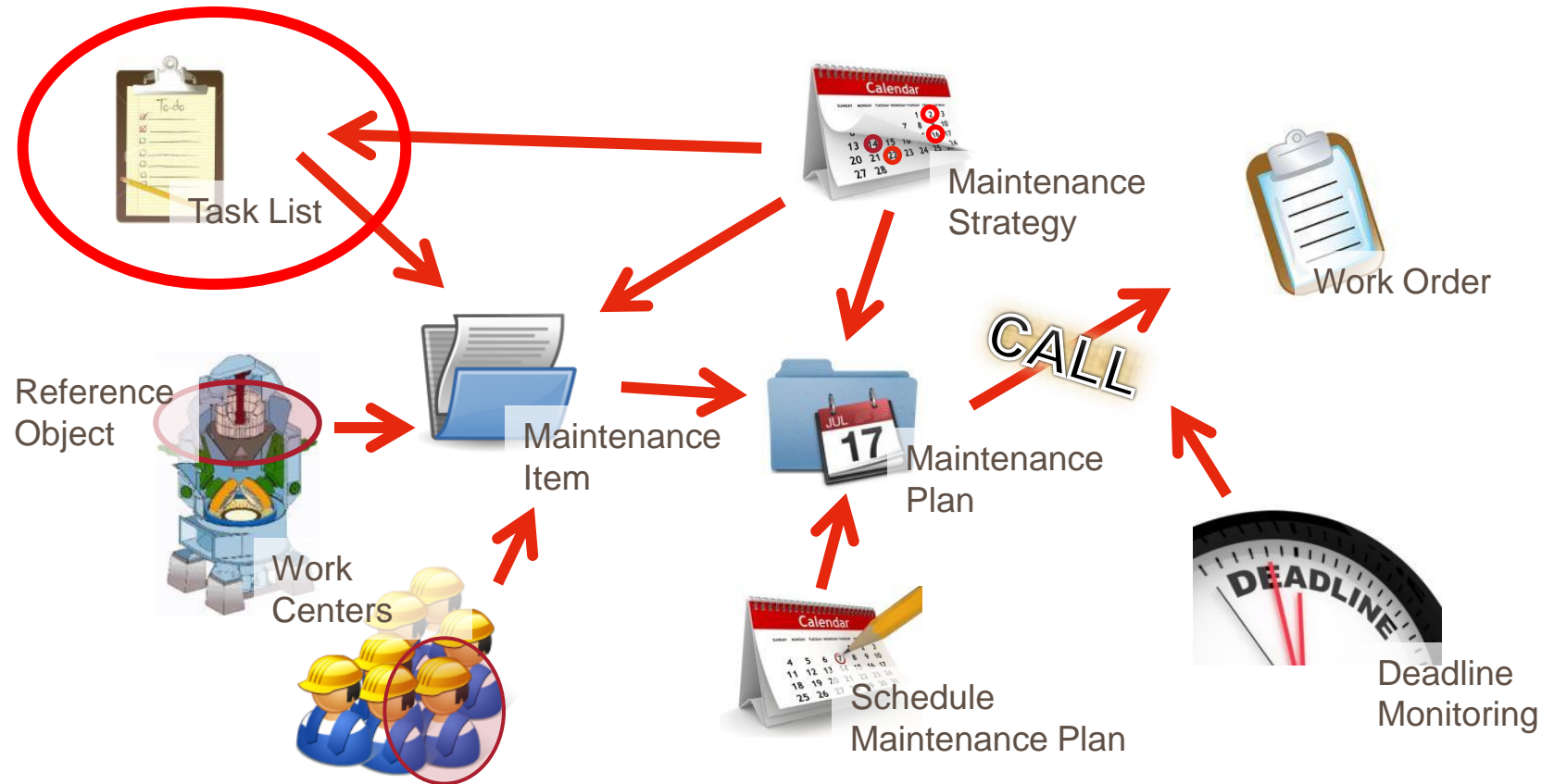


# The maintenance plan defines when a maintenance item should be executed and a call generates the work order





# How to use task lists



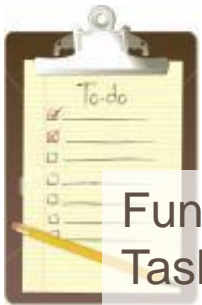
# Groups and group counters help to organize task lists



General  
Task List

Follow naming conventions, as every plant can see all task list of the region, therefore start the group names always with the plant code.

- **Always start with the plant code :**
  - ▶ For Walk By Inspection use WBI: *AE*  
*AE-WBI*
  - ▶ Mechanical WBI: *AE-WBIM*
  - ▶ Raw Ball mill Mechanical inspection: *AE-3BMM*



Function Location  
Task List

Group counters are organize different task lists within a group.

Functional Location Task Lists get their group automatically as the reference is the functional location.

# Recommendation of task list and maintenance item usage

Condition Monitoring Techniques	Example	Level for Work Order	Task List	Code	
Lubrication	Greasing route	All routes with greasing and quantity of grease	Area/Line	General Task List	LUB
	Oil and grease replacement	Fixed time replacement of oil for small GB - No oil analysis performed	Equipment	General Task List	OIL
	Oil Sampling & Analysis	Sampling analysis of oil of main equipment	Area/Line	General Task List	OIL
Condition Monitoring	Walk By inspection	Maintenance walk by inspection	Area/Line	General Task List	WBI
	Vibration route	All routes used for Vibration analysis with data collector	Area/Line	General Task List	VIB
	Thermography	Routes for thermography analysis	Area/Line	General Task List	THM
	EMD	Either static of Dynamic measurements	Functional location Level 5 / Equipment	General Task List	EMD
	NDT	VT, PT, MT, UT, E Current	Functional location Level 5	General or Functional Location Task List	NDT
	Equipment specfic measurement	Shell test, lead wire, Run out etc	Functional location Level 5	General or Functional Location Task List	Equipment HAC in 2 digits
	Downtime Inspection	Visual inspection, calibration, cleaning, replacement, adjustment or services	Functional location Level 5 / Equipment	General or Functional Location Task List	Equipment HAC in 2 digits
	Wear mesurement	Liners, thickness, elegation, hardness...	Functional location / Equipment	General or Functional Location Task List	Equipment HAC in 2 digits

# Operations organize your task list – a small exercise

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## Situation Pressure Transmitters

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- There are 120 pressure transmitters in your plant
  - 5 in the crusher area
  - 70 in the raw mill area
  - 10 in the kiln area
  - 35 in the cement mill area

## PMR Routines on Pressure Transmitters

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- Once per day production checks all of them on a WBI if the pressure is within the limits
- One per week maintenance checks all of them on a WBI and writes down the actual values, together with other tasks
- Once per year all transmitters need to be calibrated by maintenance. 1 person needs 2 days for it: on the first day he calibrates the first half on the second day the second half.

## Exercise How would you organize this within SAP

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- What documents are needed?
- How do you organize your task lists?
- Discuss with your neighbor (5 minutes)
- Discussion in the plenum

# Operations organize your task list – a small exercise

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## Solution

## A recommendation

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- Production WBI not organized in SAP
- Maintenance WBI checks are organized in routes by area → using general task lists using 1 task list with 1 operation per route. Each task list is linked to the corresponding area.
- Calibration organized with 1 task list with 2 operations, one for the first day and one for the second day. Linked to functional location of the raw mill area as there is the largest amount of transmitters. An alternative for the link to the functional location would be a link to an auxiliary cost center like the electrical work shop, which would be finally transferred to Clinker Production / Cement Grinding work centers with the split of 70% / 30%.

# Use task list operations for major steps. Task list instructions to be attached via DMS to the operation

- The operations are expressed in such way they describe the frequency, and the function
- The personnel (work center) needed and the duration of the executions is also defined in this step
- Purchase request for service can be created using ControlKey PM02 or PM03 like in a work order

**Create Functional Location Task List: Operation Overview**

Func. Loc. OB.562-BB2      BROYEUR FINISSEUR M2  
Group 251    Elec Prev Maint Program      Grp.Countr 1

**General Operation Overview**

Op...	SOp	Work ctr	Plnt	Ctrl	Operation Description	LT	Work	Un.	No.	Duration	Un.	Calc	Pct	Int. distr	Fac	ActTyp
0010		ELEC1	B100	PM01	1M Electrical Service	<input type="checkbox"/>	11	H	1	11	H	1	100		1	HELECT
0020		ELEC1	B100	PM01	3M Electrical Service	<input type="checkbox"/>	15	H	1	15	H	1	100		1	HELECT
0030		ELEC1	B100	PM01	6M Electrical Service	<input type="checkbox"/>	25	H	1	25	H	1	100		1	HELECT
0040		ELEC1	B100	PM01	1Y Electrical Service	<input type="checkbox"/>	40	H	1	40	H	1	100		1	HELECT
0050		ELEC1	B100	PM01		<input type="checkbox"/>									1	HELECT

# Components can also be assigned to each operation: Can be used for corrective maintenance standard procedure

**Create FunctLoc Task List: Structure List**

✓ [Icons] Levels above Expand whole [Icons] Mat. classes [Icon]

Functional loc. OB.562-BB2 Valid From 18.10.2012

Description BROYEUR FINISSEUR M2

OB.562-BB2 BROYEUR FINISSEUR M2

- 1000553 MOTEUR PRINCIPAL FINISSEUR M2
- 1000552 PPE HLE PAL .MOTEUR FINISSEUR M2
  - PIECES MECANQUES 1 AU 1 T
  - PPE MAAG NNP 36/36 LUBRIFICATION PALIERS 1 PC 1 L 30014090
- 1000554 REDUCTEUR FINISSEUR M2
  - PIECES MECANQUES 1 PC 1 T
  - ACCOUPLEMENT GV 1 PC 1 T
  - GRAISSE TEXACO MARFAK 00 EN FUT DE 180KG 3,500 KG 3,500 L 40002476
- 1000551 GRAISS.REDUCTEUR FINISSEUR M2
- 1000548 BROYEUR FINISSEUR M2
- 1000549 GRAISS.PALIER ENTREE FINISSEUR M2
- 1000550 GRAISS.PALIER SORTIE FINISSEUR M2

**Component Selection** Catalog

Func. Loc. OB.562-BB2 BROYEUR FINISSEUR M2

Group 251 Elec Prev Maint Program Grp.Countr 1

Operation/Activity 0010 1M Electrical Service

**Component Assignments**

Material	Quantity	Un	B	M.	Component Description	I...	Assembly
			<input type="checkbox"/>				
			<input type="checkbox"/>				



# How to use maintenance items



# The maintenance item contains all managerial information about the tasks

**Display Maintenance Item: Maintenance item 0000000000001481**

Maintenance item: 1481 Annual Inspection  
Maint. plan cat.: Maintenance Order

Item | Object list item | Item location

Reference object

Functional loc.: OB.562-BB2 BROYEUR FINISSEUR  
Equipment:  
Assembly:

Planning Data

Planning plant: B100 Usine d'Obourg  
Order Type: PM02 Maintenance preventive order  
Main WorkCtr: ELEC1 / B100 Equipe Electrique  
Priority: R-Regular  
Sales Document: /

Maint. Planner Group: EL1 Jean-Pierre Geerae  
MaintActivityType: Z33 Preventive Maintenance  
Business Area: 1000 Clinker & Cement wit...  
Settlement Rule: [Icons]

Task List

Typ	Task LstGrp	GrpCr	Description
T /	251	2 [Icon]	Yearly Inspection of Motor [Icons]

