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SIMATIC PCS 7 Condition Monitoring Library

Performance you trust

SIMATIC PCS 7 Condition Monitoring Library
Introduction

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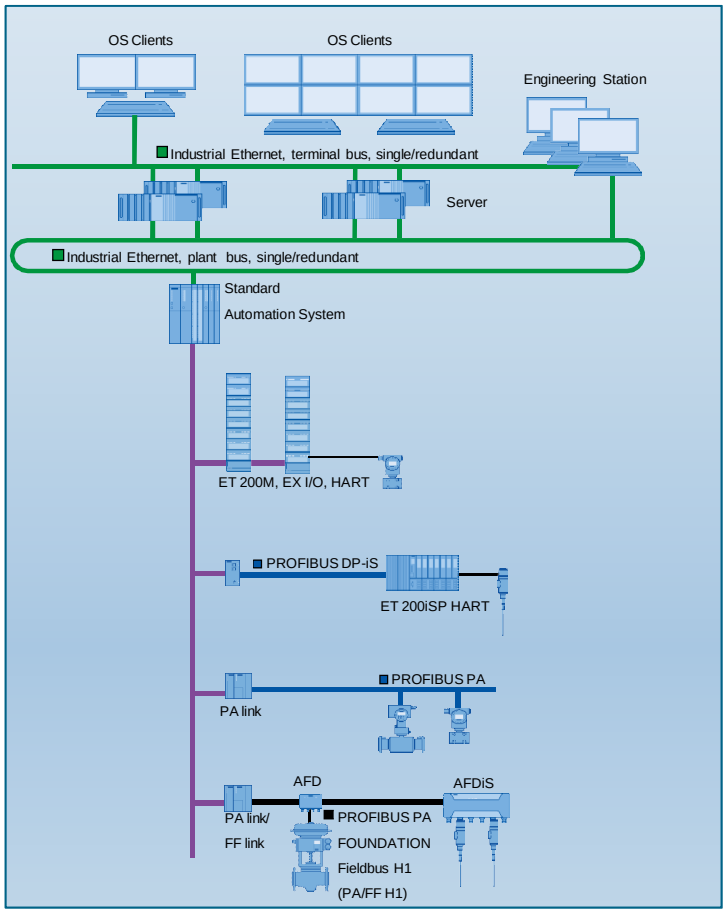
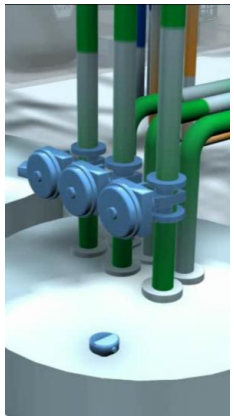


Many Assets in PCS 7 system provide information about their own status to users. The connection of Assets across bus systems makes this possible.

But what about the mechanical Assets, which can not be integrated into this network?

For example:

- pumps
- control valves
- exhauster
- filter
- heat exchanger
- pipelines



SIMATIC PCS 7 Condition Monitoring Library
Why use Condition Monitoring ?

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- PCS 7 Condition Monitoring Library (CML) provide an approach to monitor mechanical assets and to integrate them into PCS 7 system.
- With CML existing data and measure values can be analyzed in real-time and the assets‘ condition can be diagnosed.
- Thereby conclusions on performance (process relevant) and condition (device relevant) can be gained.
- An additional standard integration in PCS 7 Operator Station and/or in PCS 7 Asset Management is also possible to demonstrate and evaluate the CML information.

What is the performance of PCS 7 Condition Monitoring Library?

- Increasing of plant and device efficiency
- Status oriented and plan-able maintenance a required
- Detection of creeping changes and therefore avoidance of unplanned plant shutdown

What is not possible with PCS 7 Condition Monitoring Library?

- Detection and avoidance of spontaneous shutdowns

SIMATIC PCS 7 Condition Monitoring Library
Positioning

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Motivation for PCS 7 Condition Monitoring Library

- PCS 7 Condition Monitoring Library (CML) consists of functions to monitor mechanical plant components
- Monitoring and analyzation of mechanical plant components through intelligent evaluation of measured values, which are already present in process control system in many cases
  ➔ No additional I/O and no special sensor technology
- CML functions and faceplates are designed according to the design and philosophy of the accepted SIMATIC
  PCS 7 Advanced Process Library (APL). ➔ Providing a harmonious overall solution
- The functions of CML can be implemented into the project at any time.
  ➔ Also after installation retrofit
- CML can be downloaded free from PCS 7 V8.0 onwards ➔ lower cost approach

Advantages of CML use

- Detection of increasing mechanical wear
- Detection of "unhealthy" operation and energy consumption
- Lower cost approach with demand oriented stop of POs ➔ Low and scalable investment costs

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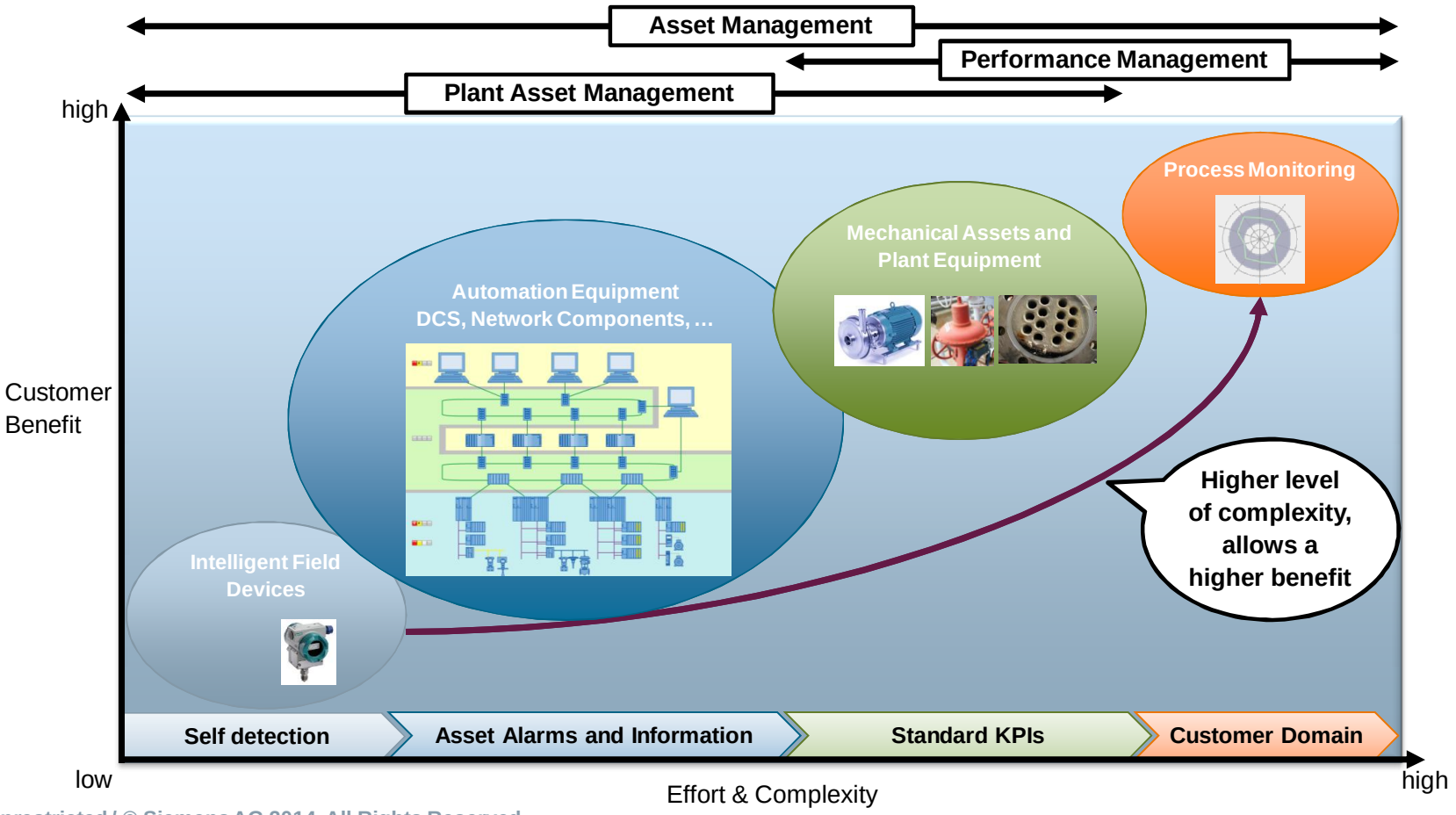
Range of Asset Management



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Integration of important mechanical assets

