

# CEMAT / MinAS

Automation for the cement and mining industry

CEMAT - has come a long way since 1974

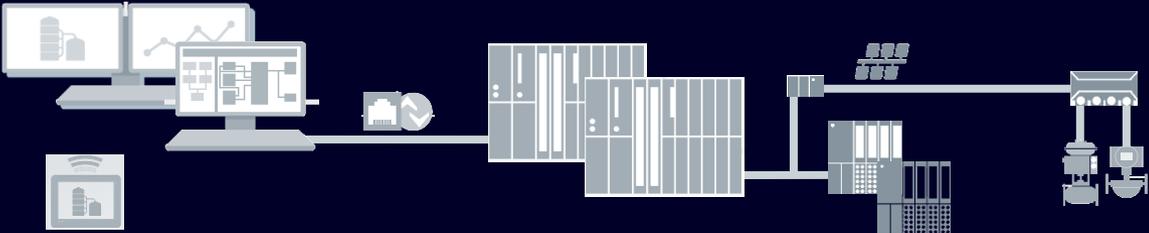


Worldwide  
**more than 900 CEMAT**  
installations

# SIMATIC PCS 7

Wide range of expansion options

<b>Information Management</b> 	<b>Life Cycle &amp; Services</b> 	<b>Integrated Engineering</b> 	<b>Plant Asset Management</b> 	<b>APC Optimization</b> 	<b>Energie Management</b> 	<b>Batch Automation</b> 
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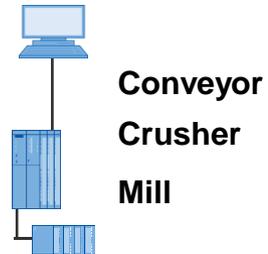


## SIMATIC PCS 7

<b>Simulation FAT/OTS</b> 	<b>Integrated Switchgear</b> 	<b>Integrated Package Units</b> 	<b>Integrated Field devices</b> 	<b>Safety Integrated</b> 	<b>Integrated Telecontrol</b> 	<b>Route Management</b> 
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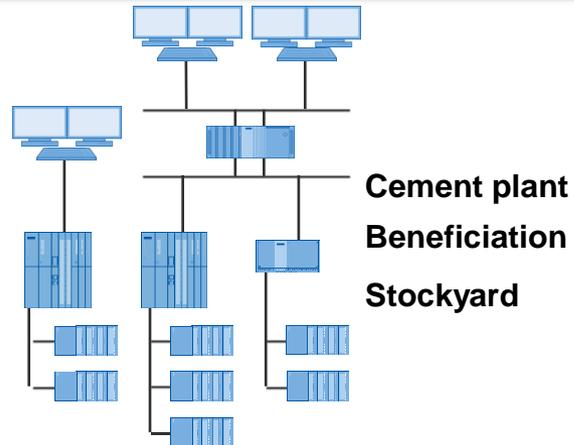
# CEMAT - one standard fits all

## Equipment level

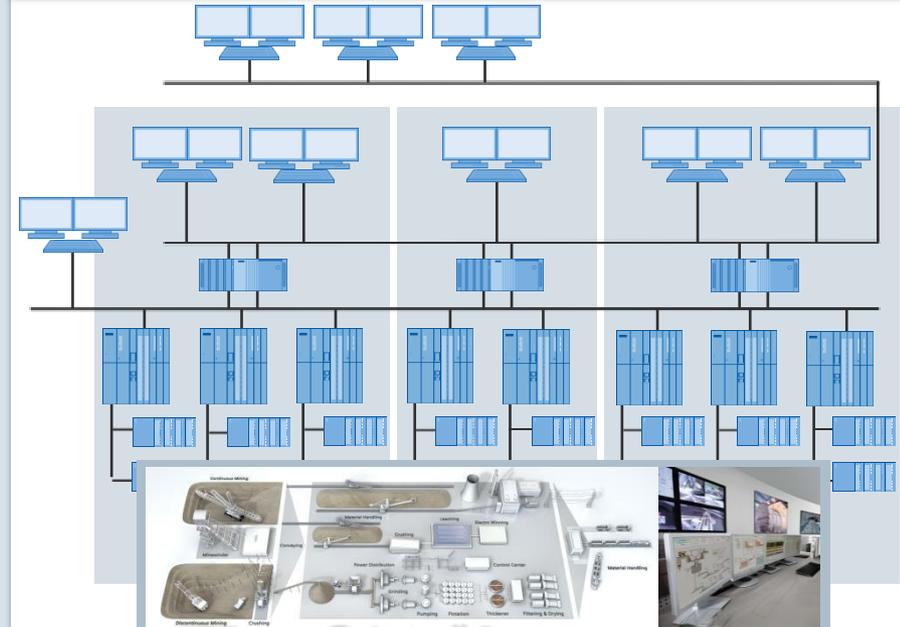


Scalable: From the starter package (~100 I/O) ...

## Production plant



## Interconnected plants at one production location (e.g. remote operated)



... to the distributed multi-user-system in Client/Server architecture with more than 120,000 I/O

**Bandwidth of scalability (1:1000), for all plant sizes ... as large as you need**

# SIMATIC PCS 7 – Hardware components

Controller for Process Automation

## SIMATIC PCS 7 controller for every requirement

### CPU 410E

Special offer for very small applications  
(200 POs)



### CPU 410-5H

Scalable CPU for all applications



**Future-proof**

- Standardized, redundant and failsafe
- Expandable online
- Powerful, rugged, scalable
- Modular, fan-free design

# SIMATIC PCS 7 – Hardware components

## Process I/O for PROFINET communication

A coordinated solution reduces the wiring work and increases the flexibility

SIMATIC ET 200M



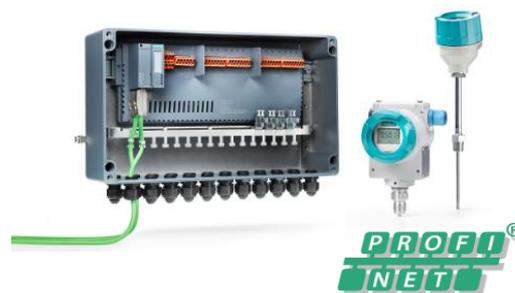
SIMATIC ET 200SP HA



SIMATIC ET 200SP



SIMATIC CFU



SIMATIC ET 200iSP



### High plant availability

- Redundant PROFINET communication down to field level
- High-performant and compact
- Use in hazardous areas
- Push-in technology
- Redundant PROFINET-Interface, I/O modules and power supply



### Flexible

- PROFINET communication
- Push-in technology
- Compact design
- System-integrated PROFIenergy



### Reduction in cabling cost

- Field distributor brings PROFINET down to the field level
- Exchange of field devices and expandability during operation without interruption
- Low commissioning, servicing and life cycle costs



### Hazardous areas

- Redundante PROFIBUS communication
- Suitable for gas/dust atmospheres in Ex zone 1, 2, 21 or 22
- Modular and flexible engineering, commissioning and cabling with low effort

# SIMATIC PCS 7 – Plant Generator

## Efficient Engineering

### Features



- Control – Template-based Import/Export using predefined CMT/EMT templates
  - Generating control modules for process plants on sensors and actuator level
  - Modifying variants of control modules
  - Generating equipment modules respectively equipment phases on group control level
- Support of spreadsheet engineering using the familiar Excel SW
- Exchanging CMT type relations of CM instances

### Key Benefits



- Efficiency – Generating CMs/EMs completely from scratch Providing an easy-to-use import/export tool
- Interoperability – Excel (csv file) as well as SimaticML (XML) support
- Flexibility – Modifying/Updating support
- Useable with existing Import-Export Assistant (IEA) License

**Generate/Import** dialog box with "Delete at target" checkbox.

**Technological list editor** table:

ID	Attribute	A	B	Status
1	ComponentType	CMT_Slave	CMT_Slave	Master
2	ComponentType	MasterSlave	MasterSlave	Master
3	Value	ASST01	CMT_Slave	Component
4	ComponentType	EMT	EMT	Master
5	File Path	Project/Generator/PlantGenerator/Process/PlantGenerator	PlantGenerator	Master
6	Instance	EMT_Slave	EMT_Slave	Master

**Component View** menu options: Component View, Plant View, Process Object View, Technological list editor.

**Generating control modules**, **Generating equipment modules**, **Modifying variants of control modules**, **Renaming**, **Changing version**.

Icons for XML and Excel files.

Bottom screenshot showing a table with columns: Name, Type, Value, Instance, Master, Slave, Component, File Path, Instance, Master, Slave, Component, File Path.