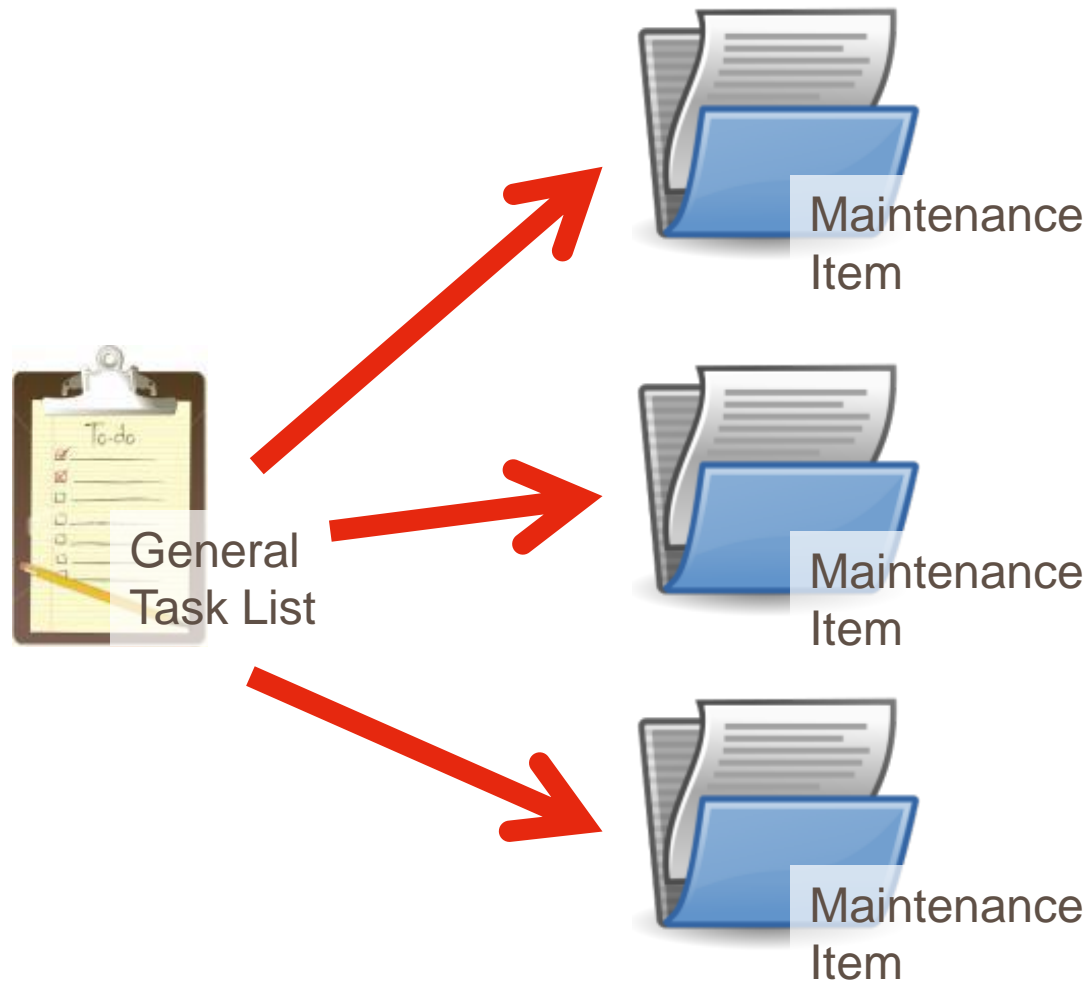
Reference Object

All information about the task

- Work order Type
- Planner Group
- Main Work Center
- Activity Type
- Priority: compulsory / regular

The connected task list

# A general task list can be linked to various maintenance items



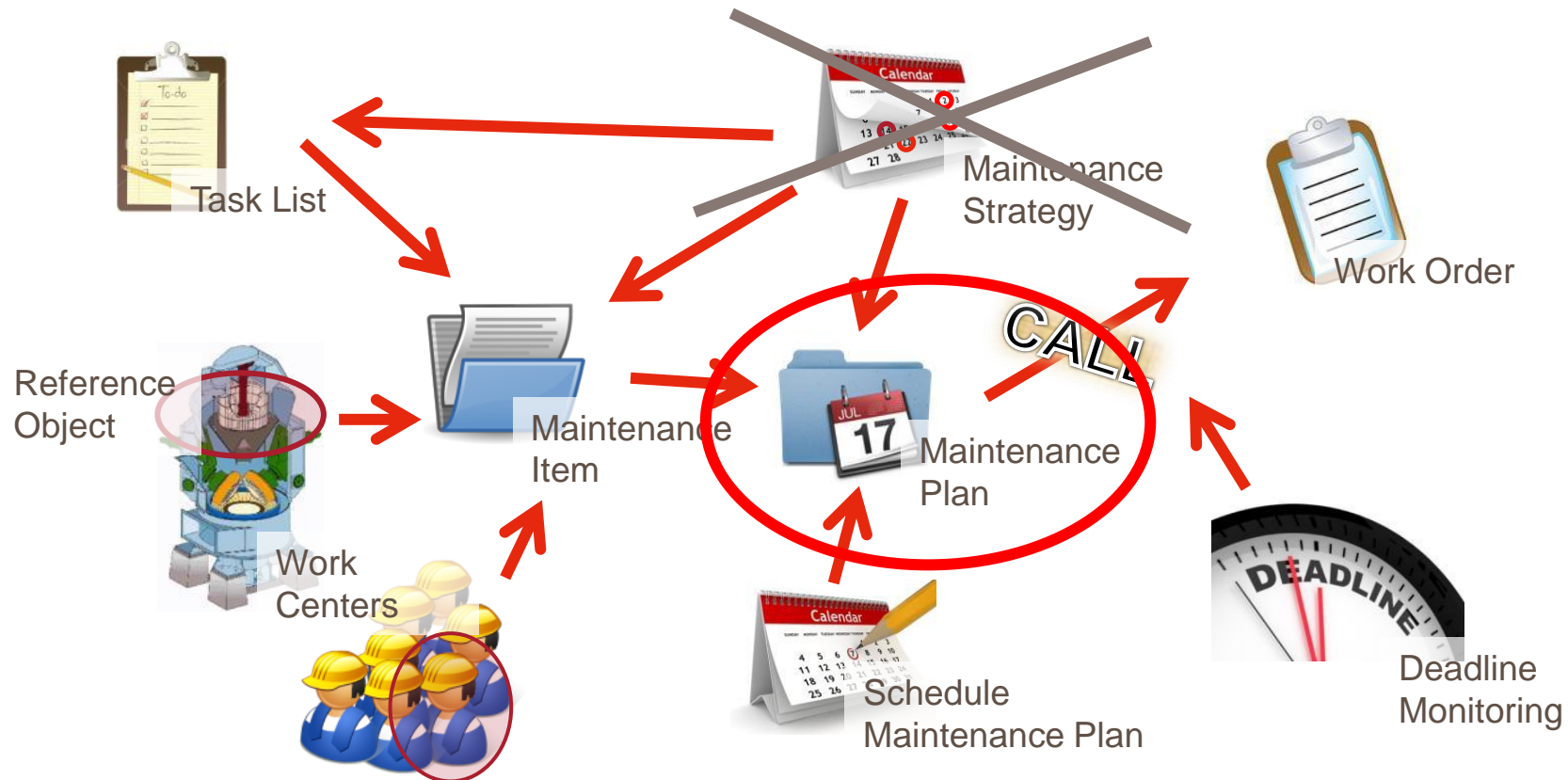
Example:

The task list contains the information about the PMR (calibration) of a weight belt feeder.

For each weight belt feeder a maintenance item is created.

If PMR that should be executed on various weight belt feeders are exactly the same, they can share the task list.

# How to use single cycle maintenance plans



# A single cycle maintenance plan can manage reoccurring activities which do not interfere with other activities

**Change Maintenance Plan: Single cycle plan OB-AN-SD**

Maintenance plan:

Maint. plan header

**Maintenance plan cycle** | Maintenance plan scheduling parameters | Maintenance plan additional data | Manual maintenance schedule calls

Cycle/Unit:  YR

Cycle text:

Offset/Unit:  YR

Counter:

**Item overview** | **Item** | Object list item | Item location

Maintenance Item:   1 / 2

Frequency on which the maintenance tasks should be executed

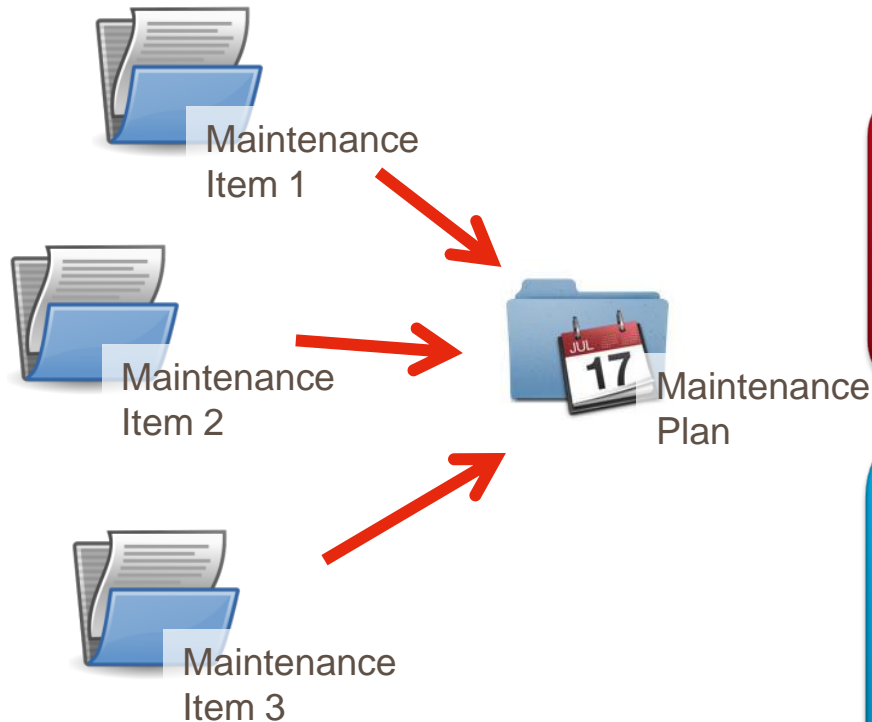
All maintenance items attached will result in the creation of WO to be executed at the same time

# To avoid disadvantages, only 1 maintenance item should be assigned to 1 maintenance plan

Advantages/Disadvantages of attaching several Maintenance Items to the same Maintenance plan:

- With 1 call several work orders can be created
- The number of maintenance plans can be reduced

- All work orders have the same basic start date
- Difficult to manage maintenance items as cycle length can not be separately managed
- If not properly managed work orders can be accidentally deleted



# How to use TIME BASED strategy plans





# A maintenance strategy is built up of maintenance packages which are either “linked” or not to each other

Name	WEEK_H					
Description	Weekly Based with Hierarchy					
Scheduling indicator	Time					
Package No.	Cycl.length	Unit	Maintenance cycle text	Cycle ShortT...	Hierarchy	Hierarc
10	1 WK	1 Week	1W	10	1W	
20	2 WK	2 Week	2W	20	2W	
30	4 WK	1 Month	1M	30	1M	
40	8 WK	2 Month	2M	40	2M	
50	12 WK	3 Month	3M	50	3M	
60	16 WK	4 Month	4M	60	4M	
70	24 WK	6 Month	6M	60	6M	
80	48 WK	1 Year	1Y	70	1Y	
90	96 WK	2 Years	2Y	80	2Y	

Packages are defined through their cycle length and hierarchy level

Packages are “linked” to each other → Hierarchy

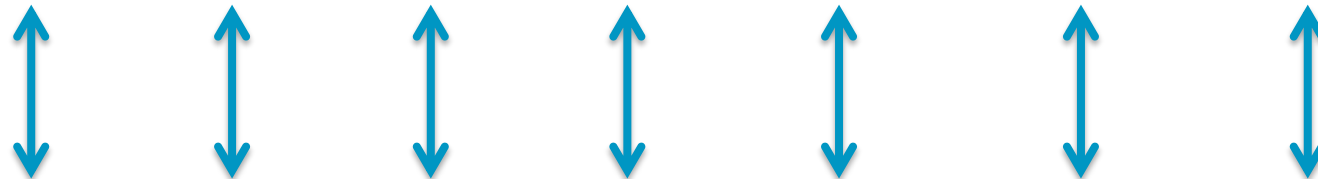
Name	WEEK_N					
Description	Week Based w/o Hierarchy					
Scheduling indicator	Time					
Package No.	Cycl.length	Unit	Maintenance cycle text	Cycle ShortT...	Hierarchy	Hiera
10	1 WK	1 Week	1W	10	NH	
20	2 WK	1 Weeks	2W	10	NH	
30	4 WK	1 Month	1M	10	NH	
40	8 WK	2 Month	2M	10	NH	
50	12 WK	3 Month	3M	10	NH	
60	16 WK	4 Month	4M	10	NH	
70	24 WK	6 Month	6M	10	NH	
80	48 WK	1 Year	1Y	10	NH	
90	96 WK	2 Years	2Y	10	NH	

Packages are NOT “linked” to each other → NO Hierarchy

**In a strategy with hierarchy, for each cycle, only 1 Work Order gets generated. Work Orders with lower hierarchy are ignored**

Strategy: WEEK\_N      Week Based w/o Hierarchy      **Without hierarchy**

Pk	Cycle text	1 WK	2 WK	3 WK	4 WK	5 WK	6 WK	7 WK	8 WK	9 WK	10 WK	11 WK	12 WK	13 WK	14 WK	15 WK
1	1 Week	1W	1W	1W	1W	1W	1W	1W	1W	1W	1W	1W	1W	1W	1W	1W
2	1 Weeks		2W		2W		2W		2W		2W		2W		2W	
3	1 Month				1M				1M				1M			
4	2 Month								2M							
5	3 Month												3M			



Strategy: WEEK\_H      Week Based with Hierarchy      **With hierarchy**

Pk	Cycle text	1 WK	2 WK	3 WK	4 WK	5 WK	6 WK	7 WK	8 WK	9 WK	10 WK	11 WK	12 WK	13 WK	14 WK	15 WK
1	1 Week	1W		1W		1W		1W		1W		1W		1W		1W
2	2 Week		2W				2W				2W				2W	
3	1 Month				1M											
4	2 Month								2M							
5	3 Month												3M			
6	4 Month															

