

Condition monitoring of pumps
with acoustic diagnostics –
SITRANS DA400



sitrans DA400

SIEMENS

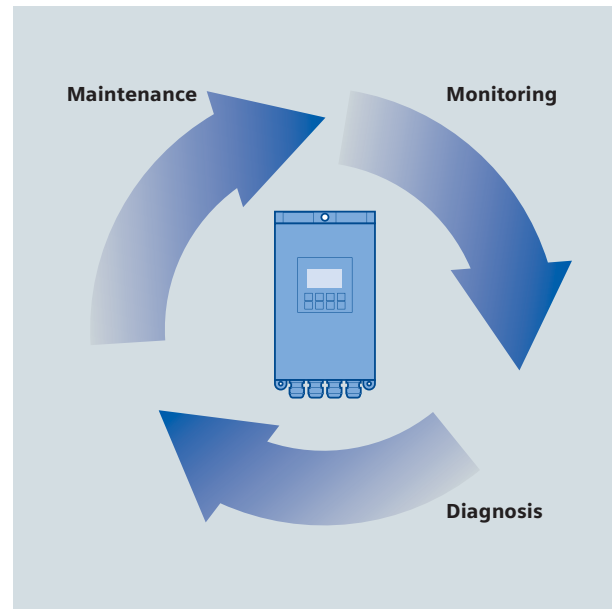
The Siemens SITRANS DA400 diagnostic unit

continuously, simultaneously and autonomously monitors the condition of valves in oscillating positive-displacement pumps. The device detects even the smallest leaks in the valves of a diaphragm reciprocating pump, plunger pumps or hose diaphragm piston pump by means of acoustic emission sensors.

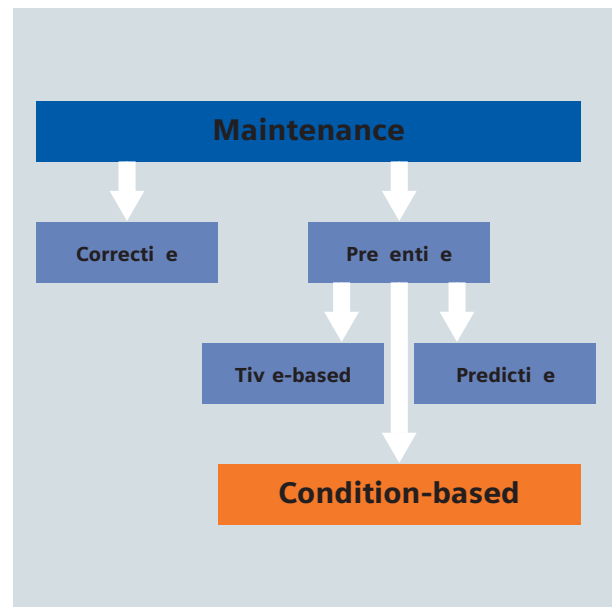
The device utilizes the fact that leaks cause cavitation, and cavitation can be detected by its acoustic emission when alarm limits are exceeded, this is indicated locally on the display and via digital output and via PROFIBUS DP or PROFIBUS PA.

The online diagnostics enable system operators, for the first time, to identify damaged valves unambiguously at an early stage, so that they can optimize their maintenance planning according to their requirements.

This also contributes to increasing system availability and productivity.



Maintenance cycle

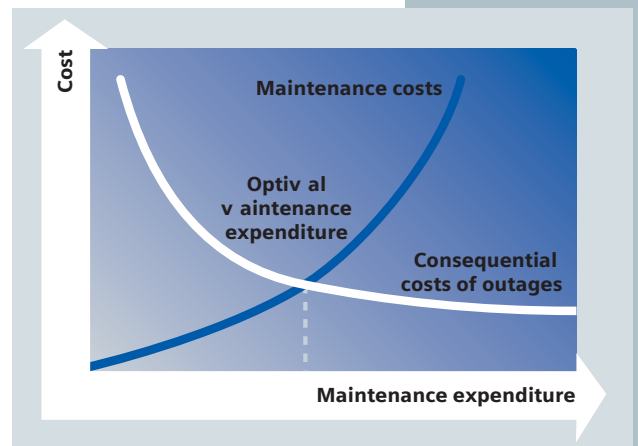


Maintenance strategies

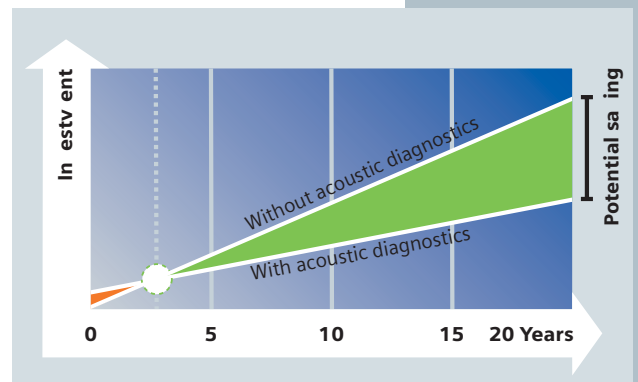
High system availability – the lever that increases productivity