# CEMAT / MinAS – Highlights V9

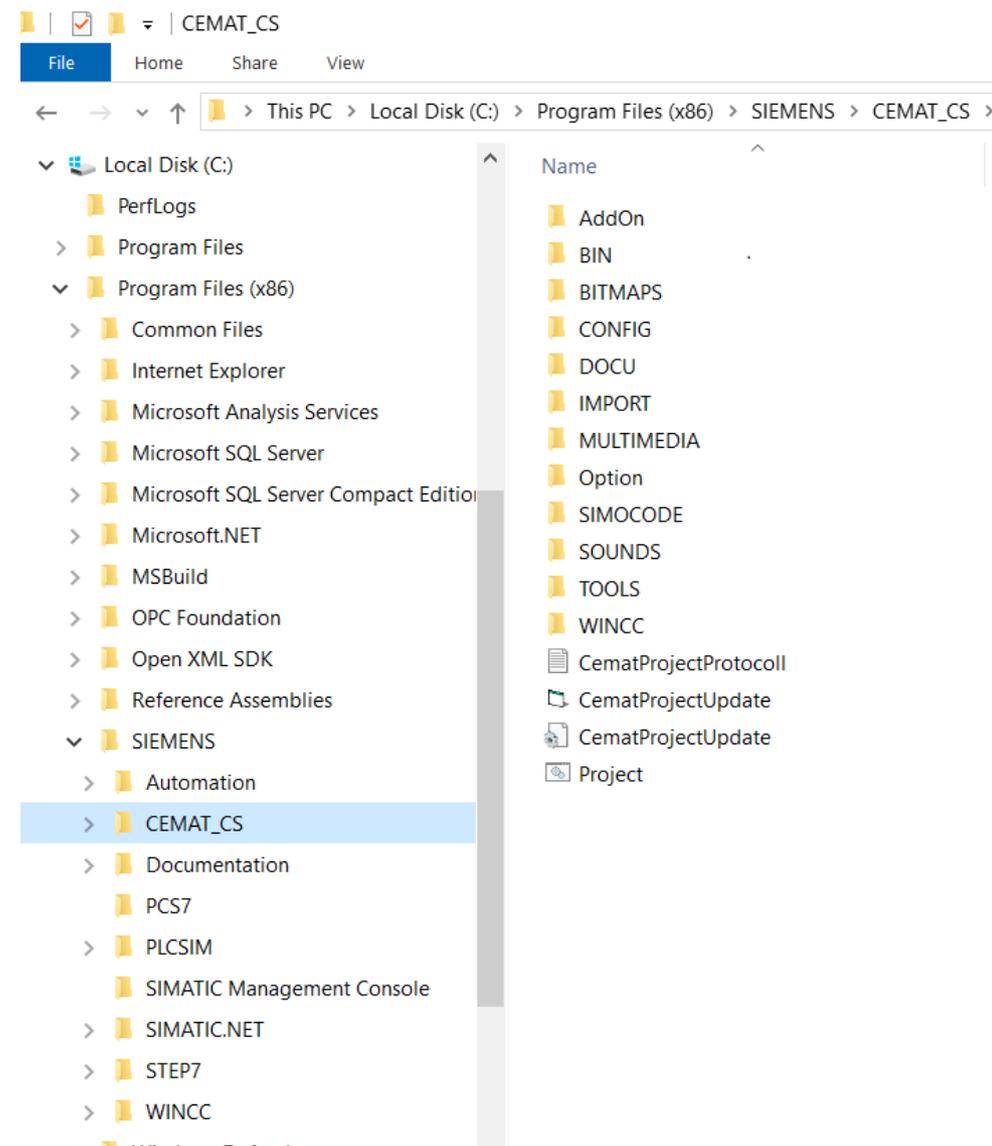
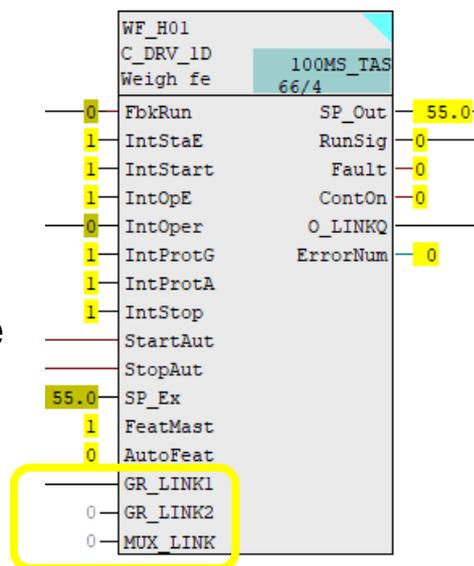
**Achieving a higher level of security and stability:**

**CEMAT\_CS** is now located in the specially hardened section of PCS 7 and can -after installation- be found under

**C:\Program Files (x86) / SIEMENS/CEMAT\_CS**

(Projects can still be located at the D: partition)

via **CEMAT self-test** now also the connections to GR\_LINK und MUX\_LINK are monitored



# CEMAT MinAS - clearly defined and flexible

## Example 1: Operating modes (AUTO, MANUAL, LOCAL,...)

Mode change philosophy is different from plant to plant:

- Mode change Group-wise or for individual objects?
- Local mode exists?
- Manual mode exists?
- Manual mode with or without interlocks?



**CEMAT**  
special

In CEMAT Project Standard 001 Minerals the mode change can be configured via feature bit settings and OS Permissions!

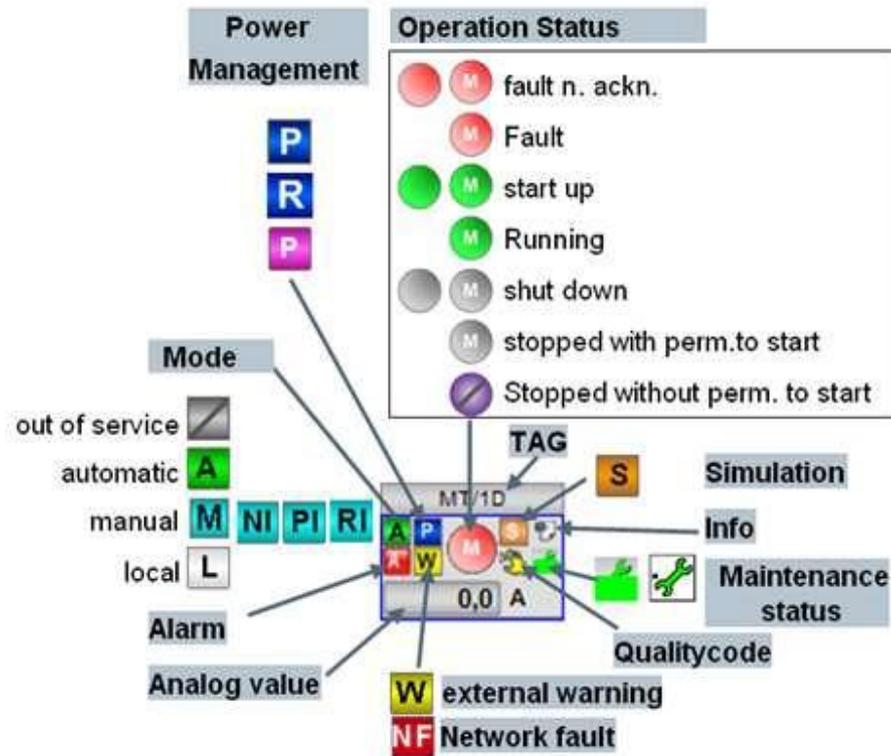
# CEMAT MinAS - symbols preconfigured and flexible

Example: the Block Icon Drive -customizable:

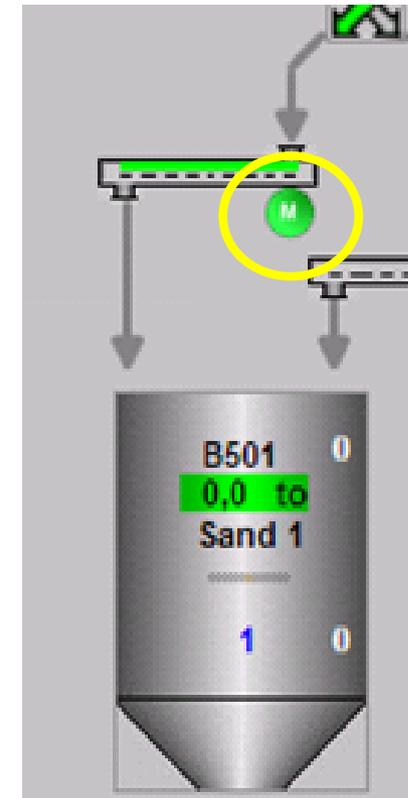
from “full blown”

to

“as simple as possible”