# A strategy has to be assigned to a task list in order to assign operations to maintenance packages

Func. Loc. OB.562-BB2      BROYEUR FINISSEUR M2

Group 251    Weekly Mill Inspection

Group 251

Group Counter 5    Weekly Mill Inspection

Planning plant B100

**Assignments to Header**

Work center MECH1 / B100    Equipe M

Usage 4    Plant maintenance

Planner group ME1    Nicolas Fierro

Status 4    Released (general)

System Condition 1    in operation

Maintenance strategy WEEK\_H    Week Based with Hierarchy

Assembly

Name WEEK\_H

Description Weekly Based with Hierarchy

Scheduling indicator Time

Package No.	Cycl.length	Unit	Maintenance cycle text	Cycle ShortT...	Hierarchy	Hierarc
10	1 WK		1 Week	1W	10	1W
20	2 WK		2 Week	2W	20	2W
30	4 WK		1 Month	1M	30	1M
40	8 WK		2 Month	2M	40	2M
				3M	50	3M
				4M	60	4M
				6M	60	6M
80	48 WK		1 Year	1Y	70	1Y
90	96 WK		2 Years	2Y	80	2Y

**Strategy has to be assigned**

Func. Loc. OB.562-BB2      BROYEUR FINISSEUR M2

Group 251    Weekly Mill Inspection      Grp.Countr 5

**General Operation Overview**

OpAc	SOp	Work ctr	Plnt	Ctrl	Operation Description	LT	Work	Un
0010		MECH1	B100	ZPMI	Weekly Inspection	<input type="checkbox"/>	5	H
0020		MECH1	B100	ZPMI	Monthly inspection	<input type="checkbox"/>	8	H
0030		MECH1	B100	ZPMI				

MntPack

Func. Loc. OB.562-BB2      BROYEUR FINISSEUR M2

Group 251    Weekly Mill Inspection      Grp.Countr 5

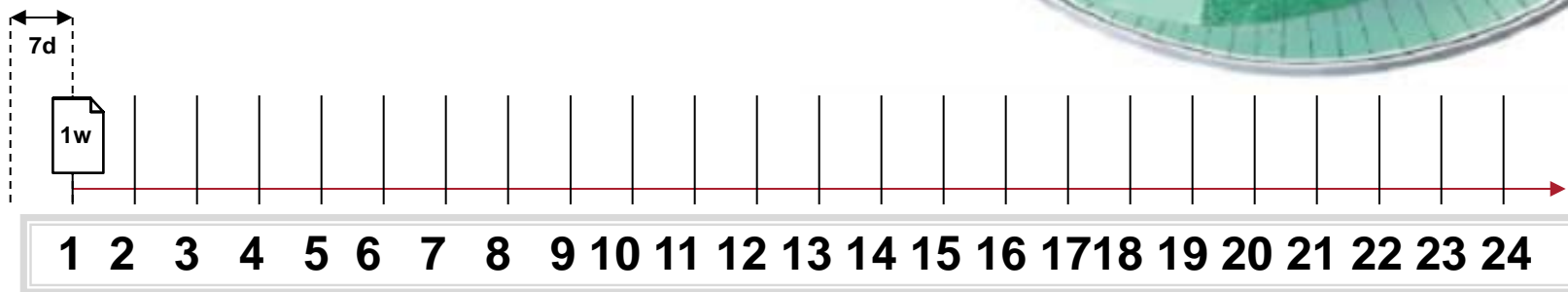
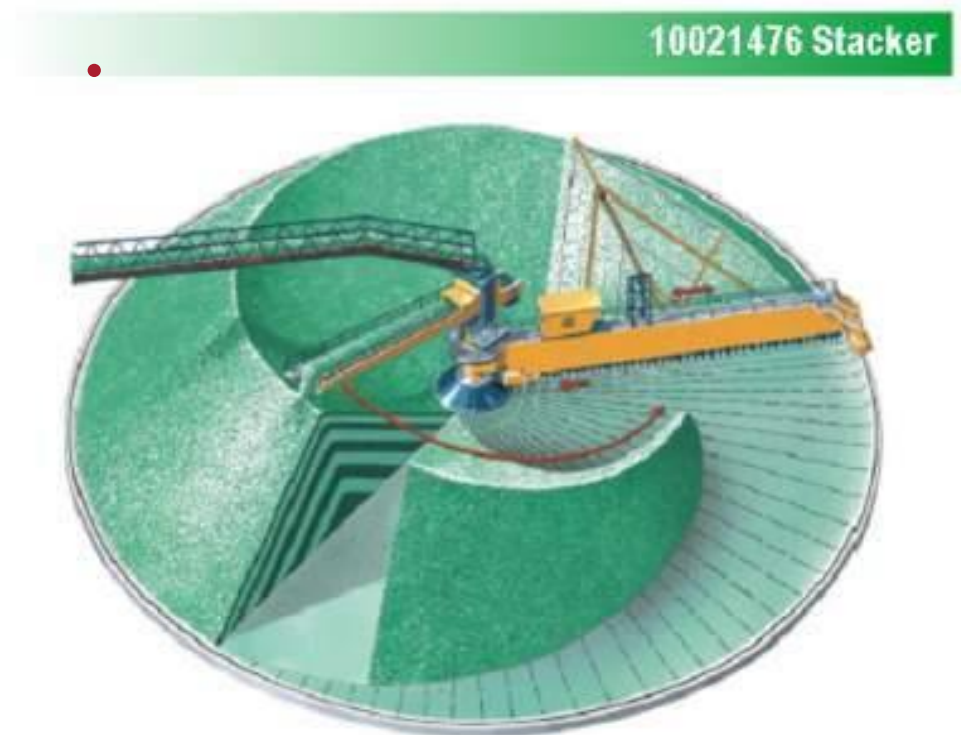
**Operat. Overview Maint. Packages**

Op.	SOp	Operation Description	1W	2W	1M	2M	3M	4M
0010		Weekly Inspection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0020		Monthly inspection	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Maintenance Packages are defined at operation level**

# Usage of hierarchy demonstrated through an example

- Consider a specific piece of equipment, certain maintenance tasks have to be carried out at weekly intervals.

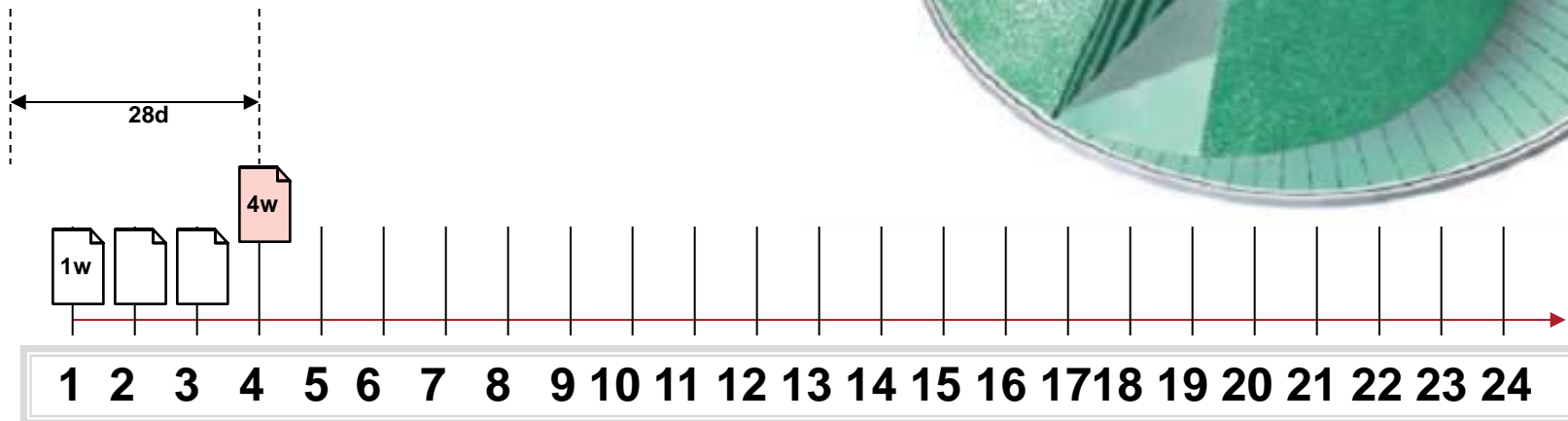
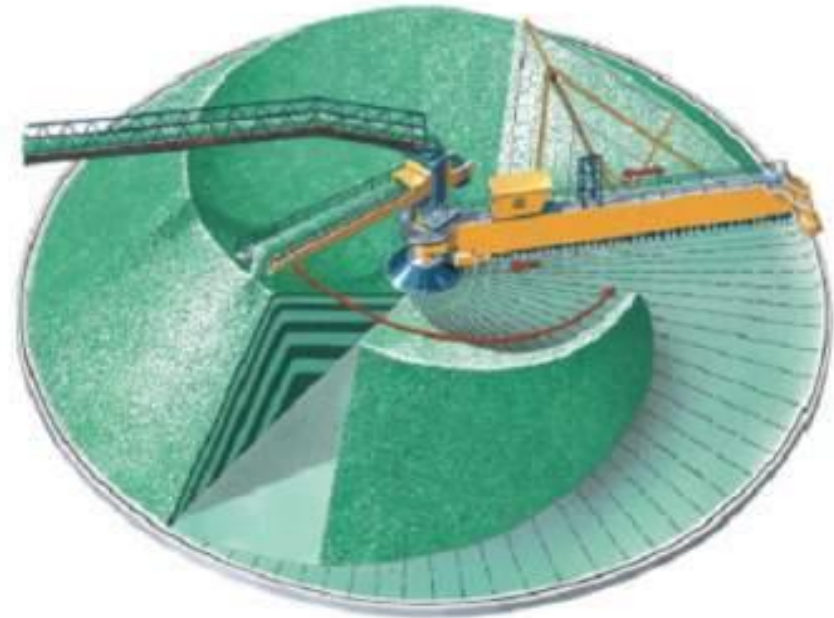


**Weekly Maintenance Cycle**

# If 2 tasks of a task list should be executed at the same time, only the one with the higher hierarchy level gets created

- Some other tasks have to be carried out once every four weeks.

10021476 Stacker

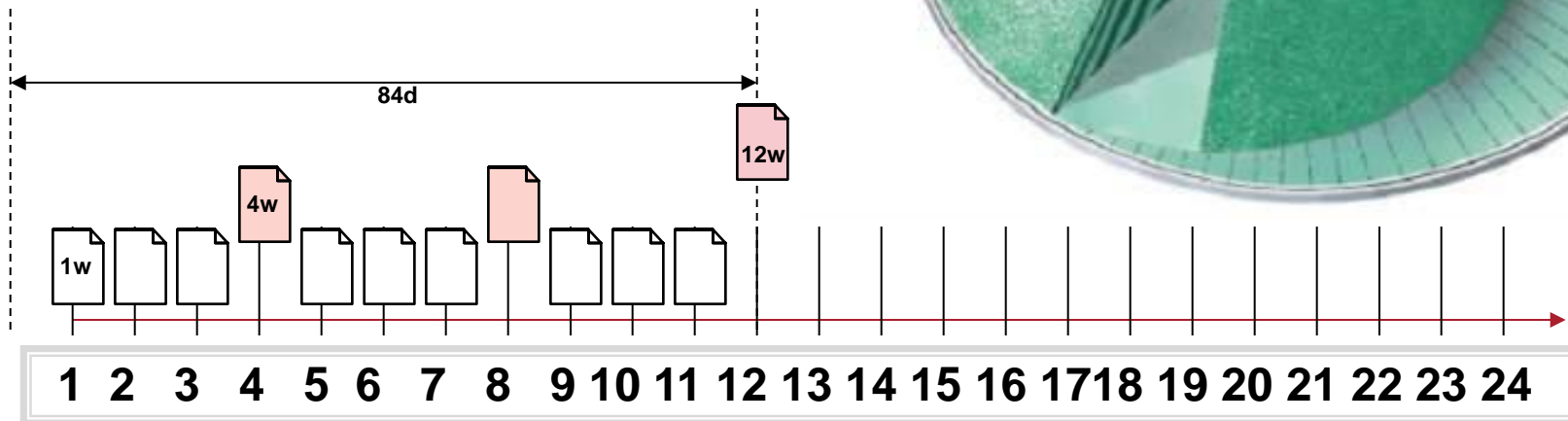
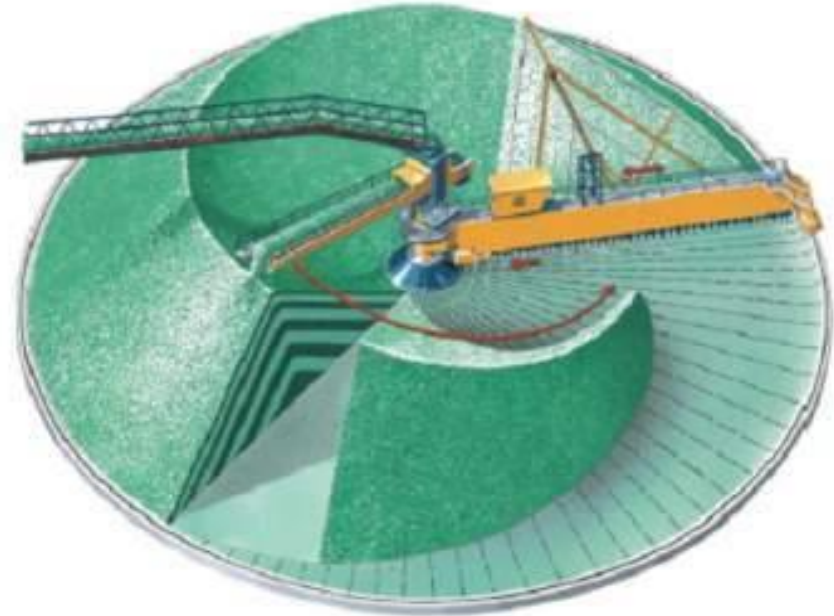


**Weekly Maintenance Cycle**

# The same applies for more than 2 tasks

- Some other tasks have to be carried out once every 12 weeks.