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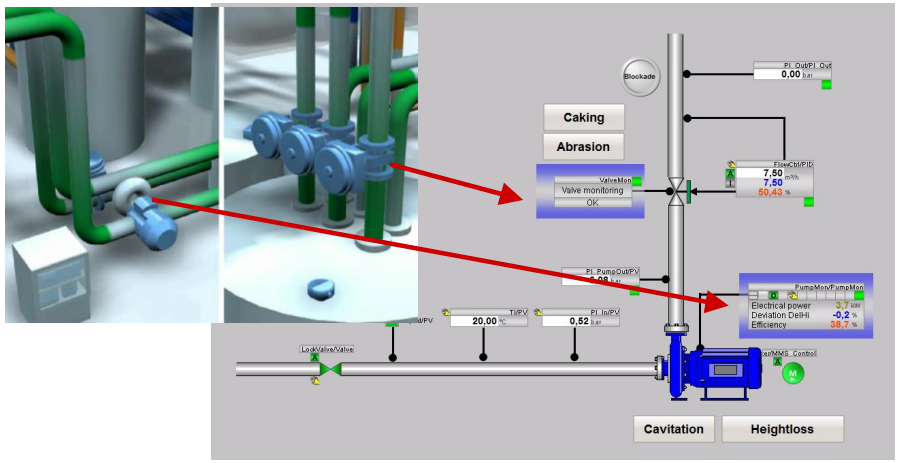
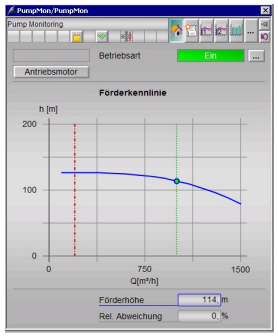
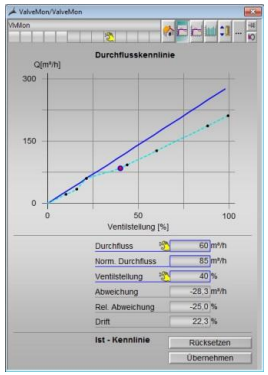


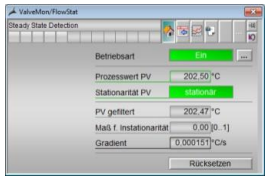
- Proven functions to monitor mechanical assets
- Look & Feel in APL design
- Low cost approach ➔ Low investment costs
- Detection of wear
- Detection of malfunctions, "unhealthy" operation and energy waste



Pump monitoring

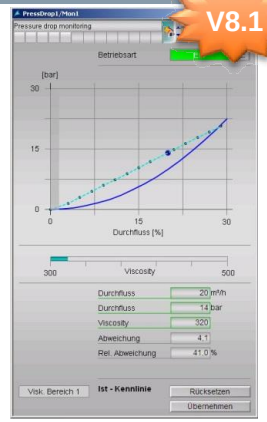


Valve monitoring



Steady State

Partial Stroke Test



Pressure loss monitoring

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Functional overview APL and CML

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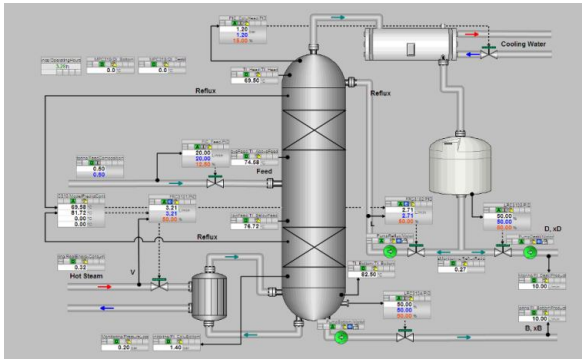
SIMATIC PCS 7 Advanced Process Library (APL)

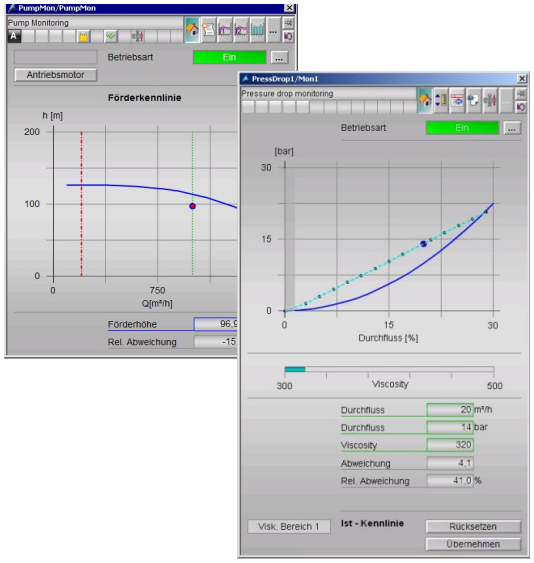
- **Control Performance Monitoring**
  Monitoring the control performance of control loops
- **Operating hours and switching cycle counter**
  Monitoring operation statistics of aggregates

SIMATIC PCS 7 Condition Monitoring Library (CML)

- **Pump Monitoring**
  Monitoring of pumps for wear, efficiency and energy consumption
- **Valve Monitoring**
  Monitoring and analysis of control valves
- **Partial Stroke Test**
  Extension of the test intervals for safety shutoff valves
- **Pressure Loss Monitoring**
  Monitoring of pressure losses in all types of system components

V8.1





SIMATIC PCS 7 Condition Monitoring Library

Monitoring of pumps with “PumpMon“

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Calculation and display through evaluation of data and operator conditions

- Current power data recorded by the pump engine
  - Mechanical power
  - Electrical power
  - Hydraulic power
- Flow characteristic and current delivery height
- Power characteristic and efficiency characteristic with current working points
- NPSH characteristic with current working point (for cavitation-free operator)
- Statistical analyses of operation point and of cavitation value in an histogram

Parameterization of pump characteristic line

- Manual input of specific value and supporting point
- Alternative: step-by-step learning of specific values and supporting points on the current situation via Teach function

Application Note „Monitoring of centrifugal pumps with "PumpMon„
http://support.automation.siemens.com/WW/view/en/42460161

SIMATIC PCS 7 Condition Monitoring Library

Monitoring of pumps with “PumpMon“

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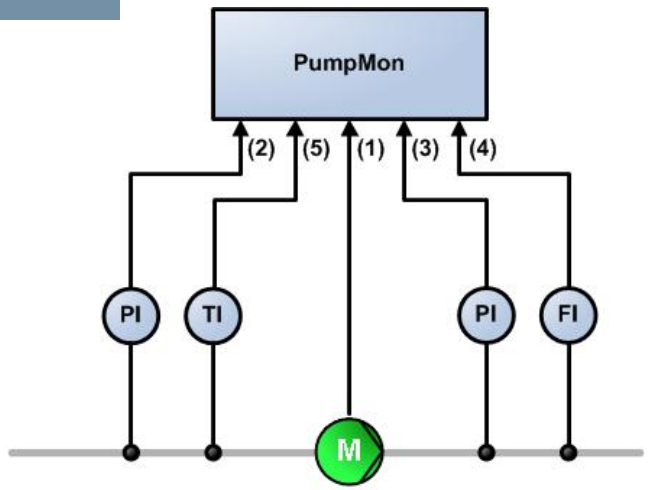
Diagnostic functions

- Limit violation of the performance values (mechanical, hydraulic & electrical)
- Part-load operation, risk of pump overheating
- Exceeding the rated flow ➔ overload
- Detection of gas conveyance or cavitation
- Blockage and dry-running detection
- Deviation of operating point from performance /efficiency curve
- False-circuit detection

Relevant measured values

- Flow rate of pumped medium (4)
- Inlet pressure, intake pressure (2)
- Output pressure, flow pressure (3)
- Active electrical power (1)
- Binary state of the motor (1)
- Temperature of pumped medium (5)
- Speed of the motor (with speed-controlled motors) (1)
- Mechanical power of the converter (1)



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Relation between measured values and diagnosis:

Diagnosis	Measured values						
	Flow rate	Pressure deviation	Electrical power	Inlet pressure	Temperature	Density	Steam pressure equation
Blockage	X (1)		X (4)				
Dry run	X (1)		X (4)				
Gas conveyance	X (2)	X				X (6)	
Cavitation	X			X	X (5)		X (7)
Wear	X	X (3)	X				
Overload			X				
Bed degree of efficiency	X	X	X				

Notes:

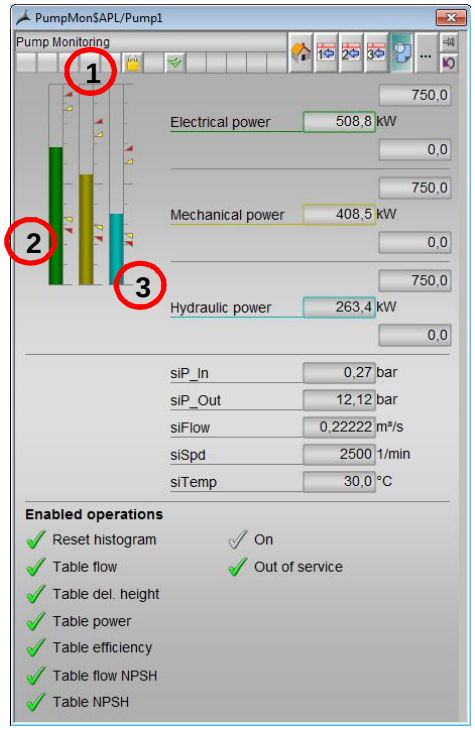
- x (1): not absolutely necessary, but useful for additional plausibility
- x (2): to correct for different diameters of suction and discharge nozzles
- x (3): more evident in flow characteristic than in power characteristic
- x (4): used to calculate the mechanical power - more significant than electrical power
- x (5): unless constant
- x (6): unless constant; may be available as an associated value of the flow measurement
- x (7): implemented in the block for water up to 100 ° C (Antoine equation); to be provided for other media per adapted Antoine coefficients or by external calculation