Block Icon C\_DRV\_1D

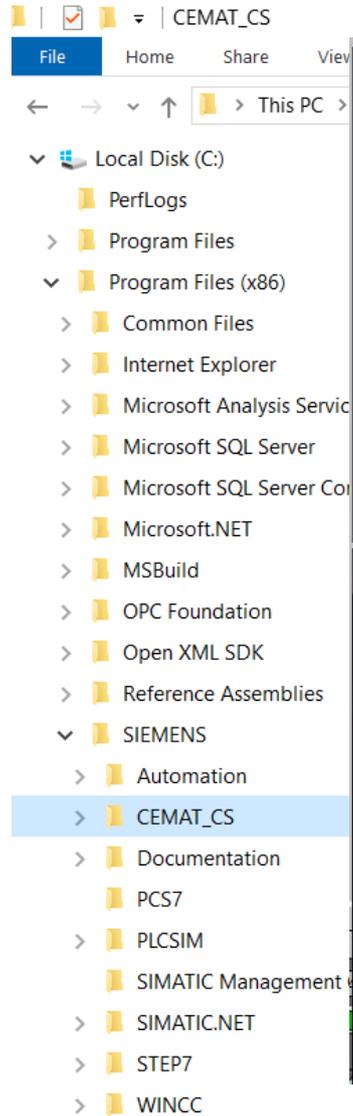


# CEMAT MinAS - symbols preconfigured and flexible

For each type  
(motors, dampers, valves,  
measurements, binary  
monitoring, groups, routes,...)  
preconfigured symbols do exist



# CEMAT / MinAS – Highlights V9



SPC\_CM\_G/FbkObjOn

Group running

SPC_CM_ACT/WF_H01	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/WF_H02	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/WF_H03	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/SP	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/SF	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/MD	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/CEM_Transport	InSig = 0	<input type="checkbox"/>
SPC_CM_ACT/6	InSig = 0	<input type="checkbox"/>

Temporary bypass 2 expires in 6 s

AS restart 06.07.2021 16:05:08

SPC\_CM\_G/FbkObjOn

Group running

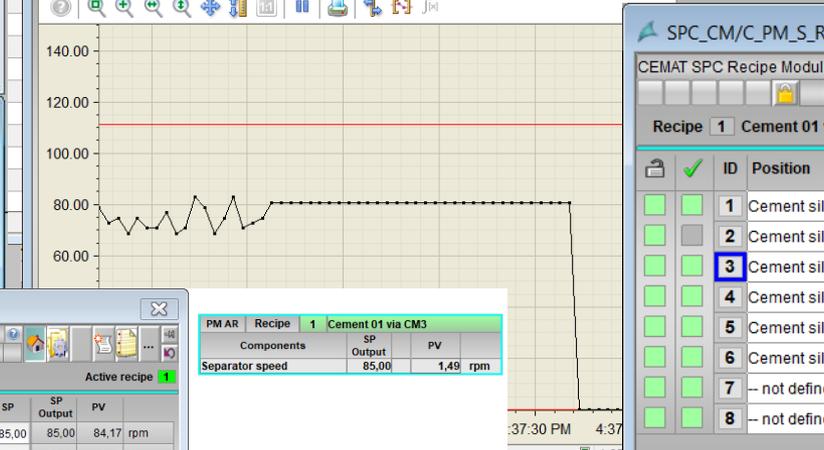
Bypass	Set bypass		Reset bypass
	temporary	permanently	
<input checked="" type="checkbox"/>	0 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	6 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	19 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	0 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	0 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	23 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	34 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	0 s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Process Parameter

Temporary bypass elapse time s 40

PCS 7 measuring point browser

Name	Type	State	Area
CM_MEAS/FF	C_MEASUR	OoS in Safe mode	SPC



SPC\_CM/C\_PM\_AR\_Rec01

Recipe 1 Cement 01 via CM3

ID	Components	SP Original	SP	SP Output	PV
1	Separator speed	0,00	85,00	85,00	84,17 rpm
2	Separator fan speed	0,00	50,00	50,00	49,17 %
3	Exhaust air damper	0,00	0,00	0,00	0,00 %
4	Fresh air damper	0,00	10,00	10,00	0,00 %
5	Circulation damper	0,00	40,00	40,00	0,00 %
6	spray water 6	0,00	10,00	10,00	10,00 %
7	spray water 7	0,00	5,00	5,00	5,33 %
8					
--	Sum	0,00	200,00	225,00	177,87 --

PM AR Recipe 1 Cement 01 via CM3

Components	SP Output	PV
Separator speed	85,00	1,49 rpm

SPC\_CM/C\_PM\_S\_Rec01

CEMAT SPC Recipe Module: Storage selection

Recipe 1 Cement 01 via CM3 Active recipe 1

ID	Position
<input checked="" type="checkbox"/>	1 Cement silo 01
<input type="checkbox"/>	2 Cement silo 02
<input checked="" type="checkbox"/>	3 Cement silo 03
<input type="checkbox"/>	4 Cement silo 04
<input type="checkbox"/>	5 Cement silo 06
<input type="checkbox"/>	6 Cement silo 05
<input type="checkbox"/>	7 -- not defined --
<input type="checkbox"/>	8 -- not defined --

Start position 3

On

Execution OK Cancel

PM S	Recipe	Cement 01 via CM3
	1	Cement 01 via CM3
		SPC_CM/C_PM_S_Rec01
		CEMAT SPC Recipe Module: Storage selection
		Components
		Cement silo 01
		Cement silo 02
		Cement silo 03
		Cement silo 04
		Cement silo 06
		Cement silo 05

# CEMAT - usability with GROUP module

... the plant can be operated **individually** –motor by motor- or “**grouped**” with the **C\_GROUP** :

The screenshot shows the CEMAT control interface for a group module. At the top, a status bar displays '310\_GR/G01' and a row of indicator lights, with the first two being green and labeled 'A' and 'O'. A yellow starburst graphic in the top right corner contains the text 'CEMAT special'. The main interface area is divided into several sections:

- Top Section:** Includes a 'Comment to TAG' field, a 'U R' indicator, and an 'Objects Mode' selector set to 'Aut'. A green bar below indicates 'Completely running'.
- Control Section:** Features 'Start', 'Stop', and 'Interrupt' buttons. To the right, there are buttons for 'Interlock bypass', 'Group not empty', 'Group not empty reset', and 'Immediate Stop'.
- Bottom Section:** Contains a 'Force Object Mode' selector with 'Automatic', 'Manual', and 'Local' options. The 'Manual' mode is currently selected.

Annotations with arrows point to specific features:

- 'Show “Related Objects” in flow mimic' points to the 'U R' indicator.
- 'Group Status' points to the 'A O' indicator lights.
- 'Interlock Status (with link to Interlock faceplates)' points to the 'O' indicator light.
- 'Start or Stop the Group, interrupt startup or shutdown' points to the 'Start', 'Stop', and 'Interrupt' buttons.
- 'Operating mode selection' points to the 'Automatic', 'Manual', and 'Local' mode selector.

# CEMAT MinAS - Scalable Production Control (“SPC”)

## Functionality

- ✦ Up to 26 recipes/parameter sets per recipe manager
- ✦ User-defined quantity and data types of recipe parameters
- ✦ Material assignment for storage locations

## Use case

- ✦ Recipe management for applications like cement grinding, rawmix production or kiln firing

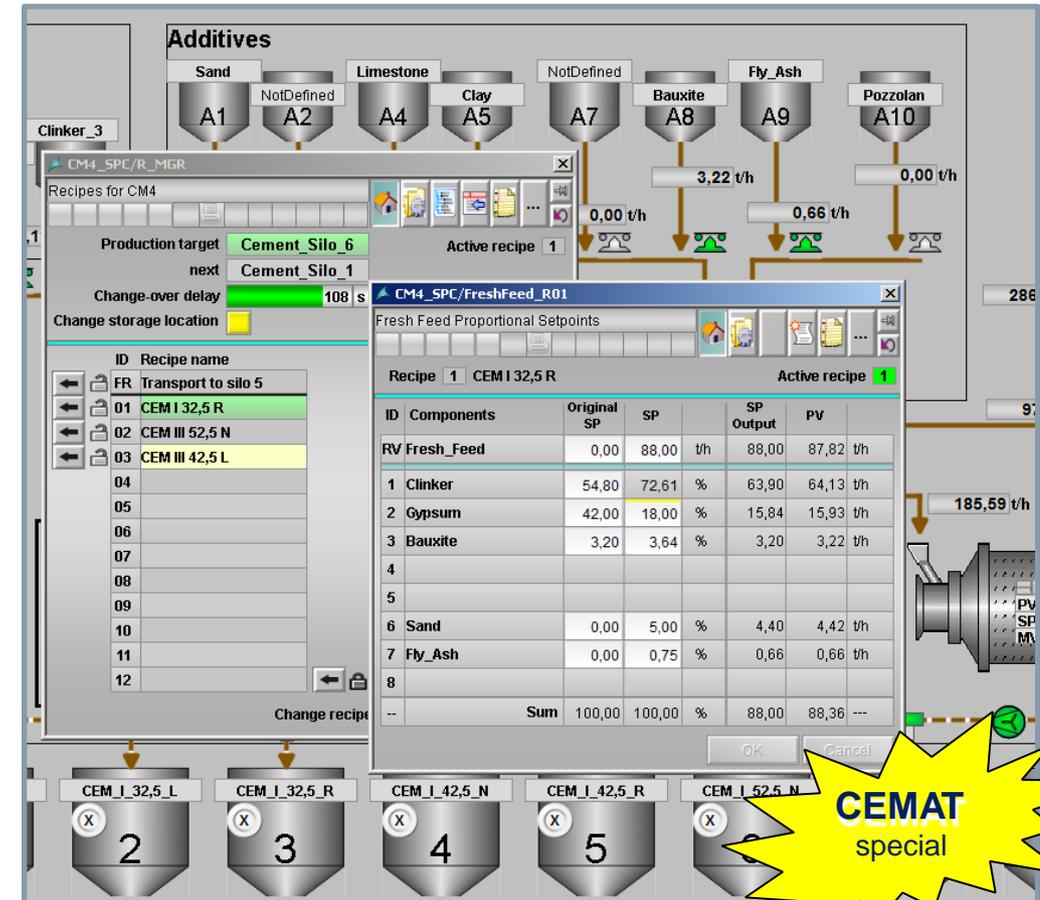
## Benefits

Only CFC knowledge required for the engineering

Easy to use

Expandable

Data is held within the PCS7 user-project, no add-on to PCS 7 required



# CEMAT MinAS - Scalable Production Control ("SPC")

**SPC - Cement mill 01**

**Fresh feed hoppers**

Clinker	43,70 t/h	43,8 t/h
Fly_Ash	3,51 t/h	3,5 t/h
Gypsum	7,73 t/h	7,7 t/h

**Separator**

SP	75,00	Output	75,00	%
SP	81,30	Output	81,30	%

**Mill main drive**

**CM 01**

**Cement mill control**

Start / stop: (group control)