10021476 Stacker

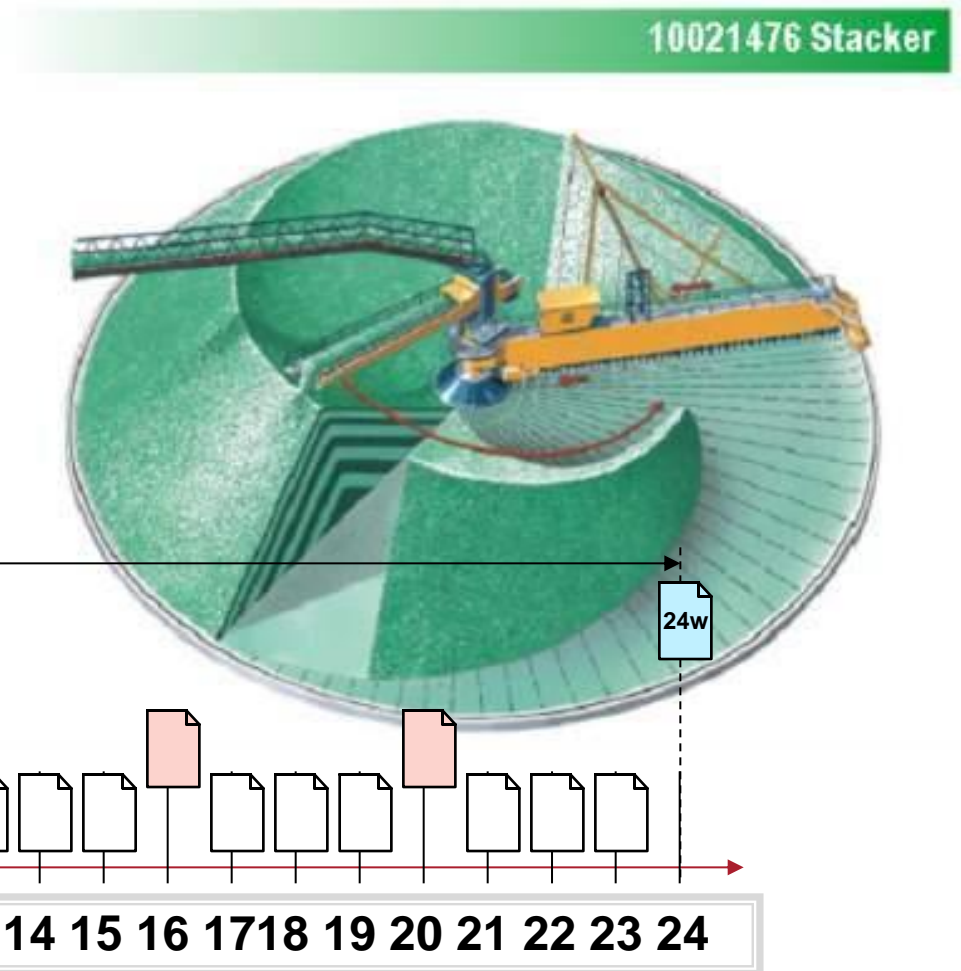


Weekly Maintenance Cycle



# Example : Time Based Plans

- And some other tasks have to be carried out once every 24 weeks.
- The Task List is the tool for preventive maintenance
- The purpose of the task list is to provide the Planned Order with its Operations




**Weekly Maintenance Cycle**



# Only task lists with assigned strategy can be assigned to maintenance items with the same strategy

## Change Maintenance Item: Maintenance

Maintenance item 1486 Inspection   
Strategy WEEK\_H Week Based with Hierarchy  
Maint. plan cat. Maintenance Order

Only maintenance items with assigned strategy can be assigned to a maintenance plan with a strategy

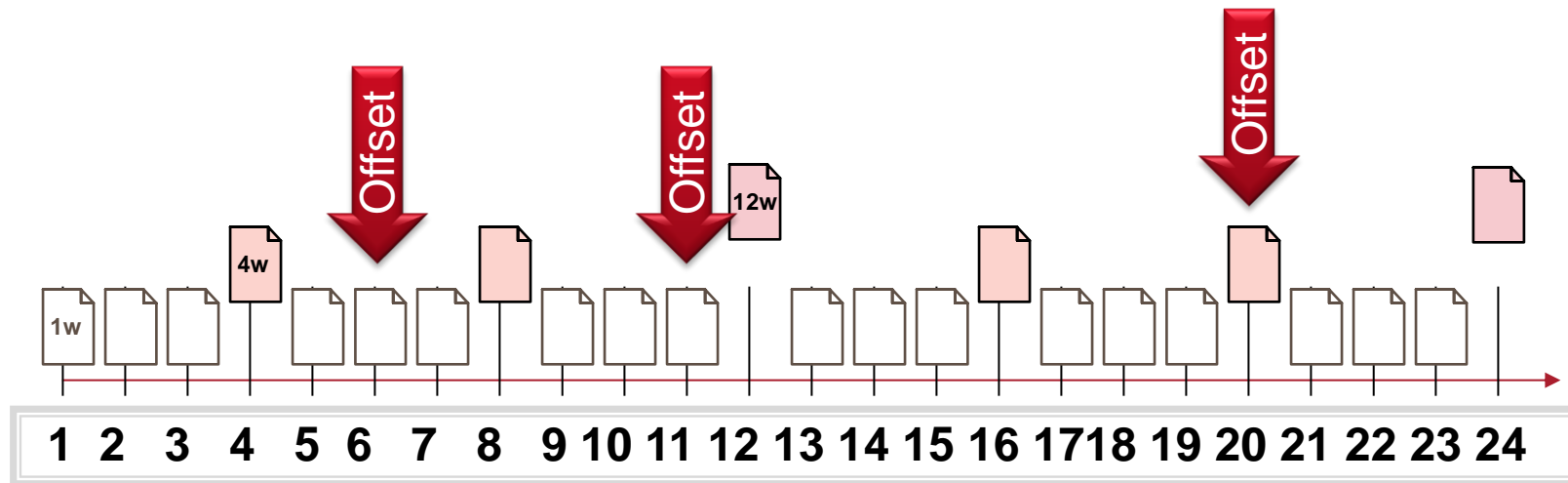


## Display Maintenance Plan: Strategy plan OB-WK-INSP

Maintenance plan OB-WK-INSP Weekly Mill Inspection  
Maint. plan header  
Maintenance plan cycle 22.10.2012 Maintenance plan scheduling parameters Maintenance plan additional data  
Sort field  
Authorization Group  
Maint. plan cat. Maintenance Order  
Strategy WEEK\_H Week Based with Hierarchy  
Key Date 22.10.2012

Maintenance strategy has to be assigned to a maintenance plan

# A maintenance strategy plan can be started anywhere within the cycle



# To start anywhere inside the strategy plan an offset has to be set when the maintenance plan is scheduled

**Schedule Maintenance Plan: Strategy plan OB-5-EL-INS**

Start **Start in cycle** Restart Manual call

Maintenance plan **OB-5-EL-INS** Electrical

Start Date **23.10.2012**

Completion date **23.10.2012**

Completion Time **16:33:44**

Offset

**Select package**

**Package Sequence**

Back ◀ Previous dates ▶ More Dates **Set start offset** Reset offset

Strategy: EBM-WW General weeks hierarchy

Category	Pk	Cycle text	7 DAY	14 DAY	21 DAY	28 DAY	35 DAY	42 DAY	49 DAY	56 DAY	63 DAY
	30	01 Month				1M				1M	
	50	03 Month									3M
	60	06 Month									
	70	01 Year									

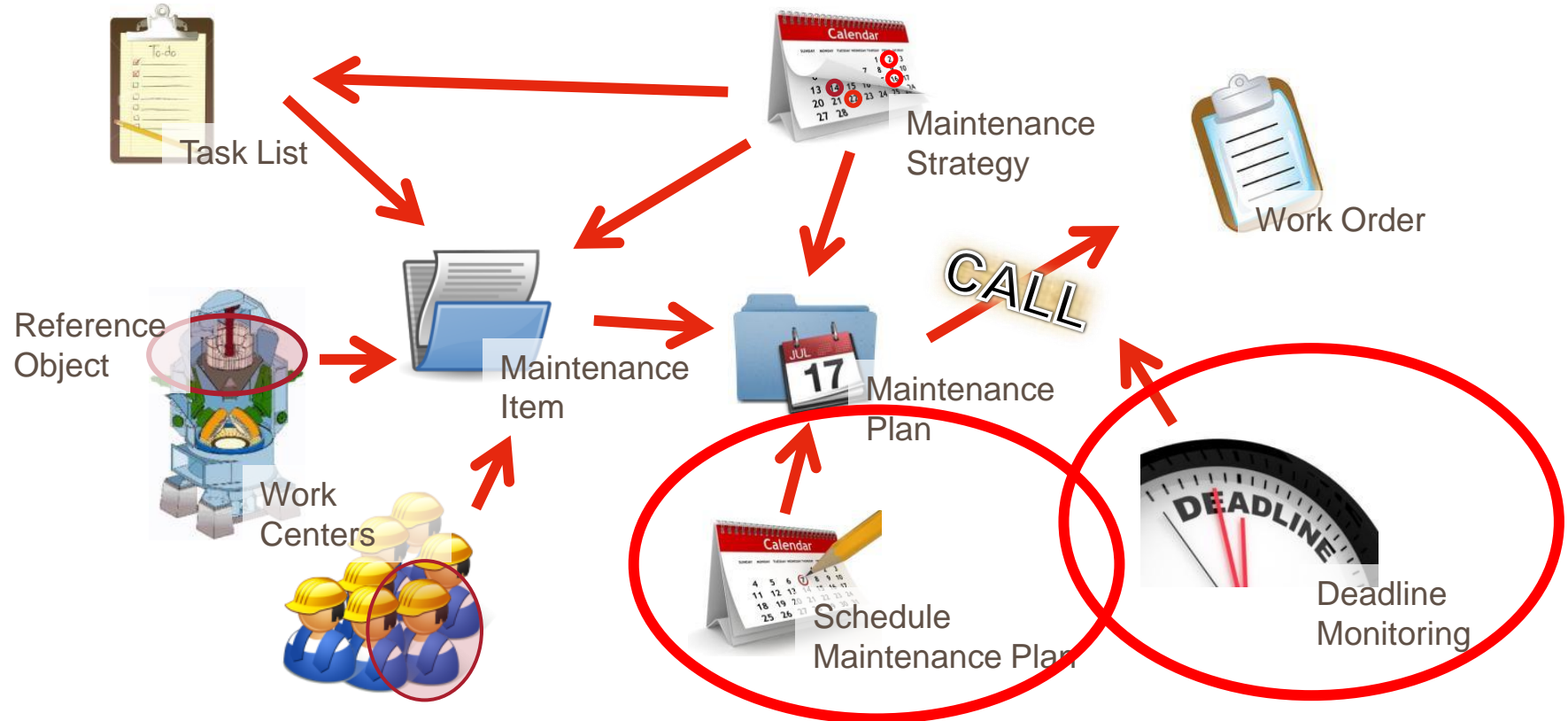
Select the cycle before the selected maintenance package and set start offset