Continuous determination of the pump condition is the crucial beneficial feature of the SITRANS DA400 diagnostic system. This enables condition-based repair and gives the system operator:

- **Higher system availability through**
 - shorter downtimes
 - extended maintenance intervals
 - increased pump reliability
- **Prevention of expensive successive damage** by detecting the damage in an early stage.
- **Minimized costs** through condition-based maintenance. The continuous online diagnosis increase system safety, even in the case of critical applications – at no time is the pump unobserved.
- **Reduced storage costs**
The stockage of components can be minimized or possibly completely eliminated.
- **Substantially shorter repair times**
Damaged valves can be unambiguously identified, the time-consuming search for faults is eliminated.
- **Advance maintenance planning**
is made possible by detecting faulty components.
- **Reduced cost of ownership**
The higher investment costs are amortized within a few years. That substantially reduces the total service life maintenance costs of the pump.



Condition monitoring (CM) prevents expensive successive damage



Reduced cost of ownership

■ **Damage and the associated decrease in performance are detected in the early stages of development.**

The SITRANS DA400 diagnostic system enables up to four valves in a reciprocating pump to be monitored continuously, simultaneously and autonomously for leaks. **Leaks are detected at the 1% level (in the case of water).**

■ **Comprehensive monitoring**

by integrating up to four additional signals. For example: Measuring the pressure to monitor the diaphragm for crack formation. Measuring the temperature to monitor the hydraulic oil or inadequate infeed.

■ **High-performance software**

automatically detects signal level differences between normal and defective valves. This eliminates the need for a **learning procedure and calibration – as it is self-adaptive.** The software also detects the operating conditions of the pump, so that variable operating conditions such as pressure or stroke rate don't cause problems in other areas. This eliminates the need for additional encoders – so **no adjustment of the pump is required.**

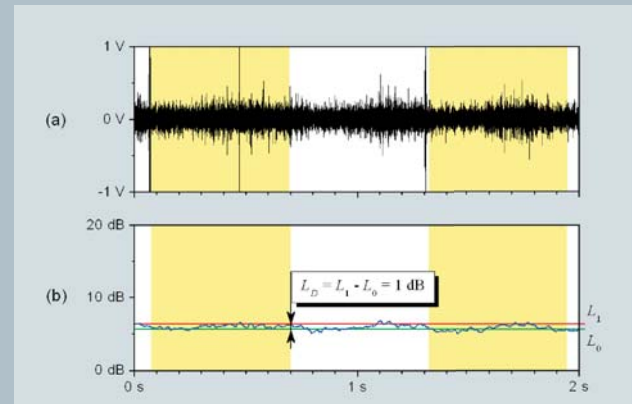
■ **Customized alarm strategy**

as the levels of the pre-alarm and main alarm can be set independently, and the alarms can be freely assigned to the digital outputs.

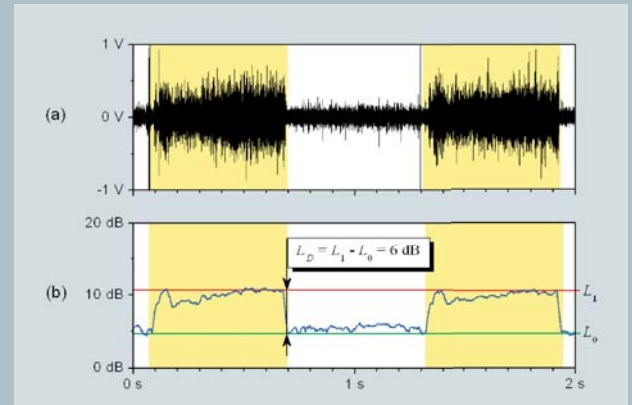
■ **User-friendly retrofitting of the pump**

and integration into existing systems is facilitated by a smart design concept.