Calculation and display of performance data

- The **mechanical power (1)** is determined by the electrical power. The following variants are distinguished into
  - Standard motors ➔ Calculation out of electrical power through display of efficiency characteristic and rated power
  - Converter ➔ Transfer of data directly from the converter
  - Other motors (e.g. canned motor pumps)
    An unique motor characteristic of the pump manufacturer is used via a fourth degree polynomial

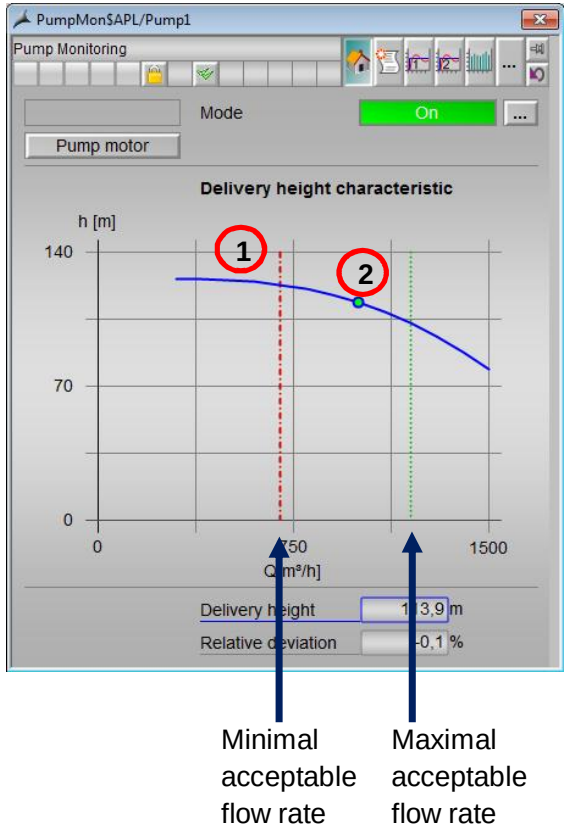
Slip correction
Slip occurs in electric motors and affects the mechanical performance. It can be accounted for or eliminated with converters that have slip correction from the factory.

- The active **electrical power (2)** is displayed as measured value
- The **hydraulic power (3)** is calculated out of normed flow rate, delivery height and density of the pumped medium



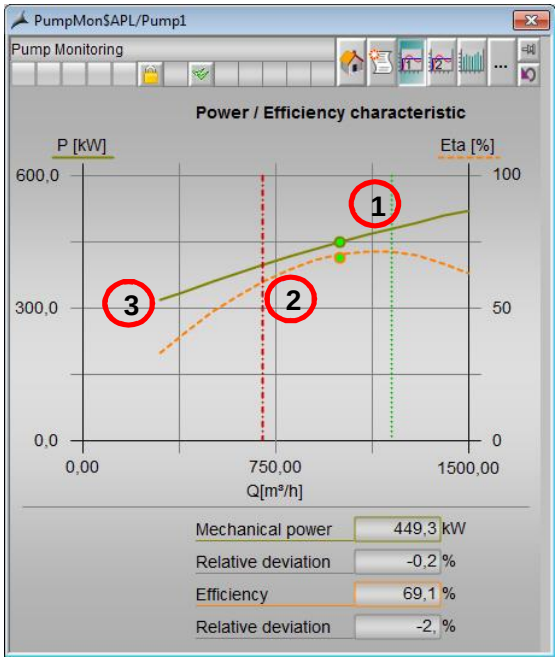
Calculation and display of head

- The current **delivery height** is calculated from the measured values pressure difference and density of the pumped medium within the pump
- The faceplate standard view displays the **head characteristic (1)** or **H/Q characteristic** together with the current operating points.
- In case the **operating point (2)** overshoot the characteristic curve, the point turns red and the corresponding report is triggered.
- The area below shows the current head and the relative deviation as numeric value.



Calculation and display of mechanical performance and pump efficiency

- The current **efficiency degree Eta (1)**, which displays the efficiency of the pump, is calculated from the ratio between hydraulic power and mechanical power.
- The current degree of efficiency is displays above the **characteristic (2)**. In case the current degree of efficiency shows a deviation from the characteristic, the color of the point changes and the correspondent message is triggered.
- The current **mechanical power (3)** is also displayed with the corresponding characteristic.
- The area below displays the current mechanical performance, the current pump efficiency and the relative deviation of both values as numeric value.



SIMATIC PCS 7 Condition Monitoring Library

Monitoring of pumps with “PumpMon“

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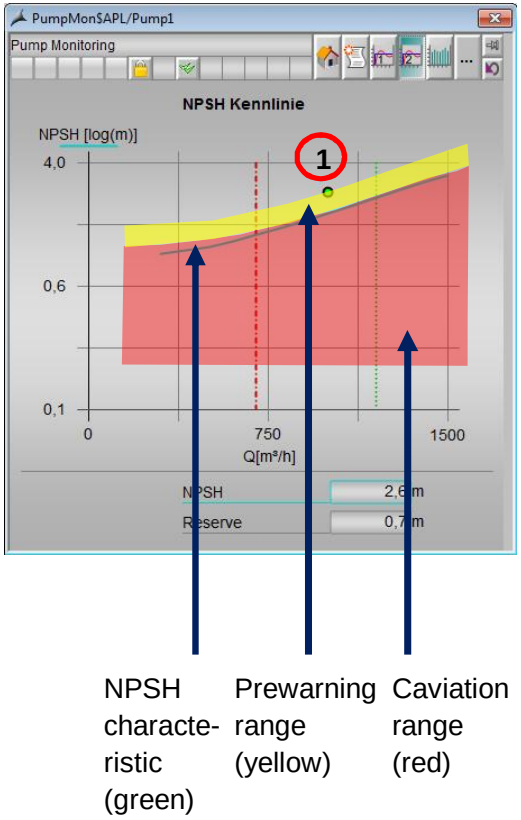
Calculation and display of NPSH value

- **NPSH** is an abbreviation for **N**et **P**ositive **S**uction **H**ead. In addition to the head amount and head, the NPSH value is one of the most important characteristics of a pump. The following must be ensured to maintain trouble-free operation of the pump:

  ➔ NPSH (plant) > NPSH (pump)
  Otherwise cavitation occurs.

- The **current NPSH value (1)** of the plant (NPSHa) is calculated in part by the vapor pressure, which can be calculated by an equation from Antoine.

- If the internal vapor pressure calculation by Antoine is not used, the vapor pressure must be calculated outside the block.

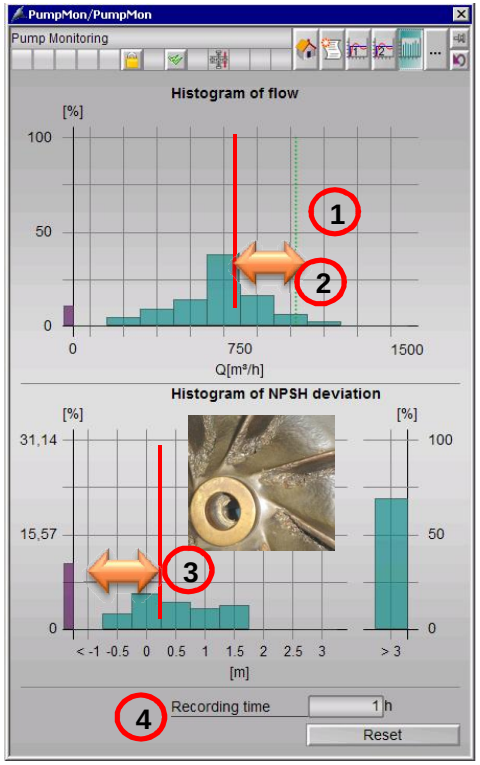


GN1 Screenshot austauschen

Giang, Nina; 8-10-2014

Statistical display in histogram

- An histogram consists of 11 bars
  - The purple bar on the left side labels the shutdown times
  - The 10 green bars divide the flow rate in 10 areas (10% per area)
- The upper histogram is for the **flow rate**
- The **green line** shows the optimal **flow rate (1)**
- Deviation from the optimal flow rate **(2)** refer to waste of energy as a result of wrong dimensioned pumps
- The histogram below is for the **NPSH value**
- Every bar is dedicated to a counter for loading time. Deviations higher than 3m are displayed on the right side
- On the left of the red line there is the **cavitation range (3)**. The pump operation in this range has a negative effect on the pump’s lifecycle
- The area below shows the recording duration (4). If required the histograms can be reset (e.g. at pump exchange)

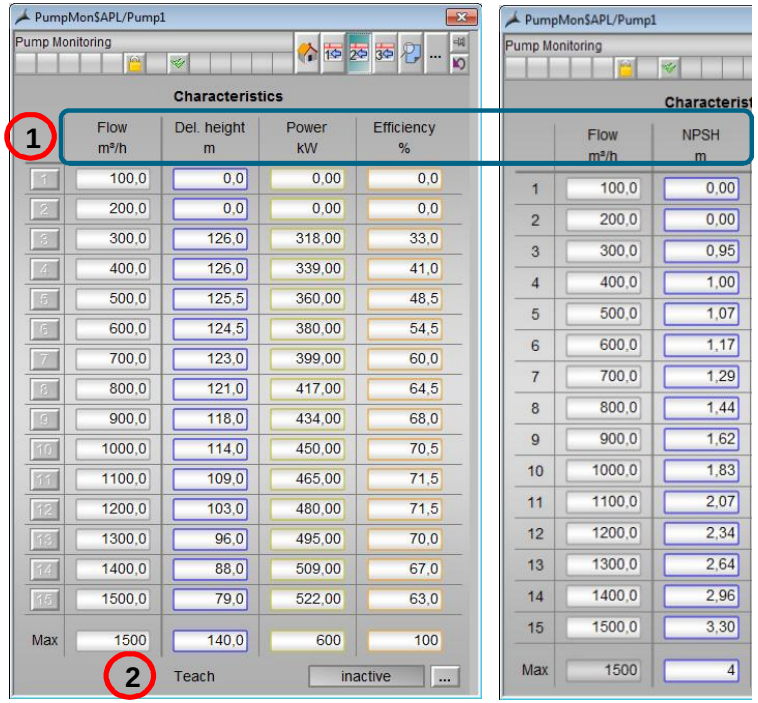


Entering of specific value: Manual or with Teach Function

- The following characteristics **(1)** can be deposited at the modules through the faceplate:
  - Flow rate
  - Delivery height curve
  - Power curve
  - Efficiency curve
  - NPSH characteristic

- The values can also be directly teached on pump through the “Teach” function **(2)**
  - Point by point teaching of reference pump characteristics via coordinates of interpolation points in good state (reference state) of the pump

➔ The “Teach“ functions is only valid for the first four curves.