**Scheduling List**

Call...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / S
1	30.10.2012	29.10.2012		1M	CyclStart Hold
2	27.11.2012	21.11.2012		3M	Scheduled Hold
3	25.12.2012	19.12.2012		1M	Scheduled Hold
4	22.01.2013	16.01.2013		1M	Scheduled Hold
5	19.02.2013	13.02.2013		6M	Scheduled Hold
6	19.03.2013	13.03.2013		1M	Scheduled Hold

$$30.10.2012 = 23.10.2012 + (56 \text{ day} - 49 \text{ day})$$

# How to schedule a maintenance plan and how to use deadline monitoring



# If the execution date of a maintenance plan regularly moves the call should be done manually and set the date



**Schedule Maintenance Plan: Single cycle plan OB-AN-SD**

Start | Start in cycle | Restart | **Manual call** | Schedule overview list

Maintenance plan: OB-AN-SD | Annual Kiln Shutdown

Scheduled calls | **Manual calls** | Maintenance plan scheduling parameters | Maintenance plan additional data

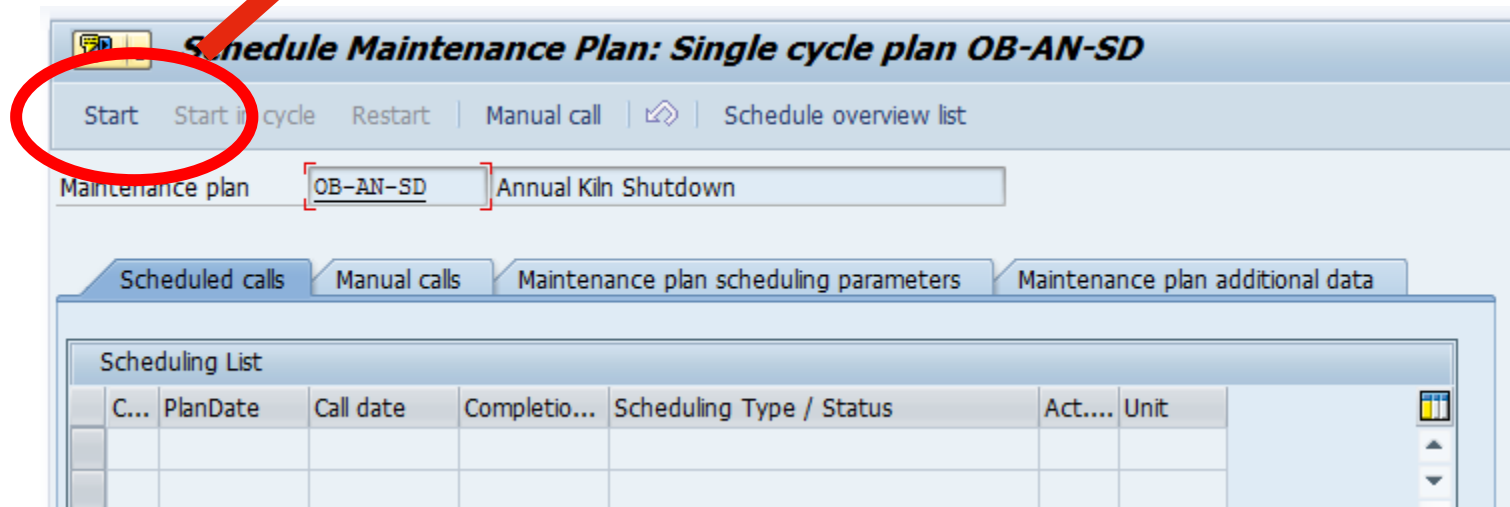
C...	PlanDate	Call date	Completi...	Sc

Start Date

Manual call

23.10.2012

# If there is a maintenance program with reoccurring tasks SAP can take care about the timing



# For time based maintenance plans not all parameters are needed

**Create Maintenance Plan: Strategy plan OB-4-WK-INSP**

Maintenance plan: OB-4-WK-INSP Kiln Inspection

Maint. plan header

Maintenance plan cycle 23.10.2012 Maintenance plan scheduling parameters Maintenance plan additional data

Date determination	
Shift Factor Late Compl.	<input type="text"/> %
Tolerance (+)	<input type="text"/> %
Shift Factor Early Compl.	<input type="text"/> %
Tolerance (-)	<input type="text"/> %
Cycle modification factor	<input type="text" value="1,00"/>
Factory calendar	<input type="text"/>

Call control parameter	
Call horizon	<input type="text" value="80"/> %
Scheduling period	<input type="text" value="91"/> D
<input type="checkbox"/> Completion Requirement	

Scheduling indicator	
<input checked="" type="radio"/> Time	
<input type="radio"/> Time - key date	
<input type="radio"/> Time - factory caldr	

Start scheduling	
Start of cycle	<input type="text"/>

Completion Requirement has to be UNFLAGGED

Date determination parameters not needed in this case

Always use TIME  
Only for fixed dates (like 2<sup>nd</sup> of each month) TIME-KEY DATE can be used



# The scheduling parameters should always have the same values

**Create Maintenance Plan: Strategy plan OB-4-WK-INSP**

Maintenance plan: OB-4-WK-INSP Kiln Inspection

Maint. plan header

Maintenance plan cycle 23.10.2012 Maintenance plan scheduling parameters Maintenance plan additional data

Date determination		Call control parameter		Scheduling indicator	
Shift Factor Late Compl.	<input type="text"/> %	Call horizon	80 %	<input checked="" type="radio"/> Time	
Tolerance (+)	<input type="text"/> %	Scheduling period	91 D	<input type="radio"/> Time - key date	
Shift Factor Early Compl.	<input type="text"/> %	<input type="checkbox"/> Completion Requirement		<input type="radio"/> Time - factory caldr	
Tolerance (-)	<input type="text"/> %				
Cycle modification factor	<input type="text"/>				
Factory calendar	<input type="text"/>				

Start scheduling

Start of cycle: 02.10.2012

Date when the execution of the maintenance plan should start

Call horizon: 80% (defined through strategy)  
Scheduling period: 91 days (only if package length is >3month a scheduling period of 1 year should be chosen)

# Example to illustrate the parameters: basic parameters

Cycles

Cycle	Unit	Maintenance cycle text	Offset
4 WK		1 Month	0

Call control parameter

Call horizon

80

%

Scheduling period

30




D

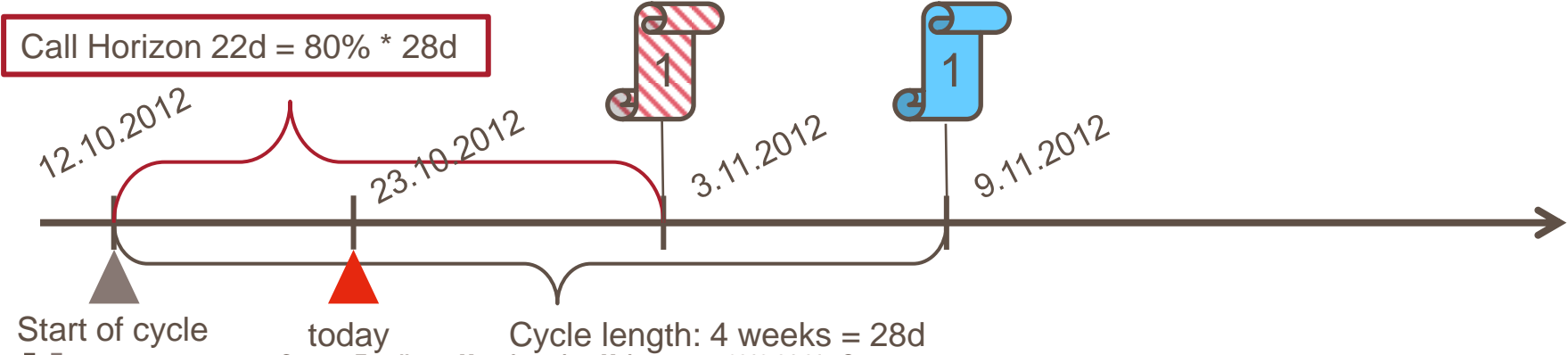
☐ Completion Requirement

Start scheduling

Start of cycle

12.10.2012

-  Planned Creation of WO 1
-  Creation of WO 1
-  Basic Start Date of WO 1



# If the plan is started with IP 10, all WO which fall within the scheduling period will be visible

**Schedule Maintenance Plan: Strategy plan AL-3-MT-INSP**

Start | Start in cycle | Restart | Manual call | Schedule overview list

Maintenance plan: AL-3-MT-INSP Monthly Raw Mill Inspection

Scheduled calls | Manual calls | Maintenance plan scheduling parameters | Maintenance plan additional

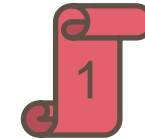
**Scheduling List**

Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status
1	09.11.2012	03.11.2012		1M	New start Hold

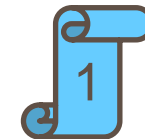
Call horizon: 80 %  
Scheduling period: 30 D



Planned Creation of WO 1

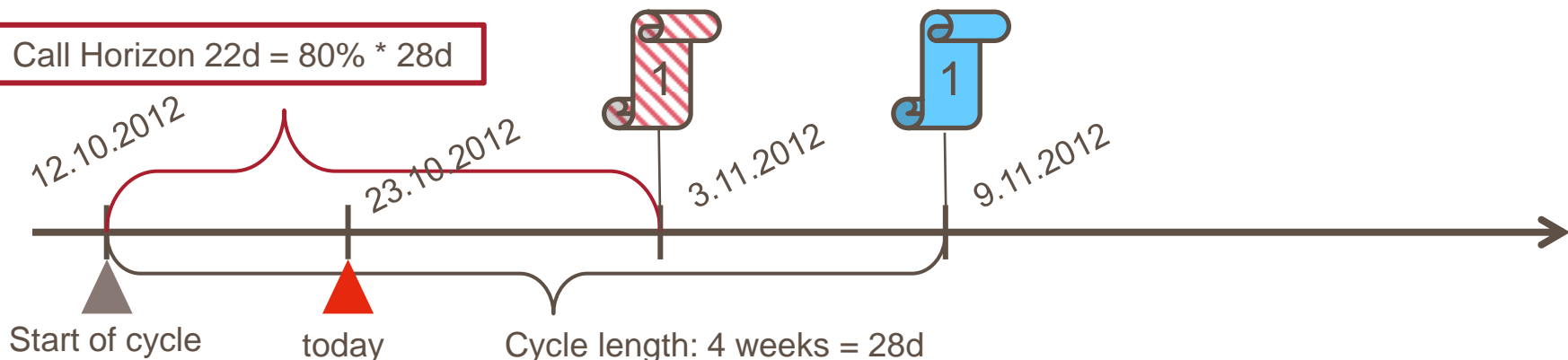


Creation of WO 1



Basic Start Date of WO 1

Call Horizon 22d = 80% \* 28d



# If the call date is beyond the call horizon, the WO will be created

**Schedule Maintenance Plan: Strategy plan AL-3-MT-INSP**

Start | Start in cycle | Restart | Manual call | Schedule overview list

Maintenance plan: AL-3-MT-INSP Monthly Raw Mill Inspection

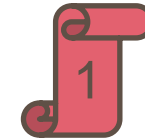
Scheduled calls | Manual calls | Maintenance plan scheduling parameters | Maintenance plan additional

Scheduling List						
Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status	
1	09.11.2012			1M	New start	Save to call

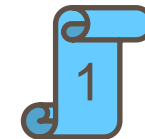
Call horizon: 30 %  
Scheduling period: 30 D



Planned Creation of WO 1

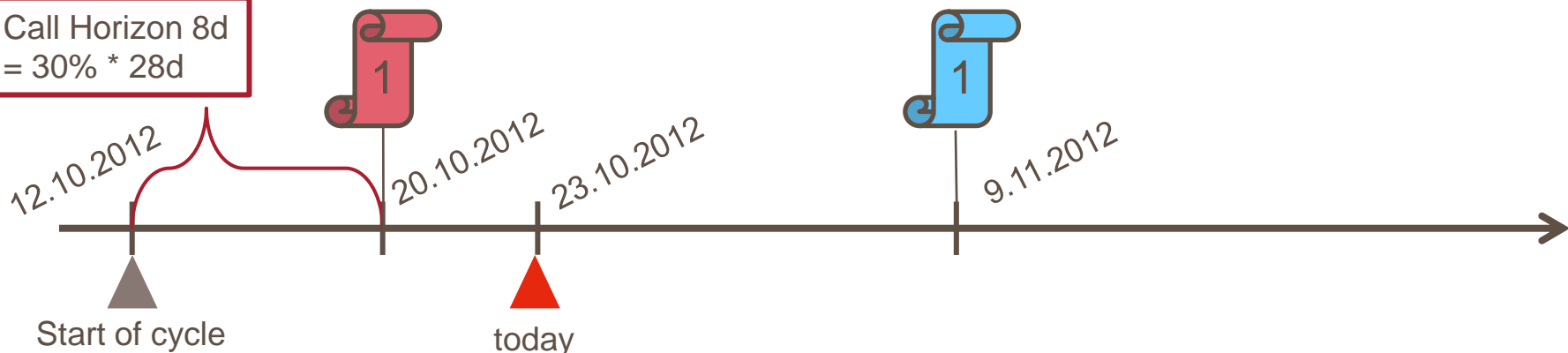


Creation of WO 1



Basic Start Date of WO 1

Call Horizon 8d  
= 30% \* 28d



# The scheduling period defines the period in the future where the WO should be visible

**Schedule Maintenance Plan: Strategy plan AL-3-MT-INSP**

Start | Start in cycle | Restart | Manual call | Schedule overview list

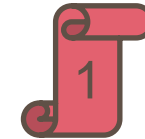
Maintenance plan: AL-3-MT-INSP | Monthly Raw Mill Inspection