**Cement Silos**

CEM_IV_52,5_R	CEM_III_52,5_N	CEM_I_32,5_R	Rej
1	2	3	4

**Sequence test mode** [HOLD] [SAVE] [LOAD]

**PM RTR Recipe 1 CEM I 32,5 R**

Components	SP	SP Output
Fresh_Feed	55,00 t/h	55,00 t/h
Clinker	79,60 %	43,78 t/h
Fly_Ash	6,40 %	3,52 t/h
Gypsum	14,00 %	7,70 t/h
Sum	100,00	55,00

**CM4\_SPC/R\_MGR**

Production target: Cement\_Silo\_8

next: Cement\_Silo\_2

Change-over delay: 7 s

ID	Recipe name	
FR	Material discharge	13
01	CEM I 32,5 R	14
02	CEM III 52,5 N	15
03	CEM III 42,5 L	16
04		17
05		
06		
07		
08		
09		
10		23
11		24
12	Special Cement	25

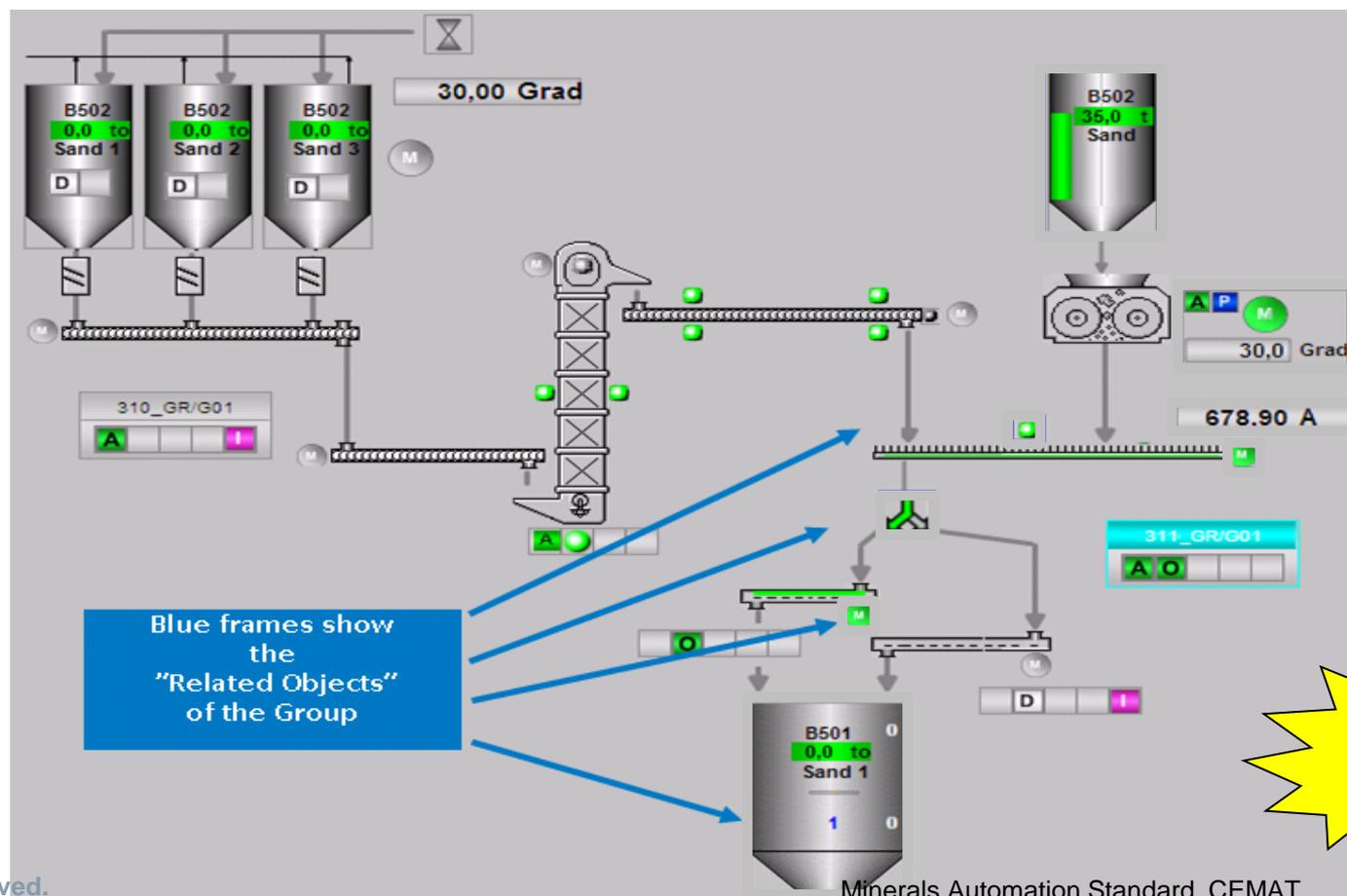
**CEMAT special**

## SPC symbols:

- ✦ Block icons for all module types to show current setpoints on the process picture
- ✦ The values of the **active** recipe are displayed

# CEMAT - usability with GROUP module

- ... operator information available **online** –
  - available with a single mouse click :



# CEMAT - efficient fault diagnosis

Reducing downtime requires **operator guidance**, **meaningful diagnostic information**:

With CEMAT:

## 1. Modul-wise

- Available since many versions

## 2. Group-wise

- summarized fault report of all objects via “Status call”
- Hierarchy GROUP-chart including dynamic information on operation modes and device status

## 3. Plant-wide

- Filter function to identify operation modes, bypassed interlocks, operator notes, ready for powermanagement, etc.,

No.	PLC	TAG	Fault Text	Annunciation Text
1	PLC01_prog	MTI2D1	Available	Two directional Drive
2	PLC01_prog	MTI3_MS2	H Limit	Measuring value 1
3	PLC01_prog	MTI3_MS3	H Limit	Measuring value 1
4	PLC01_prog	MTI3_MS3	H Limit	Measuring value 1

Object Browser - Manual Mode - Local Mode - Simulation active

- AS1\_prog
  - C\_DAMPER - C\_DAMPER/C\_DAMPER, Damper
  - C\_DRV\_1D - C\_DRV\_1D/C\_DRV\_1D, Unidirectional drive
  - C\_DRV\_1D - W\_C\_DRV\_1D/C\_DRV\_1D, Unidirectional drive
  - C\_MEASUR - C\_MEASUR/C\_MEASUR, Measuring value
  - C\_PROFIB - C\_PROFIB/C\_PROFIB, Process feedback (e.g. speed monitor)
  - C\_VALVE - C\_VALVE/C\_VALVE, Valve
  - C\_VALVE - W\_C\_VALVE/C\_VALVE, Valve