SIMATIC PCS 7 Condition Monitoring Library
Monitoring of control valves with “VlvMon“

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Calculation and display through evaluation of data/operation condition

- Display of operation data
  - Number of strokes + wear limits
  - Changes in direction + wear limits
- Operation duration
- Flow rate characteristics with current working point and relative deviation from the requirements
- Reaction characteristic to open and close the valve
- Positive and negative set point change
- Statistical analyses in histogram

Parameterization of set-valve characteristic

- Manual entry of specific values and supporting points
- Adaption of specific values and supporting points to the current situation

Application Note “Monitoring of control valves with VlvMon“
http://support.automation.siemens.com/WW/view/en/87604493

SIMATIC PCS 7 Condition Monitoring Library
Monitoring of control valves with „VlvMon“: diagnosis functions

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- Monitoring the max. allowable operating hours in continuous standstill without valve movements
  ➔ caking, encrustation
- Monitoring the max. allowable operating hours in continuous operation without valve standstill
  ➔ overload
- Monitoring the max. allowable number of valve strokes
  ➔ maintenance
- Monitoring the max. allowable number of direction changes
  ➔ maintenance
- Detection of valve movements without position commands
  ➔ air pressure leakage or external mechanical influences
- Shifting of the high and low end position
  ➔ Damage to the valve plug, point of origin shifting
- Determination of a permanent control deviation after the valve movement
  ➔ Indication of problems in the drive, supply voltage or the air supply
- Monitoring of valve response time with reference to a set response time characteristic curve
  ➔ Stiffness, damage of valve gear

SIMATIC PCS 7 Condition Monitoring Library
Monitoring of control valves with „VlvMon“

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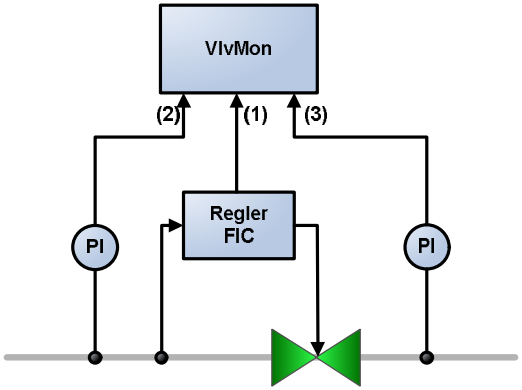
Relevant measured values:

- Valve set point (1)
- Valve actual position (position feedback) (1)

As an option

- Pressure of compressed air supply (1)
- Input pressure (pressure before valve) (2)
- Output pressure (pressure after valve) (3)



Advanced diagnostic functions

- With additional pressure sensor at the inlet and outlet end, as well as a flow sensor:
  - Operating point monitoring of the flow characteristic curve based on a set flow characteristic curve depending on the valve position
    ➔ Information on changing the valve cross-section due to caking or abrasion
  - Comparison of the automatically detected actual flow characteristic curve with the set flow characteristic curve for long-term drift detection
    ➔ mechanical damage to the valve plug, caking, abrasion
- With additional compressed air supply sensor:
  - Monitoring the air supply pressure ➔ leak in the compressed air supply.

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Relation between measured values and diagnosis:

Diagnosis	Measured Data			
	Flow	Pressure difference across the valve	Valve set point	Valve actual position
Time without movement			X	X
Time without standstill			X	X
Number of strokes			X	X
Directional reversal			X	X
External movement			X	X
Violation of high/low end stop				X
Reaction time characteristics			X	X
Deviation			X	X
Flow rate characteristic	X	X		X
Histogram valve position			X	X
Histogram step changes			X	X

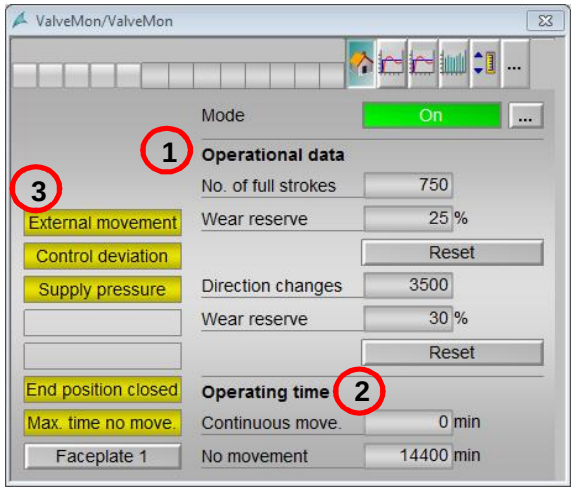
SIMATIC PCS 7 Condition Monitoring Library
Monitoring of control valves with „VlvMon“

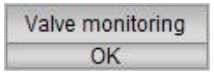
Calculation and display of operation data and operation duration

- The operation data **(1)** is distinguished into:
  - Number of strokes + Reserve to maximum value
  - Changes in direction + Reserve to maximum value
- The operation duration **(2)** differ in:
  - Duration of valve movement
  - Duration of valve standstill

Status display of modules (3)

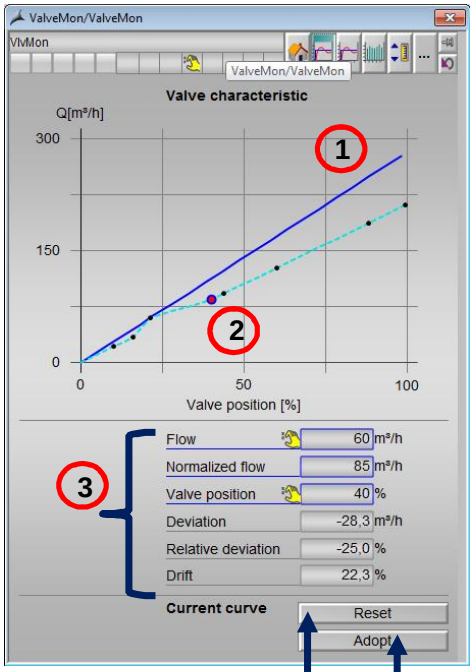
- Extern movement
- Deviation
- Supply pressure
- Max. number of strokes
- Max. direction change
- High/low end stop
- Max. shutdown time / Max. movement time





Calculation and display of flow rate head characteristic line

- The support points for the set characteristic line **(1)** are typed or recorded automatically in the parameter view
- The operating point **(2)** continuously shows the standard flow rate at the current valve position. If the gap between the current operating point and the set characteristic line is bigger than predetermined tolerance, the operating points’ color turns from green to red
- Display of specific values **(3)**
  - Flow rate
  - Standard flow rate
  - Valve position
  - Absolute deviation of operating point and set characteristic line
  - Relative deviation of operating point and set characteristic line
  - Relative deviation of current characteristic line and set characteristic line



Reset respectively delete of current characteristic line

Adoption of current characteristic line as set characteristic line

SIMATIC PCS 7 Condition Monitoring Library
Monitoring of control valves with “VlvMon“

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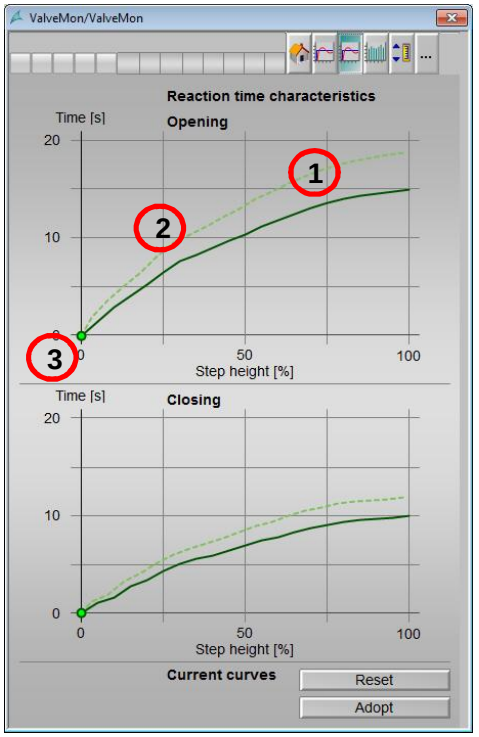
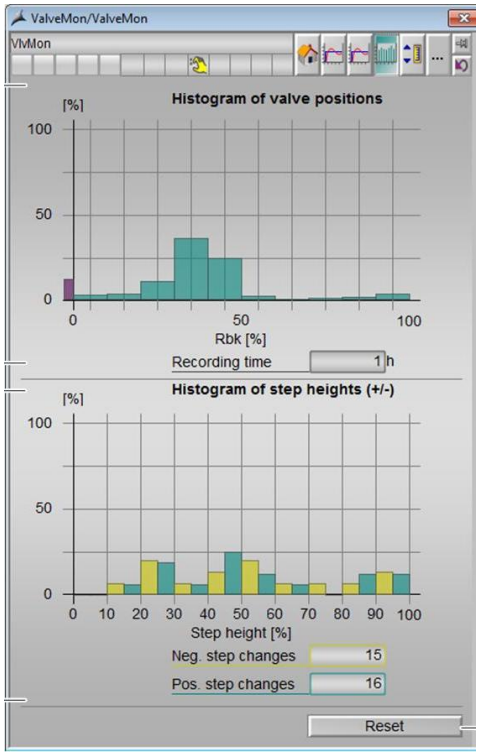
Display of reaction characteristic line