Scheduled calls | Manual calls | Maintenance plan scheduling parameters | Maintenance plan addi

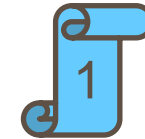
Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status
1	09.11.2012	03.11.2012		1M	New start Hold
2	07.12.2012	01.12.2012		1M	Scheduled Hold
3	04.01.2013	29.12.2012		1M	Scheduled Hold



Planned Creation of WO 1

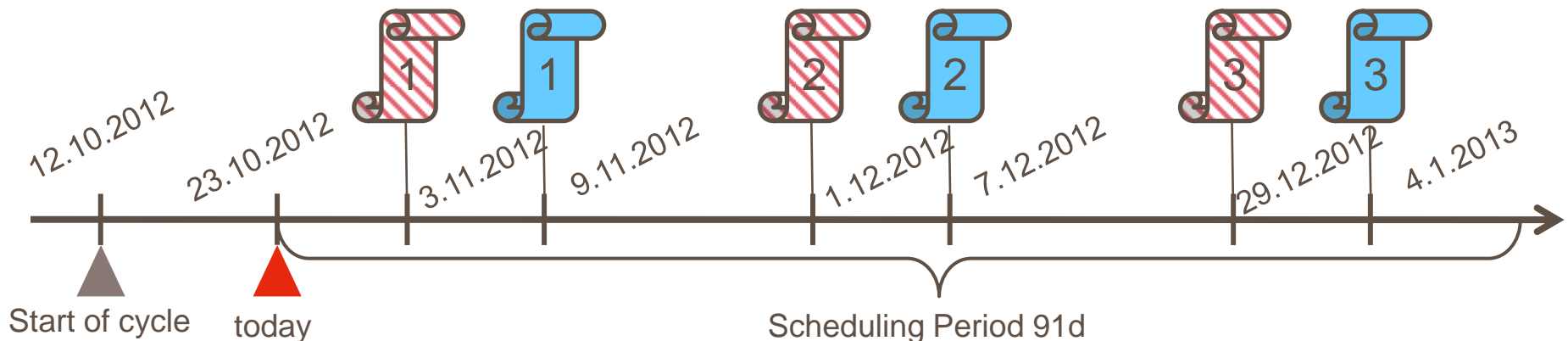


Creation of WO 1



Basic Start Date of WO 1

Call horizon	80	%
Scheduling period	91	D



# Deadline Monitoring is taking care about the calls by executing them automatically on the right time

---



# Dead line monitoring [IP30] is creating all visible WO within the Interval for Call Objects

Item   Object list item   Item location   Schedule call item   Cycle item 23.10.2012						
Maintenance Item		1489	Monthly Raw Mill Inpsection			
	Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status
	1	09.11.2012			1M	New start   Called

Deadline monitoring for maintenance plans

Maintenance Plan

AL-3-MT-INSP

Maint. plan cat.

MaintPlan sort field

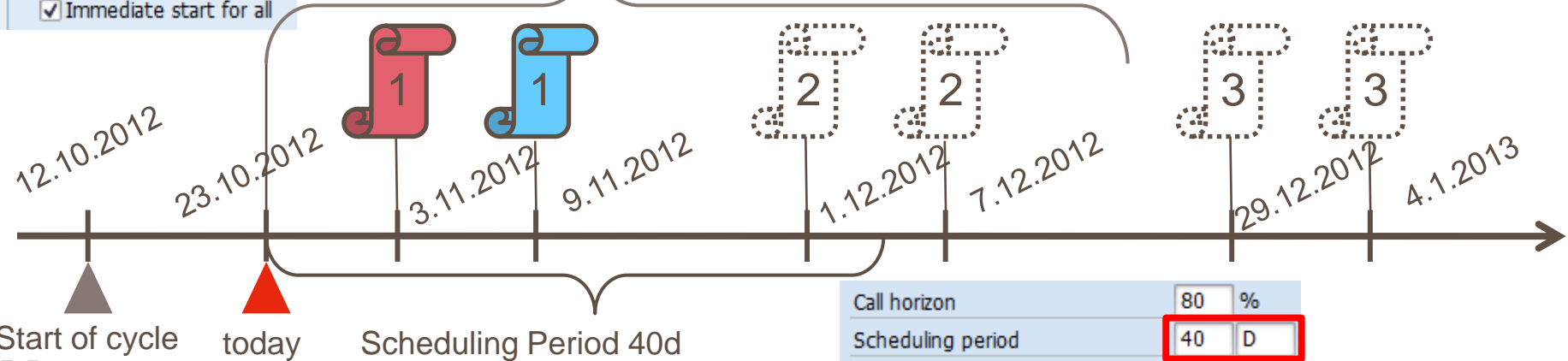
Maintenance strategy




Interval for Call Objects

60 D

☒ Rescheduling incl.

☒ Immediate start for all



-  Planned Creation of WO 1
-  Creation of WO 1
-  Basic Start Date of WO 1



# Dead line monitoring [IP30] is creating all visible WO within the Interval for Call Objects

Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status
1	09.11.2012			1M	New start Called
2	07.12.2012			1M	Scheduled Called
3	04.01.2013	29.12.2012		1M	Scheduled Hold



Planned Creation of WO 1



Creation of WO 1



Basic Start Date of WO 1

Deadline monitoring for maintenance plans

Maintenance Plan: AL-3-MT-INSP

Maint. plan cat.:

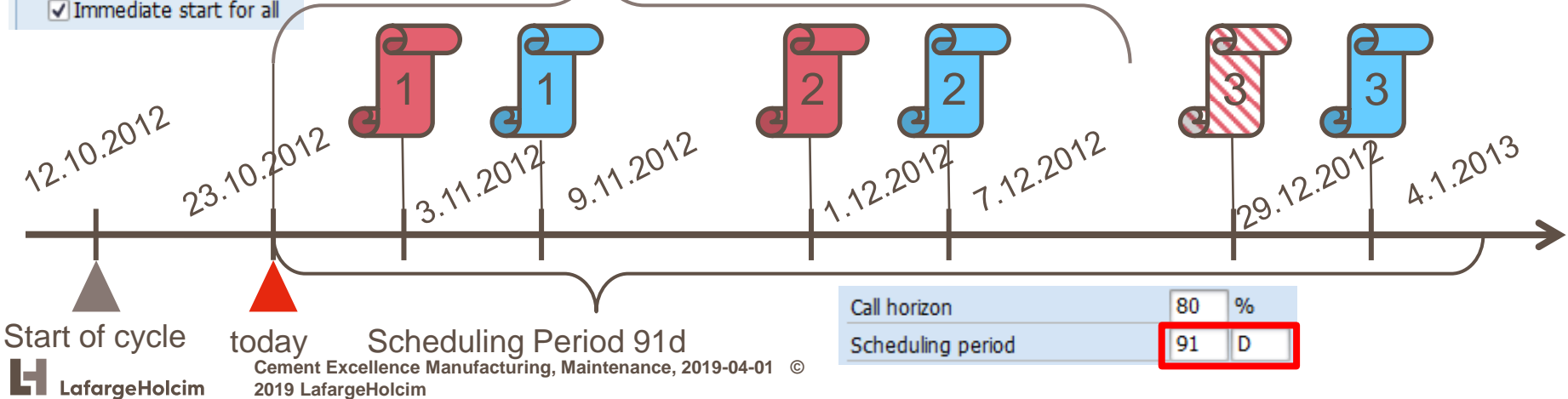
MaintPlan sort field:

Maintenance strategy:

Interval for Call Objects: 60 D

☒ Rescheduling incl.

☒ Immediate start for all



# Dead line monitoring [IP30] is creating all visible WO within the Interval for Call Objects

Cal...	PlanDate	Call date	Completion date	Due packages	Scheduling Type / Status
1	09.11.2012			1M	New start Called
2	07.12.2012			1M	Scheduled Called
3	04.01.2013			1M	Scheduled Called



Planned Creation of WO 1



Creation of WO 1



Basic Start Date of WO 1

Deadline monitoring for maintenance plans

Maintenance Plan

AL-3-MT-INSP

Maint. plan cat.

MaintPlan sort field

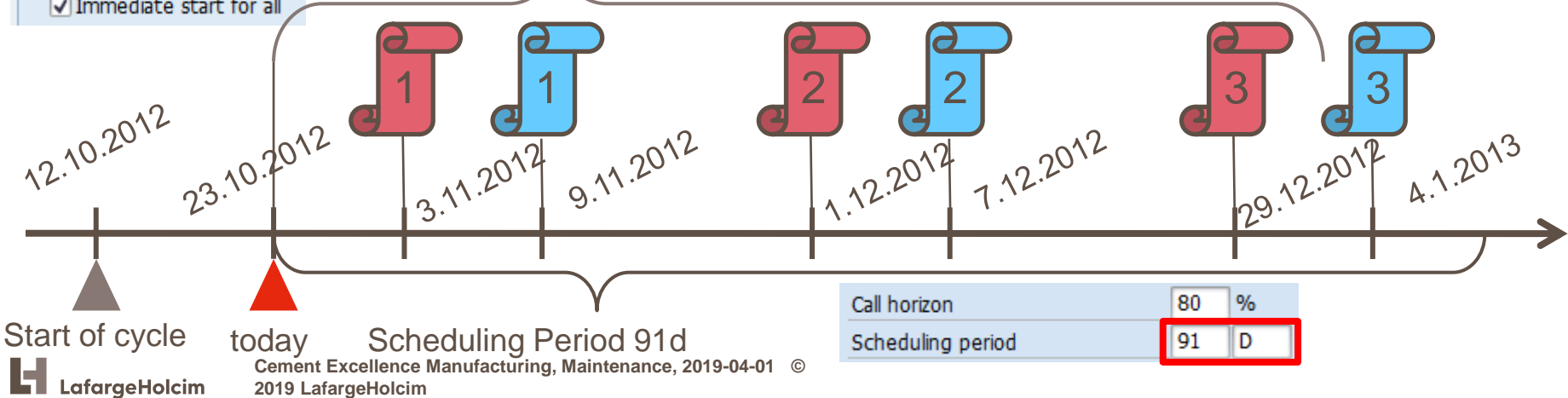
Maintenance strategy

Interval for Call Objects

70 D

☒ Rescheduling incl.

☒ Immediate start for all

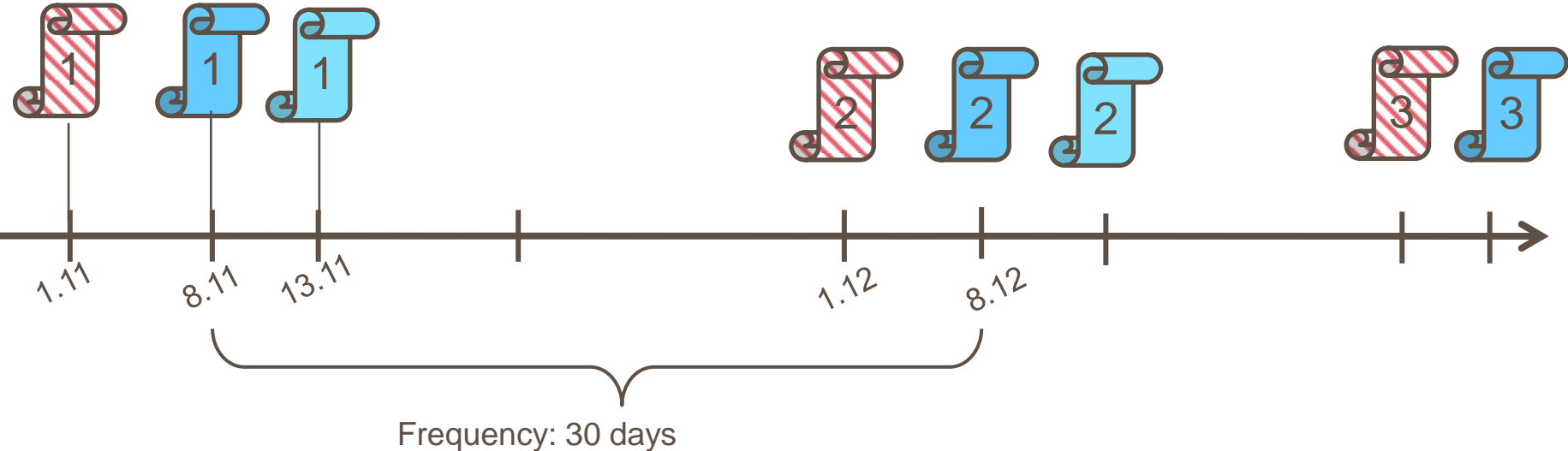
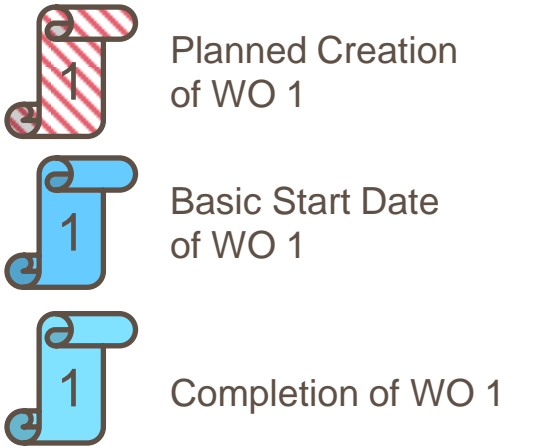