WinCC-Server Name: MINERALSVM --> OK V8.0.0 12022

WinCC-Server Name: SERV81 --> OK V8.0.1 130312

# CEMAT - usability with GROUP module

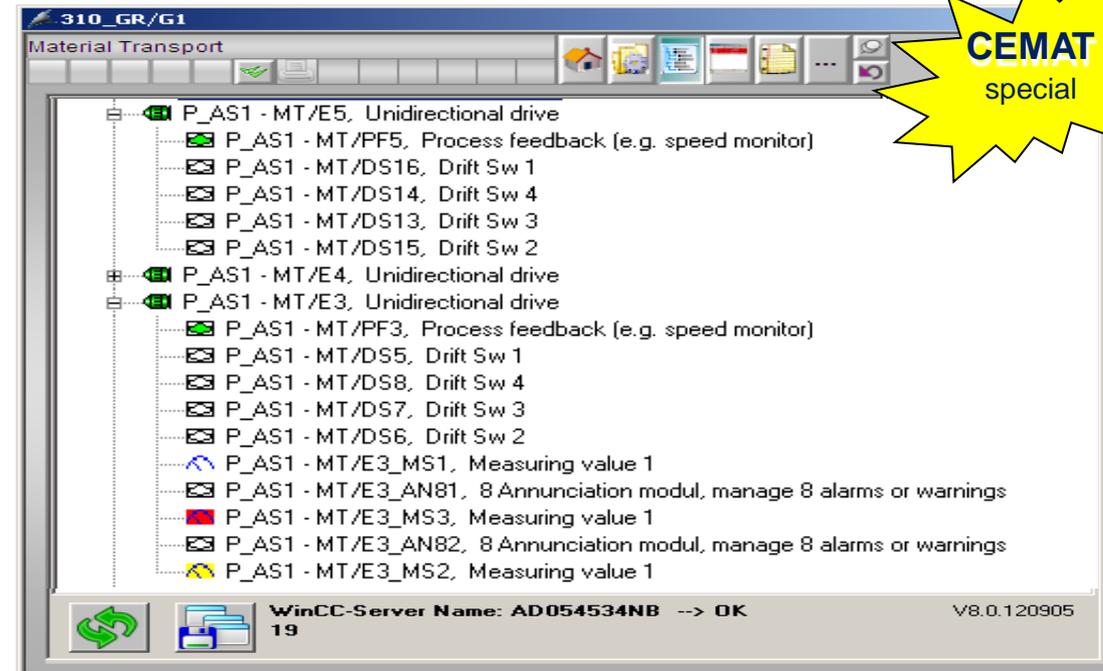
**GROUP**, controlling all subordinated objects



CEMAT eases operation by grouping the devices of the plant

## Use case

- ✦ Operate entire plant sections with just a few “mouse-klicks”
- ✦ Get the summarized status information of all related modules at a glimpse
- ✦ Actual information about every module belonging to the GROUP in the automatically populated Group-object-list



# CEMAT MinAS - usability grants save operation

Module with an individual Fault – RESET:

The screenshot displays the MinAS control interface for a 'Bucket Elevator' (313\_BE1/M1). The main window shows the drive status as 'Available' with a red 'fault' indicator. A 'Fault reset' button is highlighted with a yellow circle. An inset window shows the 'Interface Word' and 'Process Parameter' settings, with 'EIAvail' and 'EIAvail' also highlighted with yellow circles.

**Interface Word**

- IntStart Start interlock
- IntStaE Start interlock essential
- IntOper Operating interlock
- IntOpE Oper.interlock essential
- IntProtG Protection interlock
- IntProtA Protection interl. auto
- Sporadic Sporadic ON/OFF
- ProFb process feedback signal

**Process Parameter**

- Start delay: 3
- Stop delay: 2
- Feedback on time: 5
- Feedback off time: 2
- Time for start up warning: 10
- Setpoint limit max.: 100,0
- Setpoint limit min.: 0,0
- External setpoint: 0,0

**Parameter Field**

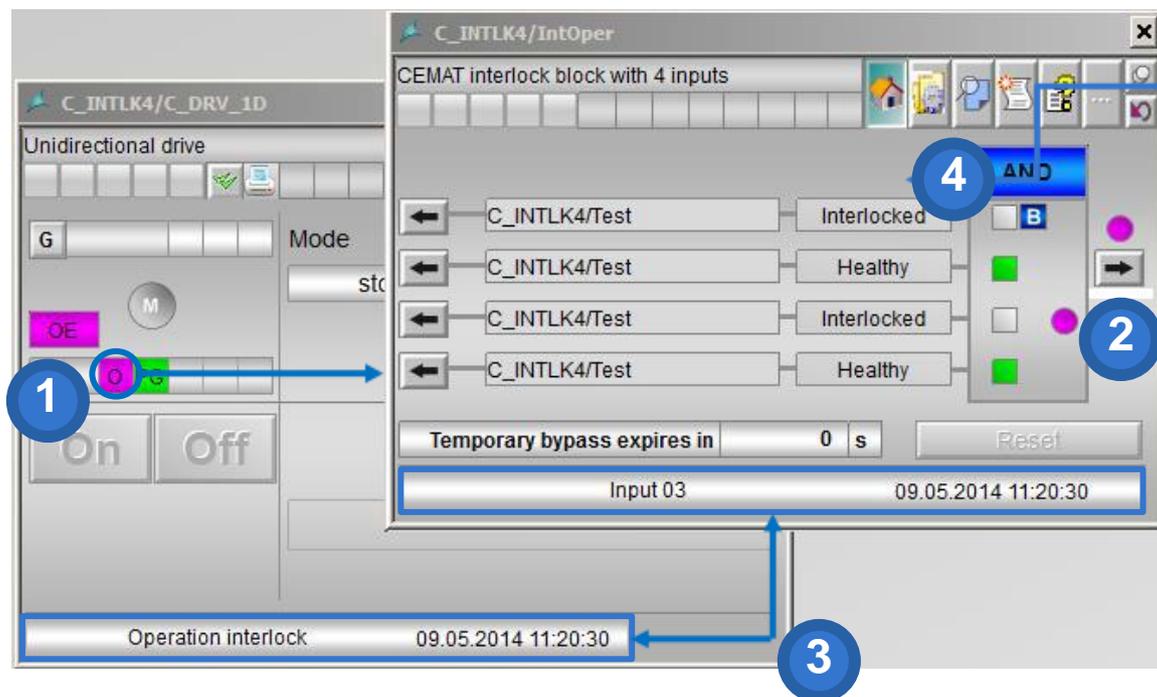
- EIAvail Electrical availability
- Overload Overload
- AutModLo Field switch ready
- StopLoc Field switch stop
- StartLoc Field switch start

**Alarm**

- EIAvail Available
- Overload Overload
- ModLoc Local
- CFeedb Contactor feedb
- ProFbFit Process feedb
- ProtInt Protection Inte
- ColAlarm External collec

Drive not running, showing a **not yet RESET** fault

# CEMAT MinAS - efficient fault diagnosis



## Interlock blocks with cascadable first-input evaluation, *permanent and temporary* bypass function

1. Interlocked signals shown in the motor faceplate
2. First-input tracking with specific marks
3. First-input evaluation with clear text and date & time
4. Permanent and temporary bypass

### Use case

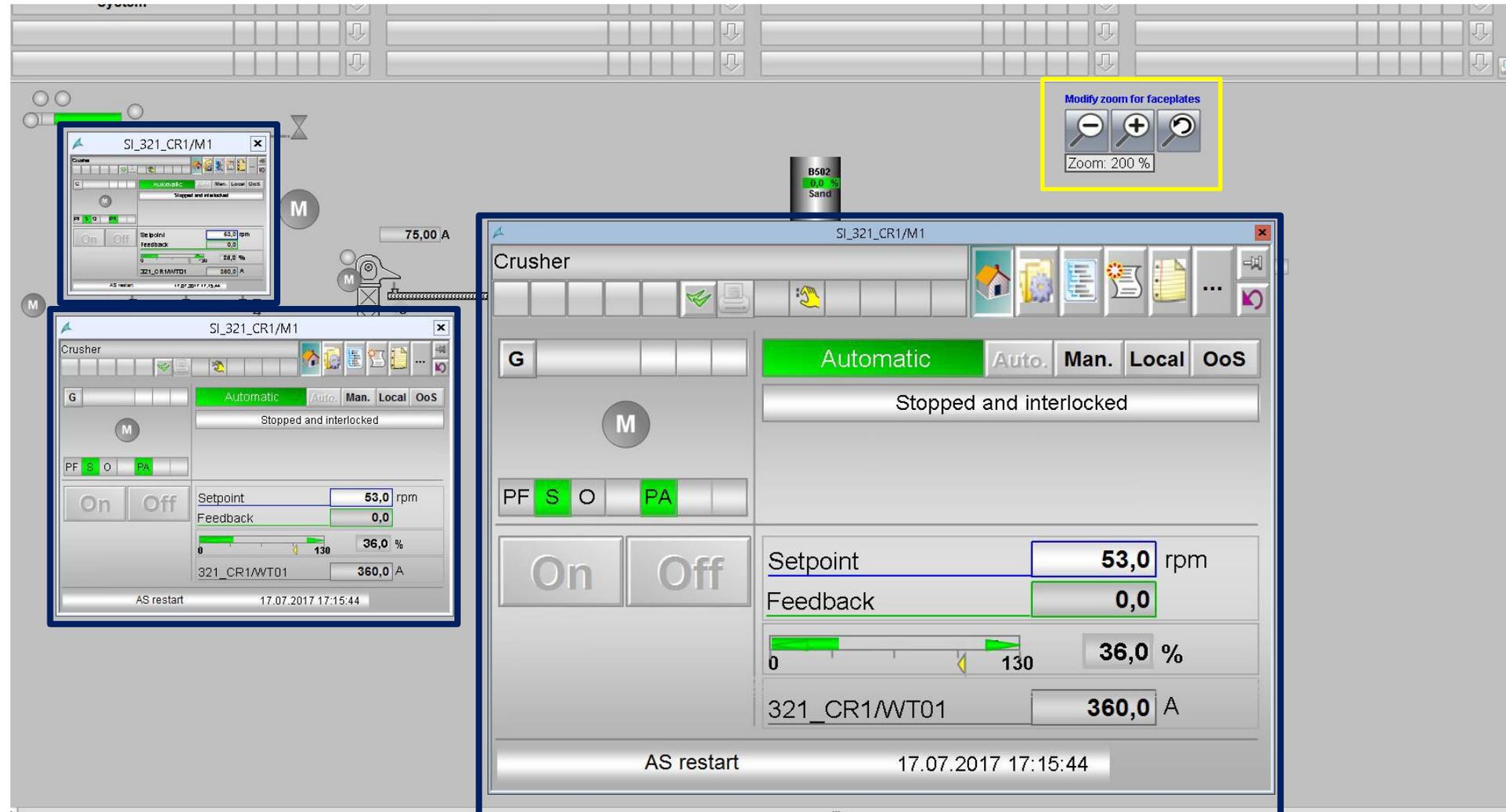
- Fault diagnosis
- Operator Guidance during plant operation