- The support point for the set characteristic line **(1)** are typed or automatically recorded in parameter view.
- Set characteristic line and current characteristic line **(2)** are displayed automatically.
- The operating point **(3)** displays the last recorded positive set point jump. If the gap between the current operating point and the set characteristic line is bigger than predetermined tolerance, the operating points’ color turns from green to red.



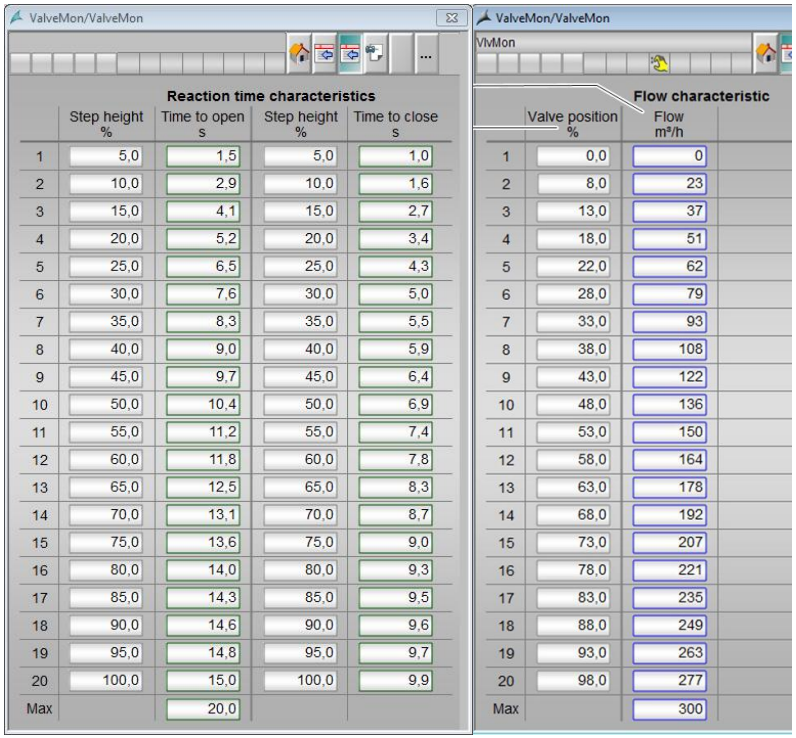
Statistic display of histogram

- The histograms display the frequency distribution of different valve positions respectively set step changes across the entire valve position traversing range (0...100%) as bar chart.
- The histogram valve position consists of 11 bars.
  - The purple bar characterizes the time during closed status
  - The 10 green bars slipt the valve position range into 10 individual ranges (per range 10%). Every part-range has its related counter for the maintenance time.
- The histogram **step changes** consists of 20 bars.
  - 10 bars for positive jumps (turquois) and 10 bars for negative jumps (yellow).
  - The 10 bars split the range of possible jumps into 10 individual ranges
    (per range 10%). Every part-range has its related counter for frequency.



Input of specific values

- The following characteristic lines can be stored in the faceplate:
  - Reaction characteristic lines for valve direction (opened/closed)
  - Flow rate (m³/h)



SIMATIC PCS 7 Condition Monitoring Library
Detection of steady state with “SteadyState“

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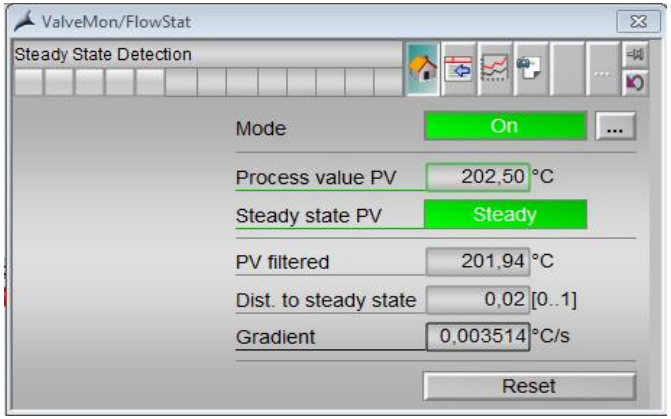
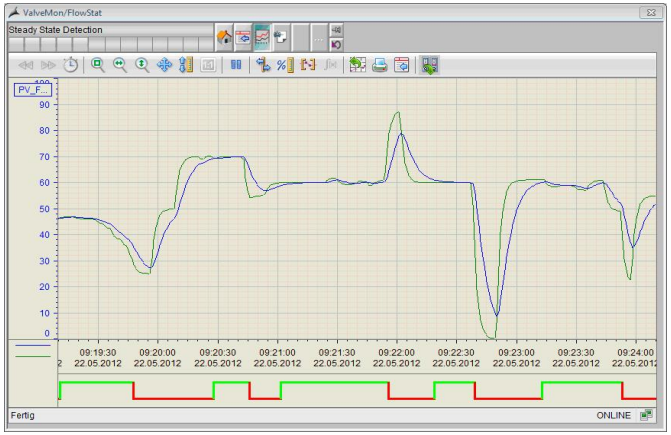
Calculation and display of evaluated data

- Online evaluation of dynamic signals on steady
- Display of evaluated results
  - Current values
  - Across the time sequences (trend)



Relevant measured value:

- Analog process values



http://w3.siemens.com/mcms/process-control-systems/en/distributed-control-system-simatic-pcs-7/simatic-pcs-7-system-components/maintenance-station/Documents/WhitepaperMechanicalAssets_EN_2014.pdf

SIMATIC PCS 7 Condition Monitoring Library
Detection of steady state with “SteadyState“

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Application examples – Monitoring of steady state:

- **From the environment of process monitoring:**

  The startup of steady processes is often characterized by fluctuating process variables. When these variables become steady, the process is in a steady state. Monitoring the steadiness of the relevant process variables therefore immediately indicates the end of the startup process.

  Example: End of the startup process of a pump when a steady flow is achieved.

- **In the field of closed-loop and open-loop control:**

  In batch processes, transition to the next basic operation in the recipe often depends on achieving certain process conditions. This situation can be indicated by the detection of the corresponding signal's steadiness.

Example: A step sequence in the Sequential Function Chart (SFC) does not activate the agitator motor of a reactor for a fixed and possibly excessive period of time; instead, it stirs until the temperature in the reactor has a steady value.

SIMATIC PCS 7 Condition Monitoring Library
Detection of steady state with “SteadyState“

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Application example – Monitoring of Instationarity:

- **From the field of process monitoring:**

  Continuous units can be monitored for proper steady-state operation. As soon as the relevant process variables of a unit begin to fluctuate, drift or fail, the operator is notified or countermeasures are taken automatically. **Example**: If the head temperature of a distillation column is unsteady, the operator is immediately alerted to intervene accordingly.

- **Determination of the plant status:**

  Depending on the plant status, messages and alarms can be activated, suppressed or hidden. In this way, alarm surges of transient irrelevant messages can be prevented.

  Example: Alarm messages from the lower-level controllers are suppressed in unsteady startup or product changeover phases.

SIMATIC PCS 7 Condition Monitoring Library
Monitoring of pressure loss with “PrDrpMon“

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Application example:

- Target of monitoring the pressure loss of plant components like:
  - Filters
  - Separator
  - Heat exchanger
  - pipelines etc.

  in dependency on flow rate or in other words the monitoring of the flow resistance.
- Such a monitoring and early recognition can be reasonable for all plant components, whose flow resistance changes undesired during, e.g.
  - Through caking
  - Blockage etc.