# Completion Requirement would create workload balancing issues

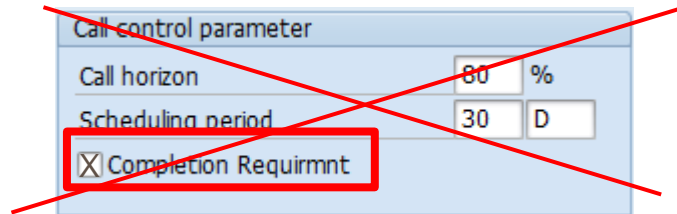
Call control parameter

Call horizon	80	%
Scheduling period	30	D
<input type="checkbox"/> Completion Requirement		

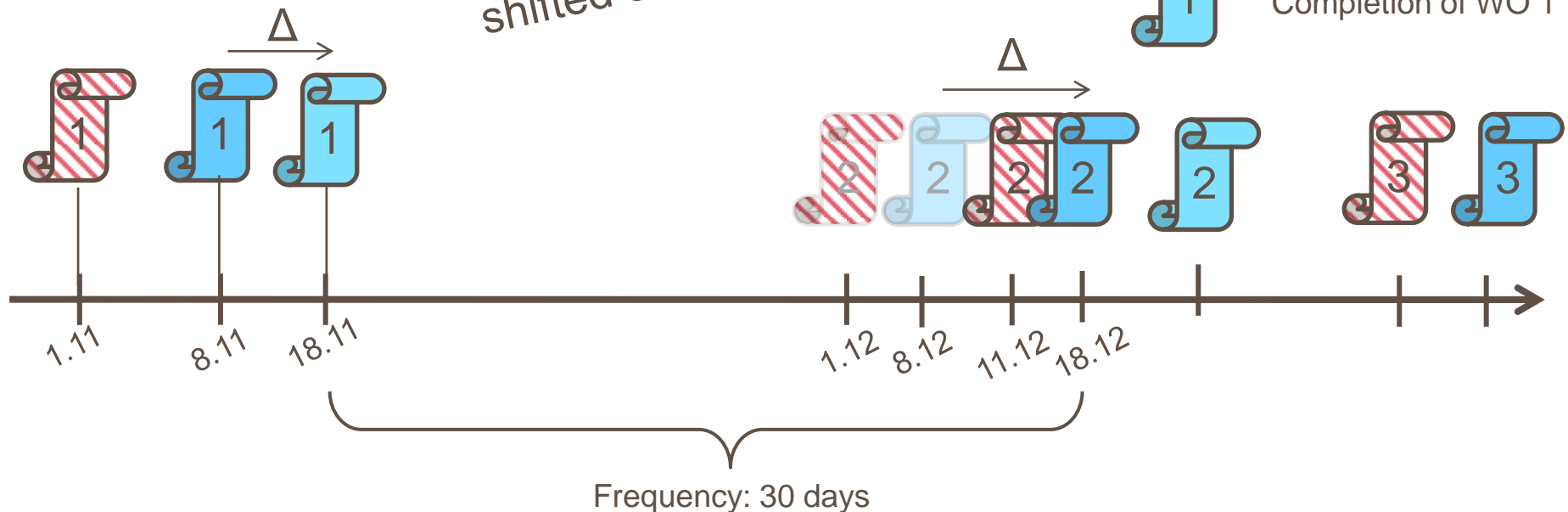
Correct behaviour –  
Workload is kept balanced



# Completion Requirement would create workload balancing issues



Incorrect behaviour –  
Workload balancing will be  
shifted each time



# The IT-Service Center can create 4 sort fields which can be assigned to a maintenance plan

---

Maintenance Plan Sort Field	Interval for Call Objects
Auto 30 days	30 days
Auto 13 weeks	13 weeks
Auto 1 year	52 weeks
Manual	-

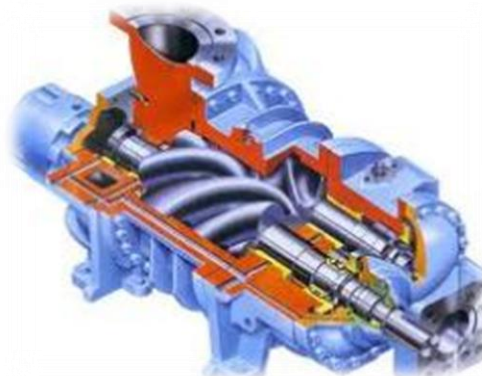
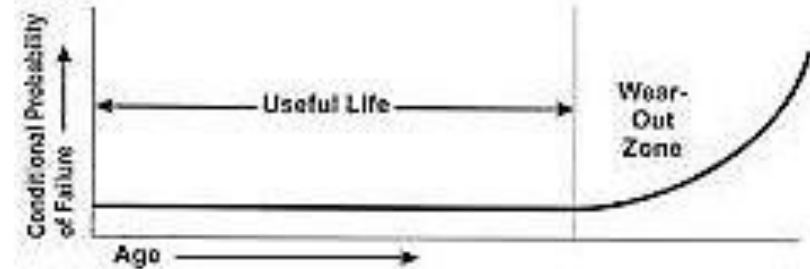
Dead line monitoring will be configured so that a maintenance plan with a “*Sort Field*” assigned get automatically linked to the corresponding *Interval for Call Objects*.

# How to use PERFORMANCE (COUNTERS) BASED strategy plans



# Not everything is about time based. It is also related with its performance...

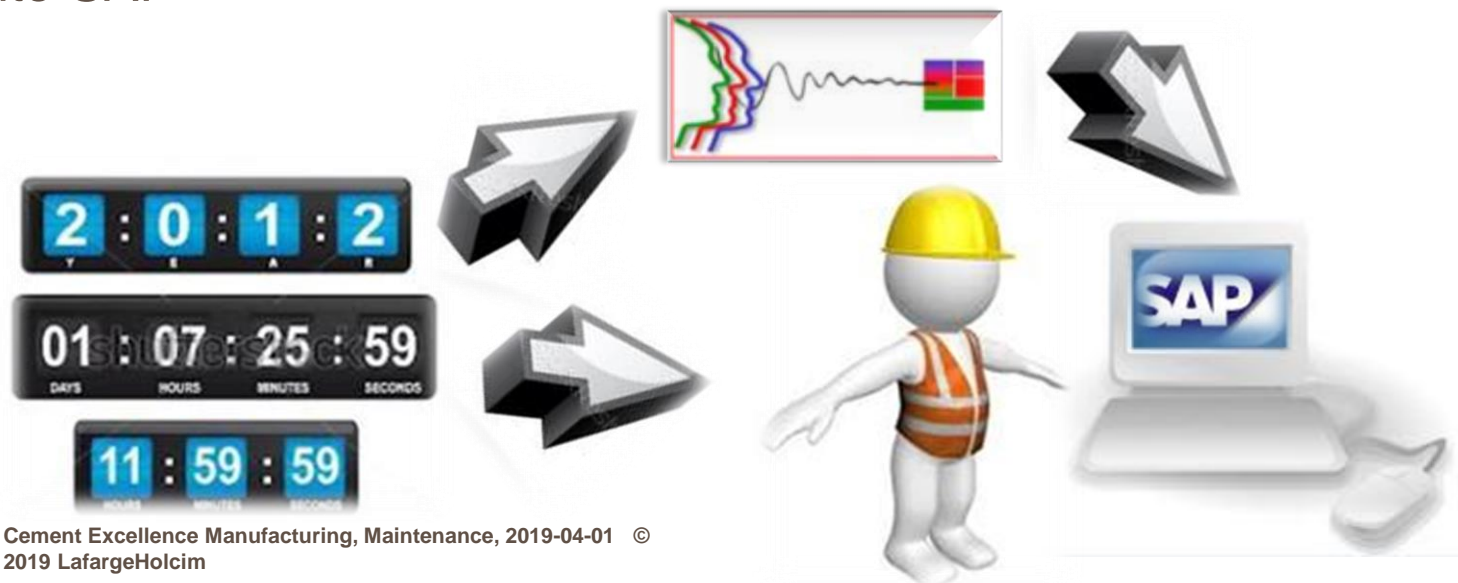
- Wear-out characteristics are often found where equipment comes into direct contact with the product
- However, age-related failures are also often associated with fatigue, corrosion, abrasion and evaporation
- It has been demonstrated that compressors and mobile equipment show a clear degraded state before a failure state during their useful life
- A degraded state is associated with a requirement for maintenance. Therefore those equipment require a strict maintenance based in counters





# Not everything is about time based. It is also related with its performance...

- A preventive maintenance plan can be scheduled on the basis of operating hours, kilometers traveled, and so on. For example, to schedule tasks at regular service intervals every 500 operating hours or every 1,000 km.
- *(Compressors in our industry are therefore good candidates!)*
- A counter system is required to measure the units needed. Such system is called Measuring Points
- The data (e.g. operating hours) can be fed either manually or automatically by TIS into SAP



# The difference in the Strategy



# A Characteristic is needed which specifies the properties of an object. First step, CT04.

- The system calculates the planned date in respect of the following counter data:
  - ▶ annual estimate
  - ▶ current counter reading
  - ▶ current date
- The values or units for a Counter are specified by a Characteristic in SAP

Characteristic: ZPM\_BOUR

Change Number:

Valid From: 07.11.2012

Validity:

Basic data | Descriptions | Values | Addnl data | Restrictions

Basic data

Description: Running Hours

Chars Group:

Status: Released

Auth.Group:

Format

Data Type: Numeric Format

Number of Chars: 6

Decimal Places:

Unit of Measure: H

Template:

Value assignment

☒ Single-value

☐ Multiple Values

☐ Interval vals allowed

☐ Negative Vals Allowed

☐ Restrictable

Format specifies the data format and unit of measure.

*Numeric format must not be confused with TIME format for a “running-hours” strategy!!!*

# Measuring Points and Counters. IK03

- Measurement documents register the measurement and counter readings for the equipment.
- Standard Work Orders are performed when the counter of an equipment has reached a particular counter reading, for example, 1000 hours of operating hours of a air compressor

**Create Measuring Point: General Data**

Additional Data... Last Measurement Document...