### Benefits

- Faster fault finding with **cascadable** first-input evaluation including date and time stamp
- Temporary and permanent bypass for maintenance purposes
- Direct jump to connected objects

# CEMAT MinAS - usability improved by online Zoom

Example:  
Motor faceplate with  
various Zoom factors  
(50 – 200% )



# SIMATIC PCS 7 V9.1 Operator System

## Enhanced Alarm management

### Key Benefits



Optimal handling of alarms with focus on product quality e.g., in the industry.

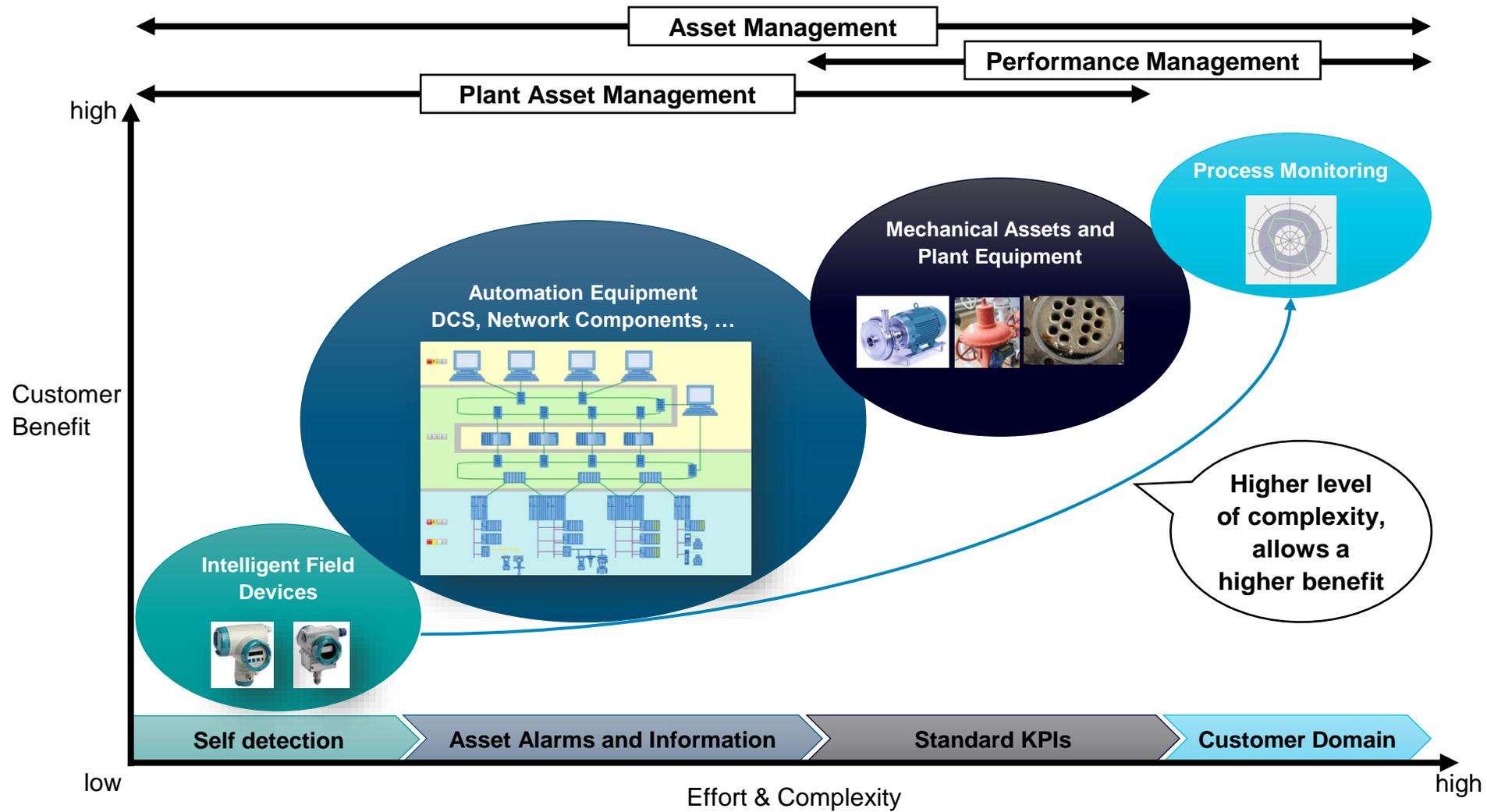
The image displays several screenshots of the SIMATIC PCS 7 V9.1 Operator System interface, illustrating enhanced alarm management capabilities.

**Operation List:** A table showing a list of operations with columns for Date, Time, Priority, Source, and Operation. The table is color-coded by priority (e.g., yellow for high, red for critical). A dialog box titled "Comment on Message" is overlaid on the table, allowing users to add comments to specific messages. The dialog includes fields for Number, Date, and Time, and a text area for the comment.

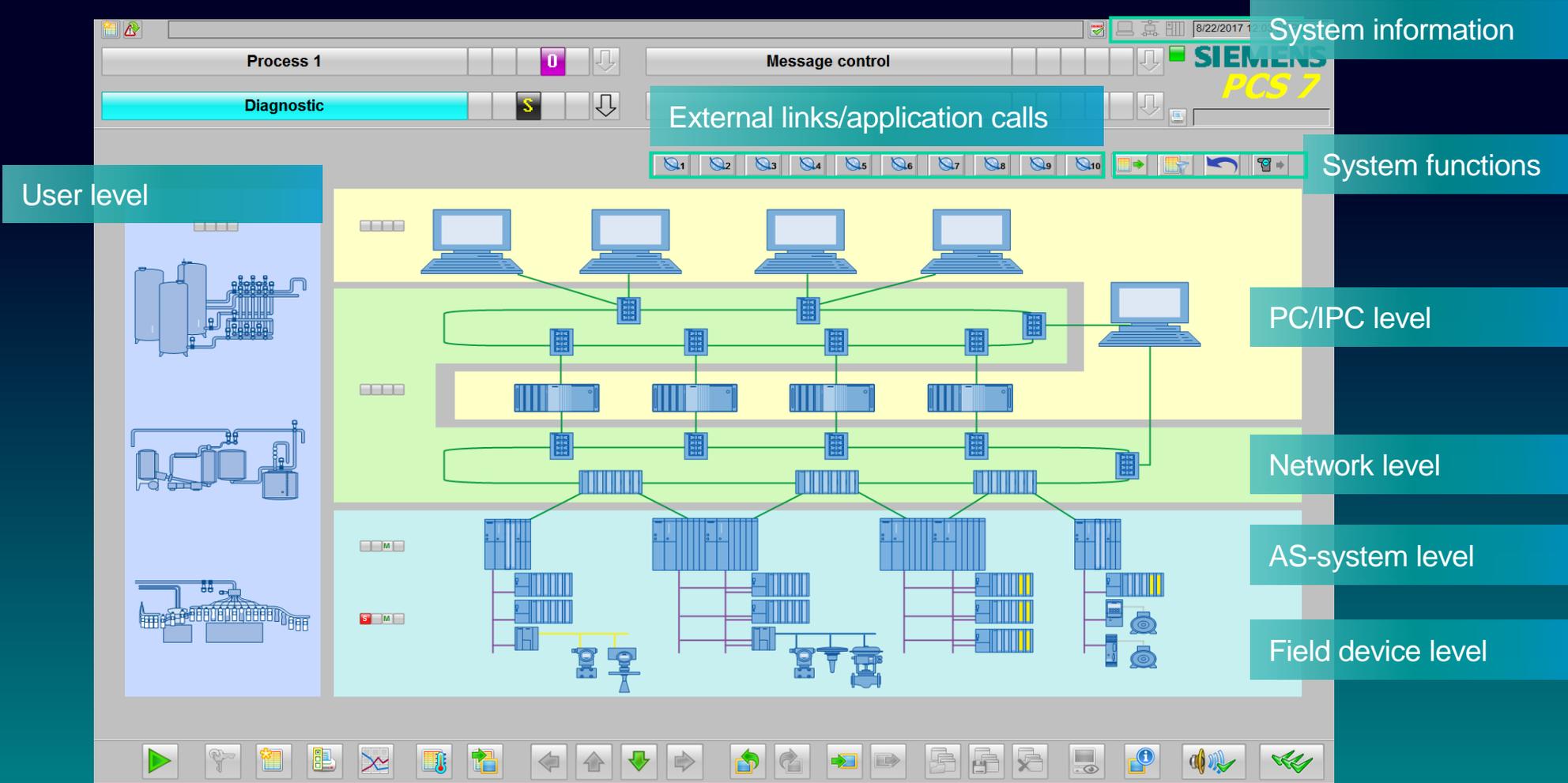
**Incoming Alarm List:** A table showing incoming alarms with columns for Date, Time, Source, Event, Status, Info, Comment, and Batch name. The table is color-coded by severity (e.g., yellow for warning, red for error). A dialog box titled "Acknowledgments" is overlaid on the table, allowing users to acknowledge specific alarms.