SIMATIC PCS 7 Condition Monitoring Library

Monitoring of pressure loss with “PrDrpMon“

Calculation and display through evaluation of data / operation states

- Display of pressure loss in dependence to flow rate and viscosity as set pressure loss characteristic line
- Display of current working point
- Display of current pressure loss characteristic line
- Current viscosity
- Current and relative deviation of characteristic lines

Parametrization of differential pressure characteristic line

- Manual entering of specific values and supporting points
- Assumption of specific values and supporting points of current situation

http://w3.siemens.com/mcms/process-control-systems/en/distributed-control-system-simatic-pcs-7/simatic-pcs-7-system-components/maintenance-station/Documents/WhitepaperMechanicalAssets_EN_2014.pdf

SIMATIC PCS 7 Condition Monitoring Library

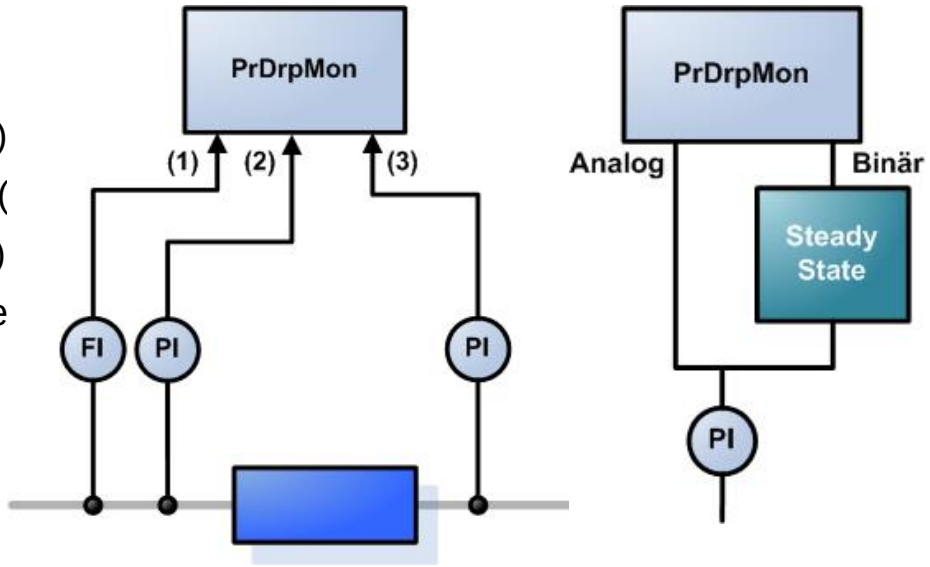
Monitoring of pressure loss with “PrDrpMon“

SIEMENS

V8.1

Relevant measured values:

- Flow rate of the flowing medium (1)
- Binar signal stationarity of flow rate (1)
- Inlet pressure (pressure before the valve)
- Binar signal stationarity of inlet pressure (
- Outlet pressure (pressure after the valve)
- Binar signal stationarity of outlet pressure
- Viscosity (optional if not constant)
- Stationarity of viscosity (optional)



The binar signals have to be provided via separate “SteadyState” moduls

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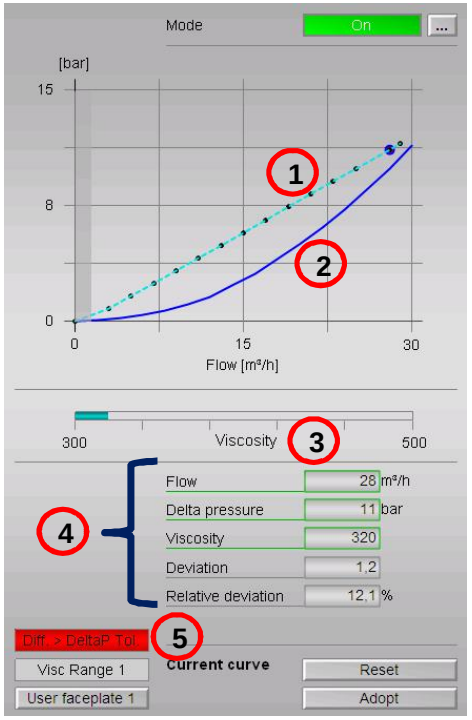
Calculation and display of pressure loss compared to flow rate

- **Current characteristic line (1)** depending on the viscosity with current working point.
  New measured points are recorded in case the stability (SteadyState) for pressures, flow rate and viscosity is reached.
- **Set characteristic line (2)** depending on the viscosity
- Display of current viscosity **(3)** within the 5 ranges
- Display of
  - Flow rate
  - Differential pressure
  - Viscosity
  - Deviation
  - Relative deviation

  (4)
- Display of exceeding the tolerance value **(5)**



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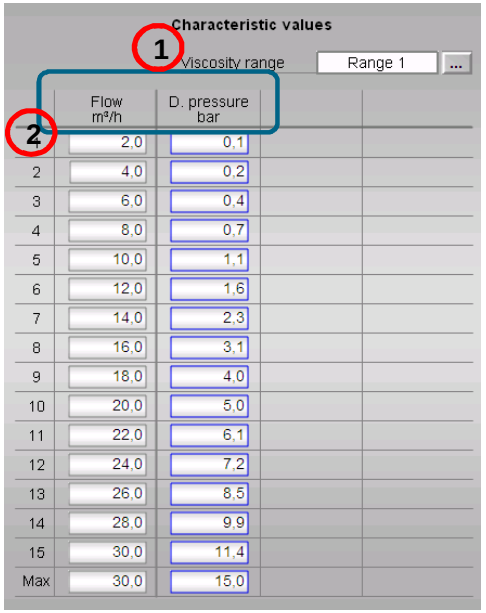
Entering of specific values

- Choose viscosity range (5 ranges) **(1)**

- The following characteristic lines can be stored via the faceplate:
  - Differential pressure in relation to flow rate **(2)**



SIMATIC PCS 7 Condition Monitoring Library
"Partial Stroke Test"

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Introduction

- A Safety Instrumented Function (SIF) can be described as a function with which a specific Safety Integrity Level (SIL) is implemented with regard to a specific process risk.
- The SIL can be derived from the average Probability of Failure on Demand (PFD) for a SIF
  ➔ a device does not perform the intended function when requested.
- The PFD-value of the safety integrated function is determined through the portion of undetected, dangerous failures and the interval between the manual Proof of the Safety integrated function
- Through common proofs of safety integrated function as well as reduction of undetected, dangerous failure (via redundancy, increased diagnosis) the PFD-value is improved

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Introduction

- In technical terms this means:
  - Safety shutoff valves normally stay in just one position: fully open or fully closed: fully opened or fully closed
  - ➔ These safety valves only have to perform a movement in an emergency.
  - The fact that they do not move for long periods of time can cause the valves to block under the tough plant conditions.
  - Regular tests are therefore required to ensure that the valve is functioning correctly and is not blocked in an emergency situation.

SIMATIC PCS 7 Condition Monitoring Library
"Partial Stroke Test"

SIEMENS

What does "Partial Stroke Test" mean?

- Partial closing of valve starting from the full opened position to proof the movement of the valve.
- In this test, the valve normally completes a stroke of 10-20% of the full stroke.
  - The actual stroke value of the valve depends on factors such as valve types and size, the manufacturer's recommendations and the operating conditions.
- Proofing of valve, without restrictions on process or triggering a failure
- Does not cover up to 100% of all failures.
  - Because the valve does not completely close, the complete way of the valve can not be proven or whether the valve closes tightly.

    ➔ the PST covers 50% and more of failures depending on the device

The most common error patterns in valve drive systems

Fault description	Possible cause of error	Fault detectable?		Fault detection
		Partial Stroke Test	Full stroke/full rotation test	
Solenoid valve not switching	Trip for the solenoid valve defective	Detectable	Detectable	Detection via feedback value
Solenoid valve not switching	Solenoid valve defective	Detectable	Detectable	Detection via feedback value
Valve reacts too slowly	Air line to the valve is pinched	Detectable	Detectable	Detection by monitoring the time until feedback value is given
Valve reacts too slowly	Valve is sluggish	Detectable	Detectable	Detection by monitoring the time until feedback value is given
Valve does not close or does not close completely	Valve seat pitted Disk eroded	**not** detectable	Detectable	Detection not possible via Partial Stroke Test
Valve does not close or does not close completely	Valve set has deposits	**not** detectable	Detectable	Detection not possible via Partial Stroke Test
Valve does not close	Valve stem blocked	Detectable	Detectable	Detection via feedback value

Source: NAMUR- NE106

SIMATIC PCS 7 Condition Monitoring Library
"Partial Stroke Test"