Measuring point: 143 Cat. M MeasPoint (general)

MeasPosition: COMPRESSOR

Description: Runing hours for compressor

Equipment: 1004962

Description: COMPRESSEUR AIR USINE

**General data**

Characteristic: ZPM\_HOUR Running Hours

CharactUnit: H Hours ☒ MeasPoint is counter

Decimal places: 2 FloatPointExp. ☐

Code group: ValCode sufficient ☐

Assembly:

AuthorizGroup:

MeasReadTransf. ☐ Supported Transfer of:

**Target value**

Target value: 24000 H

Text:

Measuring point must be linked with the characteristic

A target value (estimated annual reading) is also needed

# The Maintenance Strategy

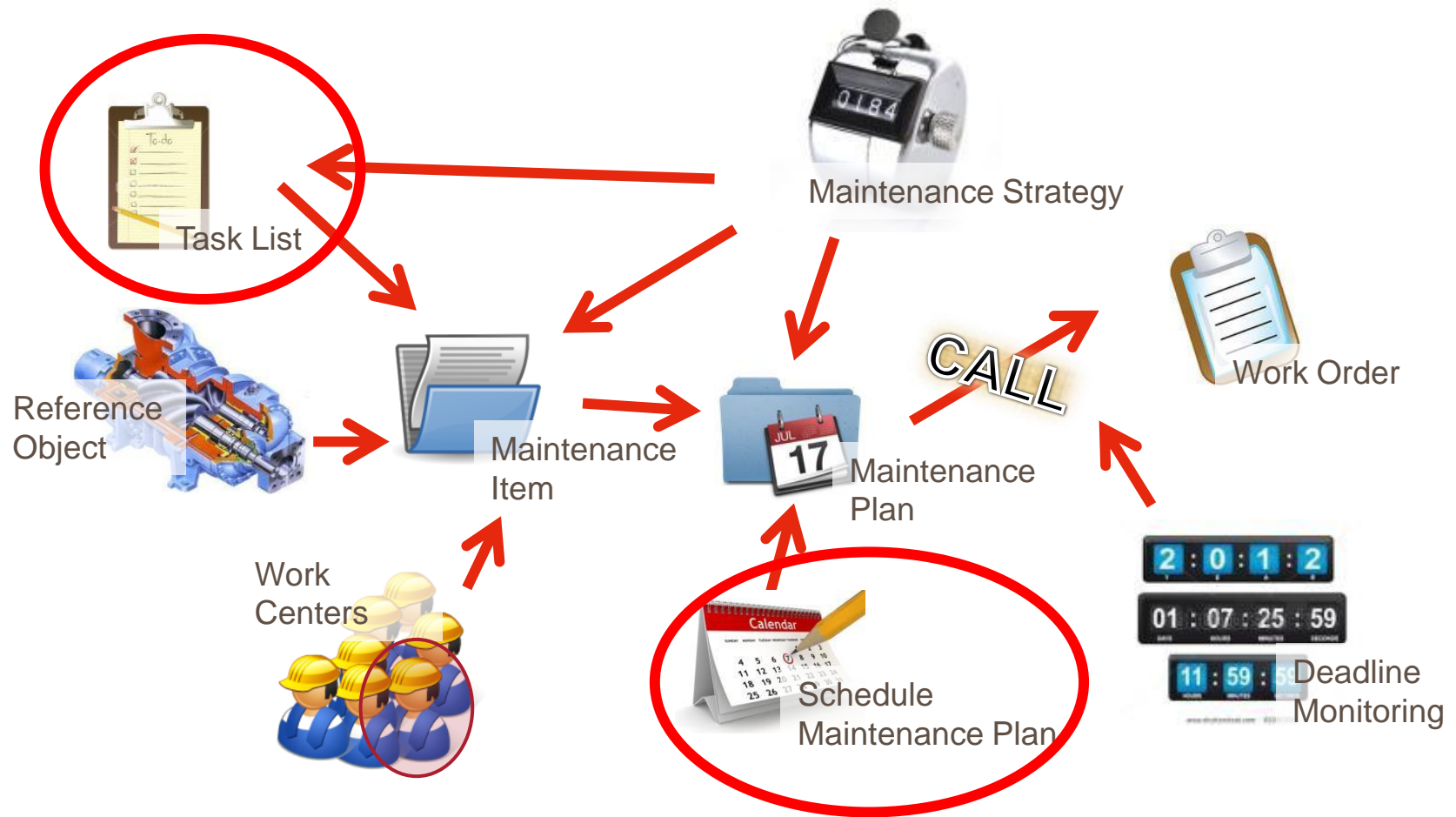
- Same principles like hierarchy are applicable to Performance-based Maintenance Strategy
- Packages could be linked or not to each other

Name	EBM-HW						
Description	General Hours hierarchy						
Scheduling indicator	Activity						
	P...	Cycl.length	Unit	Maintenance cycle text	C...	H...	H... Offset
10		125 H	250 Hours	1	10	WH	
20		500 H	500 Hours	5	20	WH	
30		1000 H	1000 Hours	10	30	WH	
40		1500 H	15000 Hours	15	40	WH	
50		2000 H	2000 Hours	20	50	WH	
60		3000 H	3000 Hours	30	60	WH	
70		4000 H	4000 Hours	40	70	WH	
80		8000 H	8000 Hours	80	80	WH	
90		24000 H	24000 Hours	90	90	WH	

Packages are established according to pre-defined intervals (depending of the activity)

The usage of Hierarchy for running hours of compressors is highly recommended

# The Task List and the Scheduling Process





# Tasks List of Performed based Strategy do not differ so much of the others

Create Functional Location Task List: Header Generation

Operation

Func. Loc. AL.D31-CX1 COMPRESSEUR AIR USINE  
Group 255 COMPRESSEUR AIR USINE

Group 255  
Group Counter 1 COMPRESSEUR AIR USINE  
Planning plant F103

Assignments to Header

Work center MECH1 / F103 Equipe Mécanique  
Usage 4 Plant maintenance  
Planner group ME1 Daniel Vogel  
Status 4 Released (general)  
System Condition 0 not in operation  
Maintenance strategy EBM-HW General Hours hierarchy  
Assembly  
Ref. Element PM/PS  
☐ Deletion flag

Create Functional Location Task List: Operation Overview

Func. Loc. AL.D31-CX1 COMPRESSEUR AIR USINE  
Group 255 COMPRESSEUR AIR USINE Grp.Countr 1

General Operation Overview

Op...	SOp	Work ctr	Plnt	Ctrl	Operation Description	LT	Wor
0010		MECH1	F103	ZPMI	D31-CX1 Prev Maint Service (125 hrs)	<input type="checkbox"/>	
0020		MECH1	F103	ZPMI	D31-CX1 Prev Maint Service (1000 hrs)	<input type="checkbox"/>	
0030		MECH1	F103	ZPMI	D31-CX1 Prev Maint Service (4000 hrs)	<input type="checkbox"/>	
0040		MECH1	F103	ZPMI	D31-CX1 Prev Maint Service (8000 hrs)	<input type="checkbox"/>	
0050		MECH1	F103	ZPMI	D31-CX1 Prev Maint Service (24000 hrs)	<input type="checkbox"/>	

Maintenance Strategy  
based in Hours

Description of the operations  
must be related with the length  
of the services and the  
selection of a third party  
services to generate the PO  
automatically



# Neither the scheduling process differs

**Schedule Maintenance Plan: Strategy plan AL-CX-PM**

Start **Start in cycle** Restart | Manual call | | Schedule overview list

Maintenance plan **AL-CX-PM** Preventive Maintenance compressor

Scheduled calls | Manual calls | Maintenance plan scheduling parameters | Maintenance

Counter  Running hours for compressor  
TotalCounterReading  H

**Scheduling List**

C...	PlanDate	Call date	Completi...	Due packages	Scheduling Type / Status
1	07.11.2012			1	New start Called
2	13.11.2012	10.11.2012		40	CyclStart Hold
3	19.11.2012	16.11.2012		1	Scheduled Hold
4	24.11.2012	21.11.2012		1	Scheduled Hold
5	30.11.2012	27.11.2012		1	Scheduled Hold
6	06.12.2012	03.12.2012		1	Scheduled Hold
7	12.12.2012	09.12.2012		1	Scheduled Hold
8	17.12.2012	14.12.2012		1	Scheduled Hold
9	23.12.2012	20.12.2012		1	Scheduled Hold
10	29.12.2012	26.12.2012		10	Scheduled Hold
11	04.01.2013	01.01.2013		1	Scheduled Hold
12	09.01.2013	06.01.2013		1	Scheduled Hold
13	15.01.2013	12.01.2013		1	Scheduled Hold
14	21.01.2013	18.01.2013		1	Scheduled Hold
15	27.01.2013	24.01.2013		1	Scheduled Hold
16	01.02.2013	30.01.2013		1	Scheduled Hold

The counter reading must be set to zero after completion of a maintenance cycle

**Start Counter Reading**

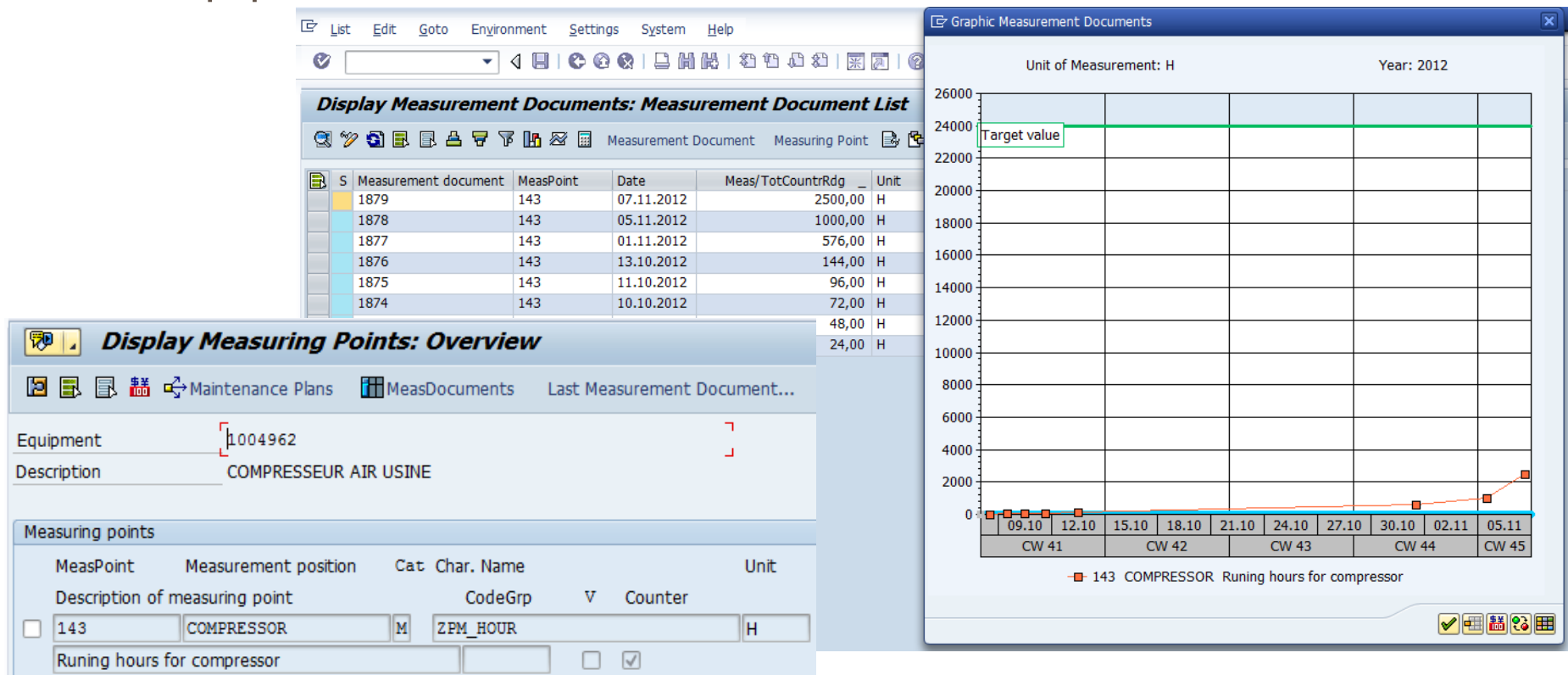
CountReading Unit  
Compl.CountRead.  H

# Neither the scheduling process differs



# Measuring Points and Counters. IK03

- Measuring points and counters are created as master records. This enables to make reference to the equipment.
- Measurement documents register the measurement and counter readings for the equipment



# Recording single measurement – IK22

**Collective Entry of Measurement Documents: Overview**

All Measuring Points on Object   Object Counter   New Entries

Equipment: 1003016  
Description: TROMMEL - DELAYEUR

Default Values for New Entries

MeasTime: 20.11.2012 / 14:15:46   Read by: CALBERT2

Measurement Documents

MeasPoint	Measurement position	Description	Val.	A
Rdg/CtrRdg	Unit	CounterRdgDifference	R	P
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>
OR		<input type="text"/>	20.11.2012	14:15:46

1. Select the equipment (Selection screen)
2. Select measuring point
3. Enter reading (see picture)

2 ways to enter data:

- Absolute reading: e.g total running hours of the equipment
- Differential reading: e.g running hours since last measurement (in case of a “reset” of the counting device)

# Creation of a reading entry list – IK31 & Measure recording – IK34

**Measurement Reading Entry List: Create**

Header data

Entry list number

Entry list name

Short descriptn

Meas. Recording List

se...	Sort fl...	Ob...	MeasPoint/Counter	Co...	MeasPoint short text
0		<input checked="" type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	
0		<input checked="" type="checkbox"/>			

1. Enter a name and description
2. List all measuring points which have to be recorder at once (e.g: during a route or a PMR) ("Obligatory" field to select if measurement is compulsory)
3. Save

**Collective Entry of Measurement Documents: Overview**

New Entries

Default Values for New Entries

MeasTime  /  Read by

Measurement Documents

MeasPoint	Measurement position	Description	Val.	A
Rdg/CtrRdg	Unit	CounterRdgDifference	MeasurementTime	R P
MeasPointObject	Description			
<input type="text" value="37"/>	<input type="text" value="LU.341-BB1+HOUR"/>	<input type="text" value="2. Trommel delayeur"/>	<input type="text"/>	<input type="checkbox"/>
<input type="text" value="+"/>	<input type="text" value="H"/>	<input type="text" value="+"/>	<input type="text" value="20.11.2012"/>	<input type="text" value="14:24:35"/>
Equipment	1003016		TROMMEL - DELAYEUR	

1. Enter the list name (Selection Screen)
2. All measurements from the list are displayed and can be entered
3. Save



**LafargeHolcim**