**Electronic Signature - Identity Verification:** A dialog box for user authentication, including fields for Operation, Number, Date, Time, User name, Password, and Comment.

# SIMATIC PCS 7 – Plant asset management



# Representation – Overview as the entry point to the Maintenance Station



# CEMAT - integrated maintenance information

Maintenance, with requests, status visualized automatically in the overview-list

CEMAT modules are monitoring runtime and number of Start&Stop

### Use case:

- Maintenance, requested after
  - runtime or
  - number of "Start" and "Stop"



CEMAT Maintenance List

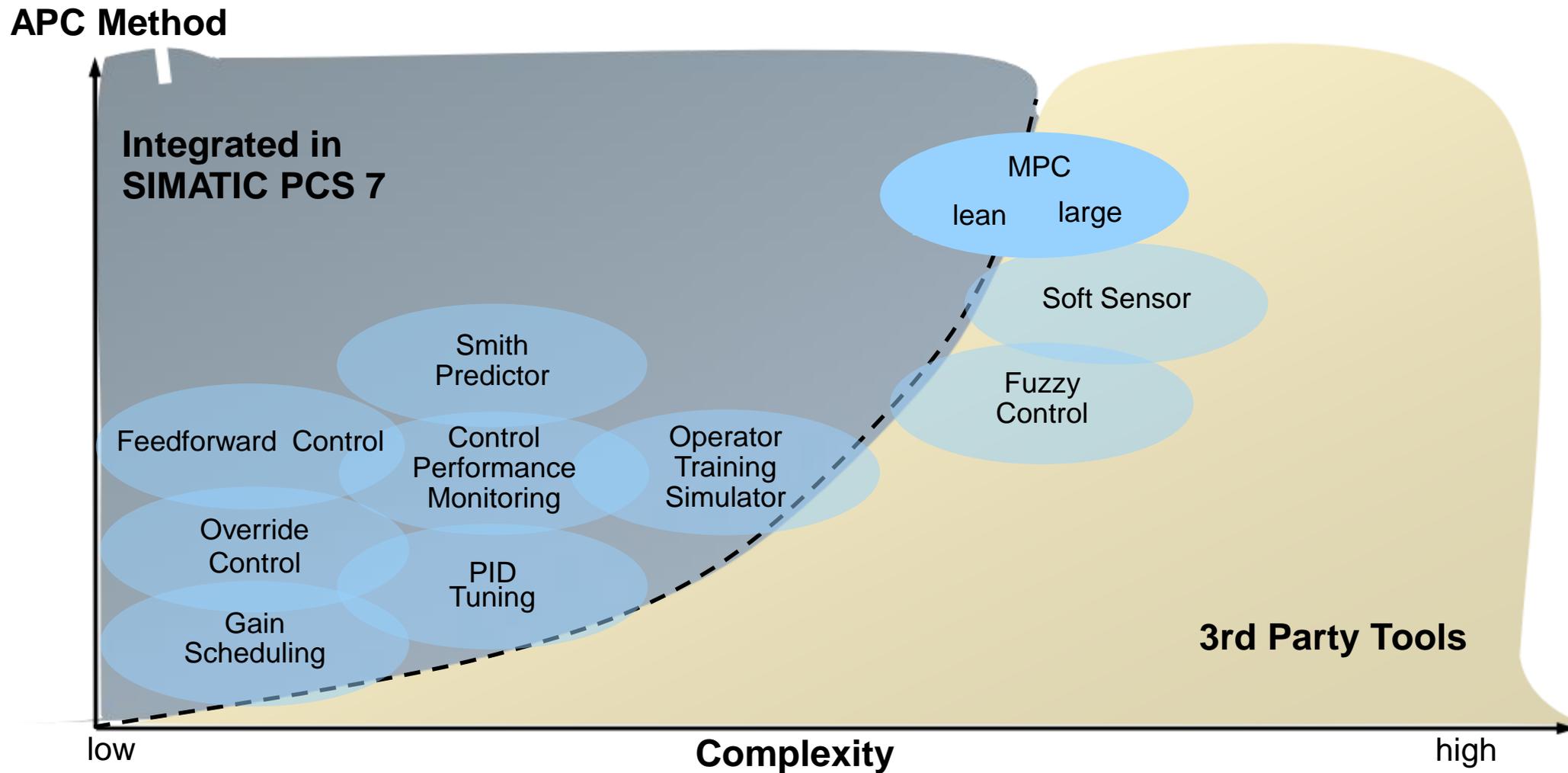
M\_interval > 0

Module ID	Device Type	Interv.	Actual Req.	Maintenance
MotListM8	Unidirectional drive	170	102	160
MotListM6	Unidirectional drive	150	102	100
MotListM5	Unidirectional drive	140	102	100
MotListM4	Unidirectional drive	130	102	120
MotListM3	Unidirectional drive	120	102	110
MotList1M30	Unidirectional drive	120	27	100
MotList1M29	Unidirectional drive	110	27	100
MotListM2	Unidirectional drive	110	102	100
MotListM1	Unidirectional drive	100	102	90
FK12E031	Unidirectional drive	100	0	0
SC.SC.ID	C_DRV_ID with Simocode	100	0	0
FK11E002	Unidirectional drive	100	0	0
MotList1.M28	Unidirectional drive	100	27	99
SC.DRV.SUB	Unidirectional drive	88	0	0
514_SC1M01	Screw Conveyor 4	80	102	70
MotList1.M18	Unidirectional drive	48	26	40
MotList1.M47	Unidirectional drive	47	26	40
MotList1.M46	Unidirectional drive	46	26	40
MotList1.M45	Unidirectional drive	45	26	40
MotList1.M14	Unidirectional drive	44	26	40

Minerals Automation Standard CEMAT

Automatically generated live-list of modules maintenance status:

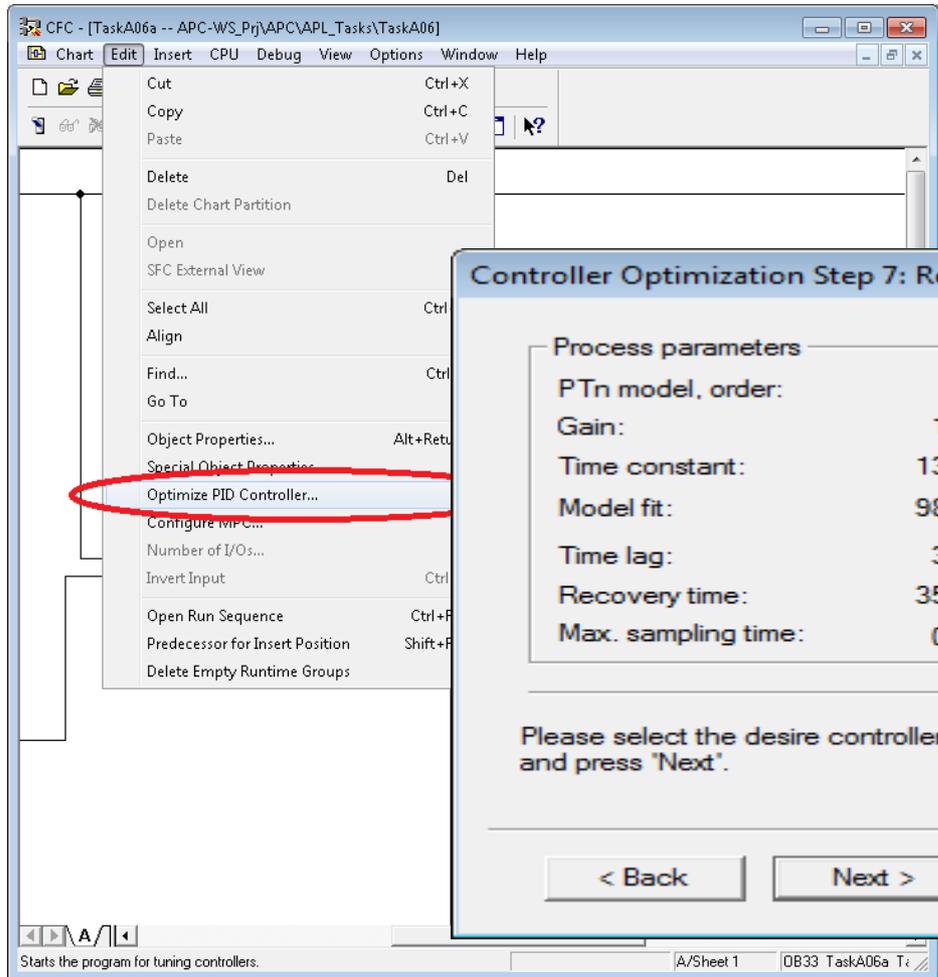
# PCS 7 Process Optimisation - templates & tools