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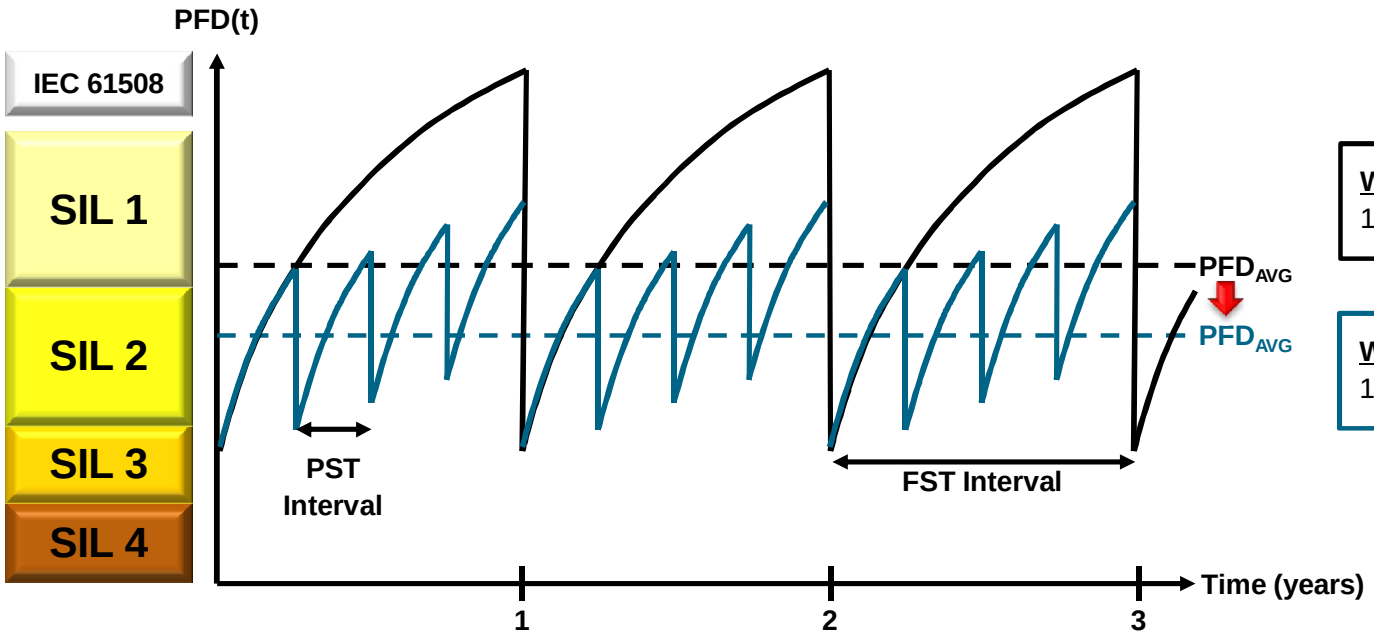
Using the Partial Stroke Test to achieve a higher SIL



Without PST
1 year Proof Testing = SIL 1

With PST (4x/year)
1 year Proof Testing = **SIL 2**

SIL = Safety Integrity Level
PST = Partial Stroke Test
FST = Full Stroke Test

SIMATIC PCS 7 Condition Monitoring Library
"Partial Stroke Test"

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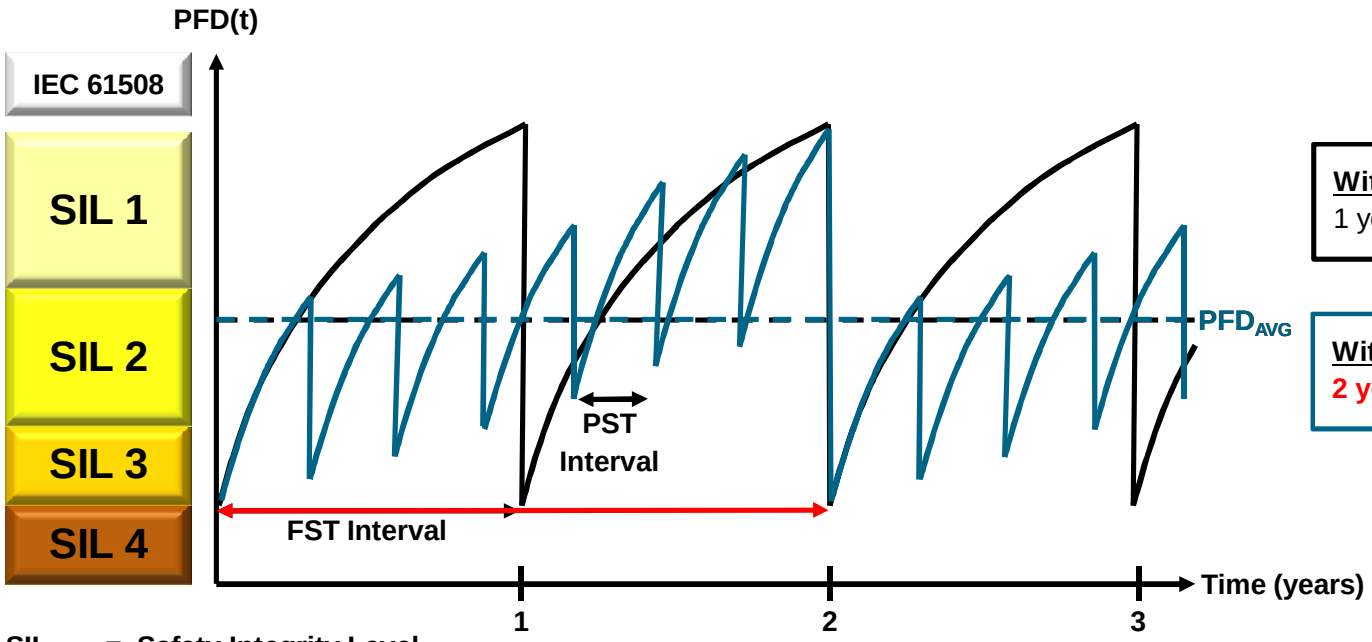
Using the Partial Stroke Test to increase the Full Stroke Test interval



Without PST
1 year Proof Testing = SIL 2

With PST (4x/year)
2 year Proof Testing = SIL 2

SIL = Safety Integrity Level
PST = Partial Stroke Test
FST = Full Stroke Test (Full Proof Test)

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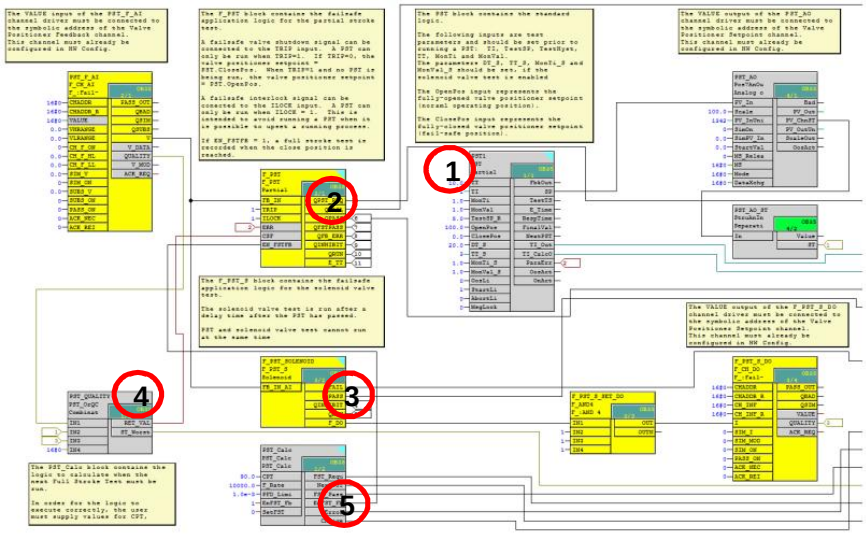
Related blocks and functions

- To execute the Partial Stroke Test the following blocks and functions have been created:
  - PST
    standard logic of the Partial Stroke Test **(1)**
  - F_PST
    fail-safe logic of the Partial Stroke Test **(2)**
  - F_PST_S
    optional fail-safe logic of the solenoid **(3)** valve test
  - PST_OrQC
    Evaluation of signal status **(4)**
  - F_PST_CALC
    PFD calculations to determine the time of the next Full Stroke Test **(5)**



- To simplify the Engineering a template is also delivered
- The template contains blocks of S7 F Systems/S7 F Library and of APL. Both libraries have to be installed before the PST to use functions.

SIMATIC PCS 7 Condition Monitoring Library
“Partial Stroke Test“: Functions

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- Automatic performance of tests in specific intervals.
- Supports the performance in automatic or manual mode.
- Opportunity to interlock the function in case the PST is not allowed to be started caused by the plant
- Calculates the instant of time for the following Full Stroke Test is required.
- The PST includes messages about the valve’s status (e.g. valve is blocked)
- Records the movement of the valve and provides this to record the operator. This permits the operator an overview on the state and possibly plans for further actions.
- Does not interfere into the part of the safety integrated function and stops the test in case of emergency
- A test is not performed, in case a Bypass or bad Signal Status is detected.
- Adjustable area of the Test- set value fluctuates to prevent depositions at the test position in the valve.
- Optional solenoid valves can be integrated. These valves are tested with delay after a successful PST.
- Detects test which are automatically initiated. Ensures that all tests are recorded.
- Temporal monitoring of tests with failure message if the time is exceeded

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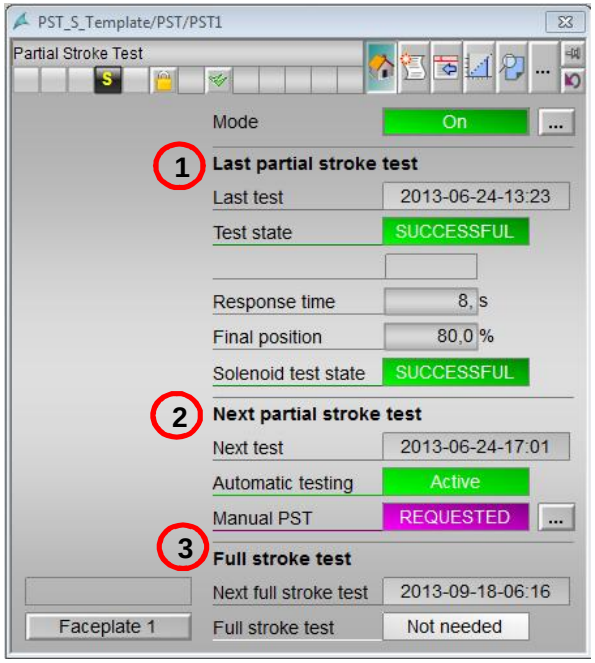
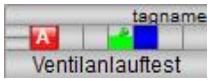
Overview Partial Stroke Test

- Data display of **latest** Partial Stroke Tests with **(1)**
  - Date
  - Result
  - Test data
- Display of **following planned** Partial Stroke Tests with **(2)**
  - Date
  - Mode
- Display of following required **Full Stroke Tests (3)**





SIMATIC PCS 7 Condition Monitoring Library
"Partial Stroke Test"

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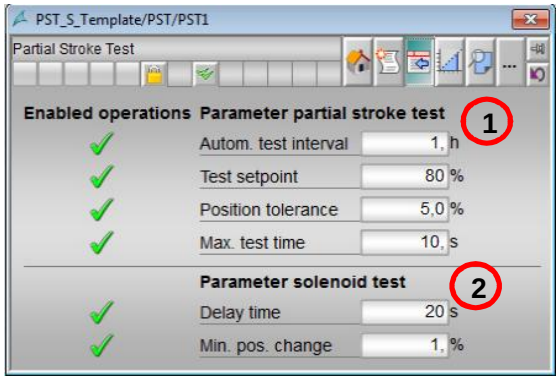
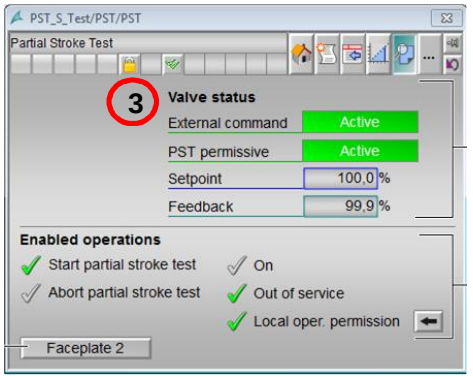
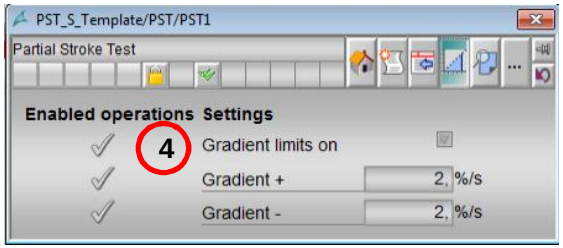
Further view of PST

- Entering of parameter for **Partial Stroke Test (1)**
- Entering of parameter for **solenoid valve test (2)**
- Display of current **valve status and release conditions** for Partial Stroke Test **(3)**
- Gradient limits **(4)**







SIMATIC PCS 7 Condition Monitoring Library
"Partial Stroke Test"

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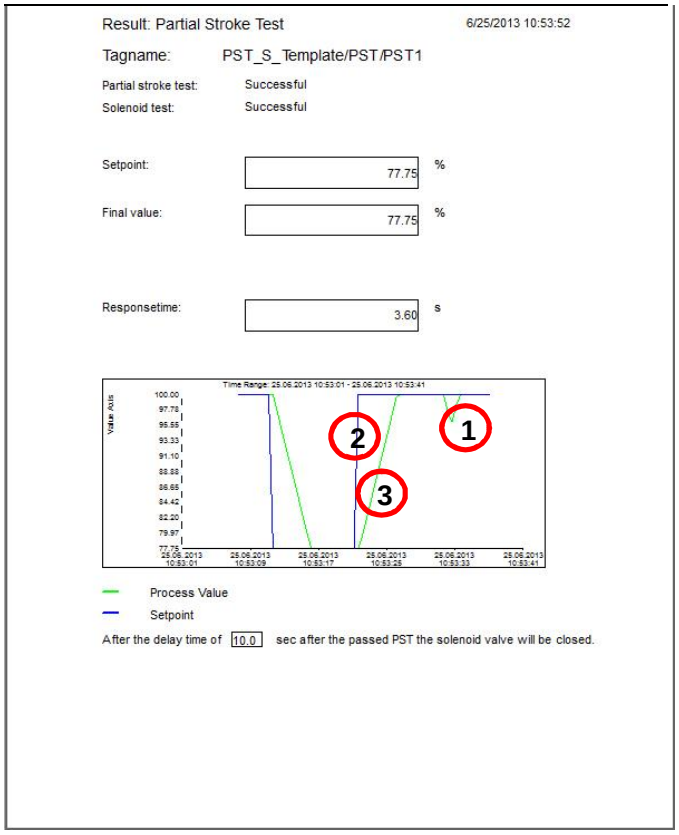
Production of record

- Precast report layouts are also delivered (German/English)
- Automatic documentation of tests
- Store and/or print to archive
- Content of report:
  - **Solenoid valve test (1)**
  - **Set value (2)**
  - **Feedback** (reaction) **(3)**
  - **Response time**



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Licensing of modules

The software SIMATIC PCS 7 Condition Monitoring Library is available for V8.0 and V8.1 at no charge.

Depending on the used module the following number of process objects (PO) "SIMATIC PCS 7 AS Runtime" and "SIMATIC PCS 7 OS Runtime" are recorded per module instance:

- PumpMon: 20 PO
- VlvMon: 10 PO
- SteadyState: 2 PO
- PST: 30 PO
- PrDrpMon: 20 PO

SIMATIC PCS 7 Condition Monitoring Library Informations

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- Homepage SIMATIC PCS 7 technical library

http://w3.siemens.com/mcms/process-control-systems/en/distributed-control-system-simatic-pcs-7/simatic-pcs-7-technologies/technology_libraries/Pages/Technology-Libraries.aspx

- Homepage SIMATIC PCS 7 Maintenance Station

http://w3.siemens.com/mcms/process-control-systems/en/distributed-control-system-simatic-pcs-7/simatic-pcs-7-system-components/maintenance-station/Pages/maintenance-station.aspx

- Sales and delivery release PCS 7 Condition Monitoring Library V8.0 and Download

http://support.automation.siemens.com/DE/view/en/71749768

- Sales and delivery release PCS 7 Condition Monitoring Library V8.0 + SP1 and Download

http://support.automation.siemens.com/DE/view/en/82857062

- Sales and delivery release PCS 7 Condition Monitoring Library V8.1 and Download

Tbd

- Whitepaper „Asset Management mechanical plant components with SIMATIC PCS 7“

http://w3.siemens.com/mcms/process-control-systems/en/distributed-control-system-simatic-pcs-7/simatic-pcs-7-system-components/maintenance-station/Documents/WhitepaperMechanicalAssets_EN_2014.pdf

SIMATIC PCS 7 Condition Monitoring Library
ReMain Research Project

SIEMENS

Reliability Centered Maintenance (ReMain)

Reliable diagnostics of remaining life-time of pumps

➜ Optimization of pump maintenance

➜ Optimization of pump operation

Continuous monitoring and analysis of over 100 pumps
in a production plant operated by Evonik-Degussa resp. Stockhausen in the chemical park in Marl over 2 years of operation

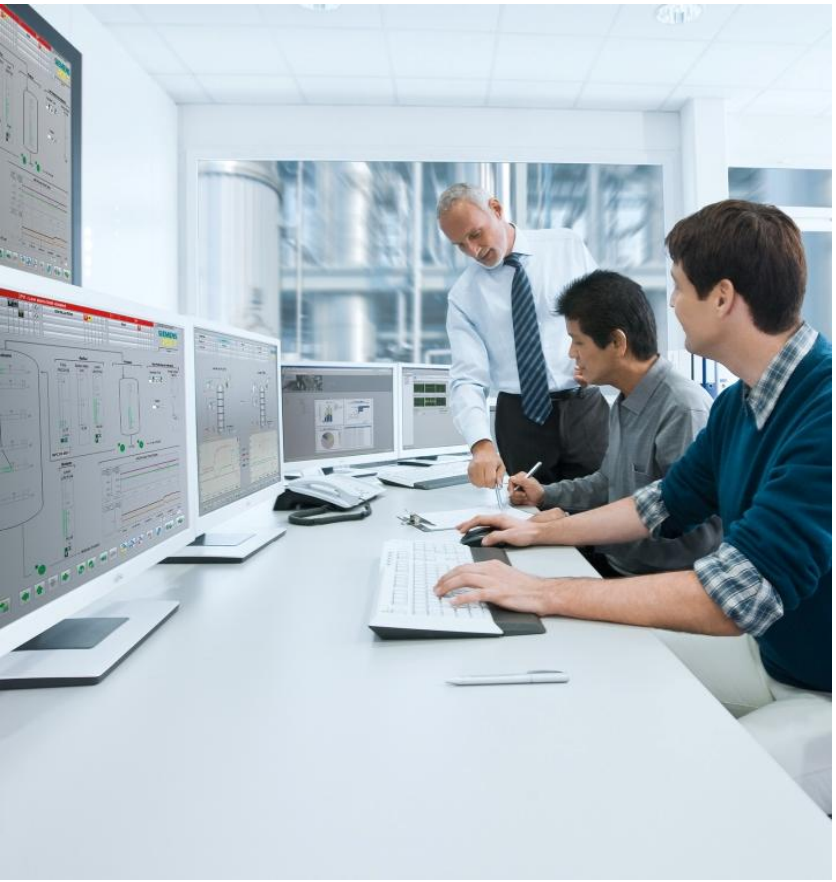
➜ delivers for the first time a broad data base as a basis for transferable results

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

Projektträger Forschungszentrum Karlsruhe (PTKA)

http://www.iml.fraunhofer.de/2227.html

Thank you for your attention!



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