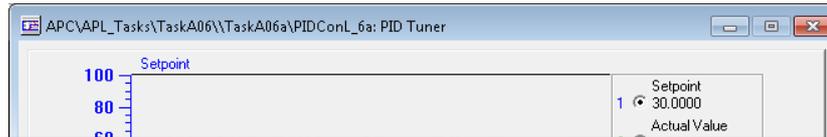
# Controller optimization in PCS 7

## Start PID Tuner

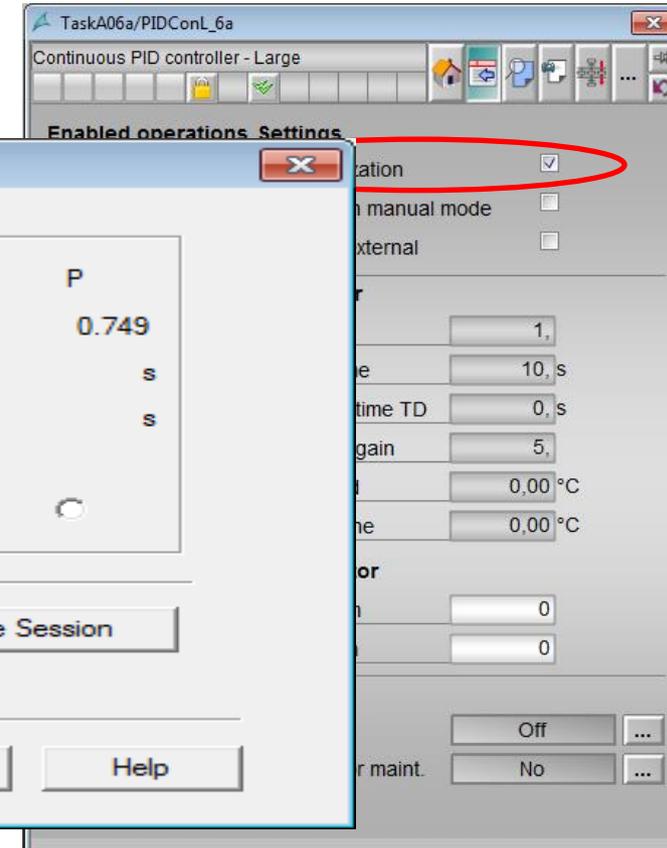
Start via CFC menu (select controller block before that):



Start window PID Tuner:



Optimization enabled?  
(Controller disabled for operation!)



**Controller Optimization Step 7: Results and selection of the controller type**

Process parameters		Controller parameters			
PTn model, order:	2	PID	PI	P	
Gain:	1.501	Proportional gain:	1.848	0.799	0.749
Time constant:	13.172 s	Integration time:	26.343	17.562	s
Model fit:	98.437 %	Derivative time:	6.586		s
Time lag:	3.688 s				
Recovery time:	35.827 s				
Max. sampling time:	0.896 s				

Please select the desired controller type and press 'Next'.

Buttons: < Back, Next >, Read Session, Save Session, Cancel, Help

# CEMAT Process Optimisation - Basic Principle "Control Loop"

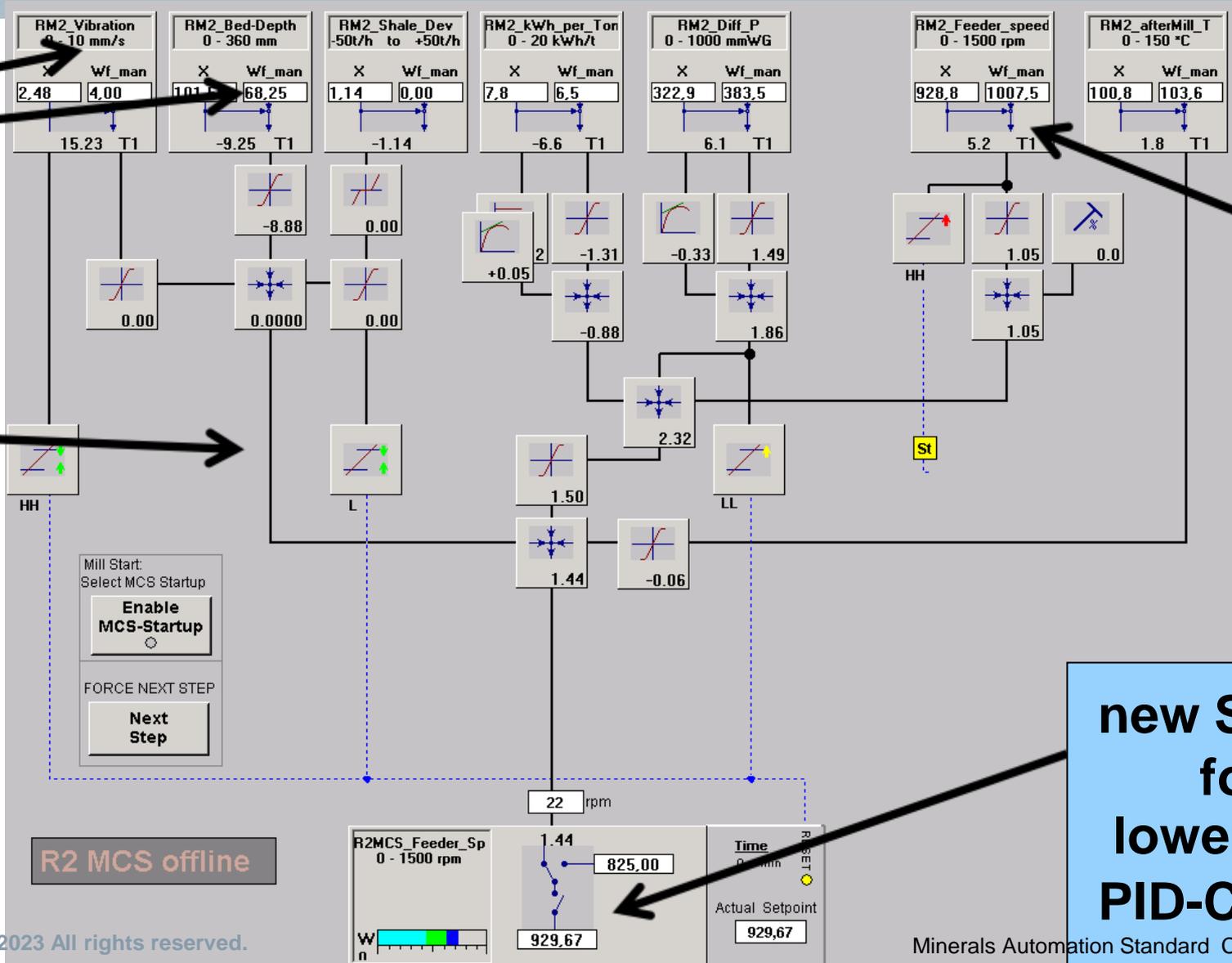
Measured Values

Logic

Operator Setpoint

CEMAT special

new Setpoint for lower level PID-Control



# CEMAT - TOP 10 unique selling points



- ☐☐ Starting/Stopping of complete drive **Groups** fully interlocked -with a single Mouse Click- facilitates operation
- ☐☐ **Status call**
- ☐☐ Clear defined **operation modes** ("AUTO", "MANUAL", "LOCAL", "OoS")
- ☐☐ Generates **one message only** per alarm condition because of high sophisticated Plausibility Logic
- ☐☐ **Detailed online diagnosis** Information about the reason and location of hardware faults
- ☐☐ **First up fault indication** of faults and detailed and clear message texts
- ☐☐ **Global TAG Browser** to do a specific search for all modules (i.e. all with a simulation, all with an operator's note, all being in Out-of-Service, etc.)
- ☐☐ Library of **verified & tested** Software Modules for all kind of functions in a plant.
- ☐☐ **Strict guidance** during programming (via engineering tools, templates, manuals, centralized feature bit definition, etc.) avoids "patchwork software".
- ☐☐ **SPC** modular recipe system
- ☐☐ **embeded Maintenance**

**Easy  
Handling for  
the Operator**

**Easy Fault finding  
reduces Down  
Times**

**Easy  
Engineering -  
fast and reliable**

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**SIEMENS**

*Ingenuity for life*

# CEMAT / Minerals Automation Standard

*more* than “just a library” ...

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