Signal level in a reciprocating pump



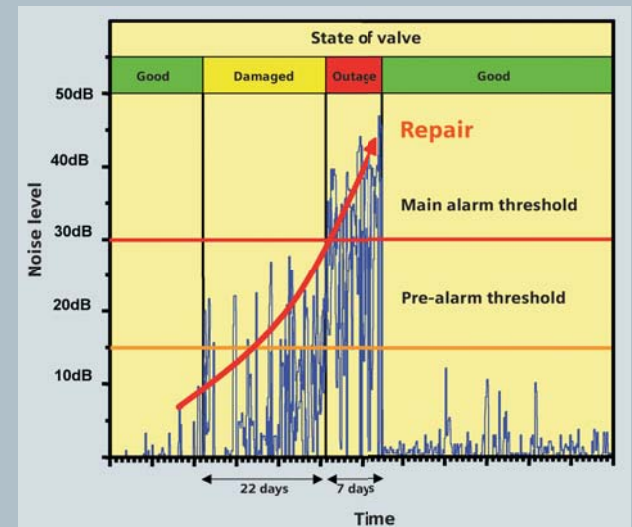
Intact valve



Defective valve



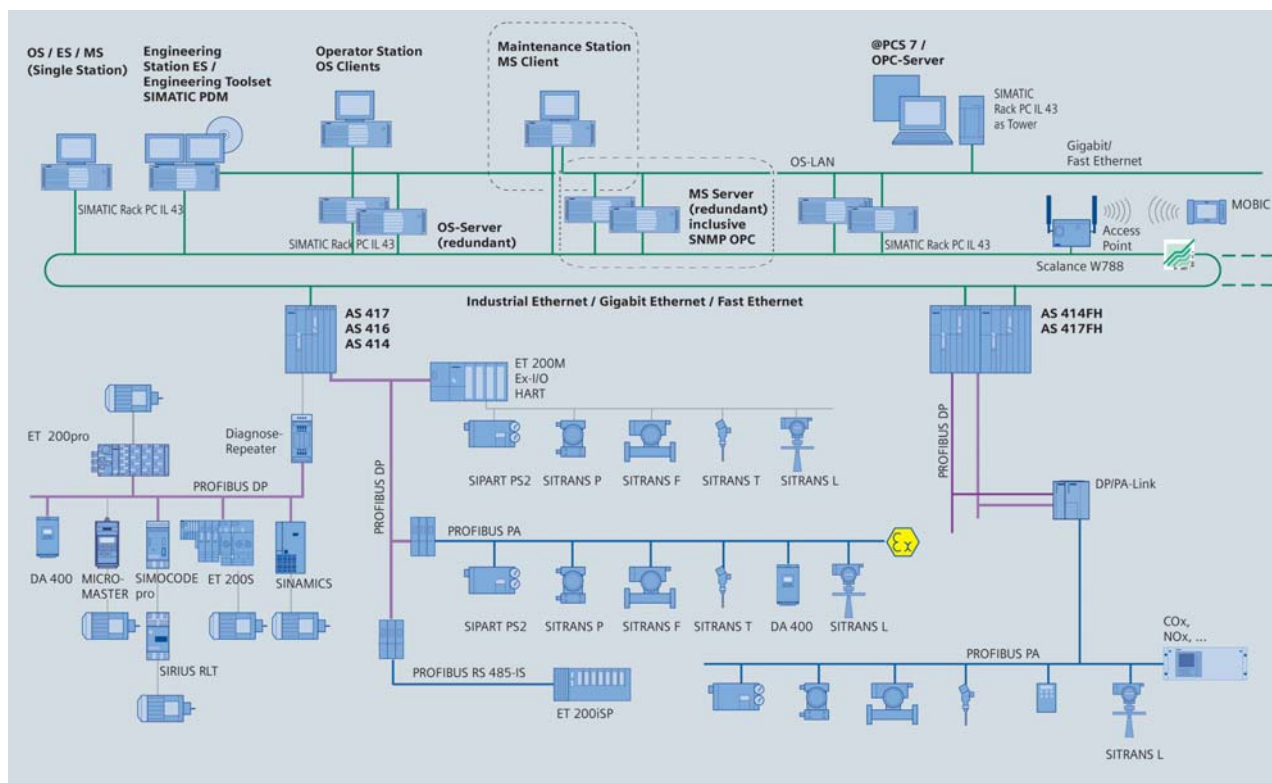
Example of damage development



Complete integration into the control system

As well as the classic integration with point-to-point wiring to hardware inputs, full field-capable connection via PROFIBUS is also available. In full conformity with Siemens' Totally Integrated Automation concept, this provides complete system-wide data and information exchange between control level, that is the control system, and field level, that is the pump and SITRANS DA400.

The Maintenance Station is an option for the SIMATIC PCS 7 process control system which displays the information relevant to maintenance about all connected field devices, switching devices, drives and components of the system.



SITRANS DA400 in detail

The SITRANS DA400 diagnostics unit has been universally designed to meet various system requirements. The pump operator has a large number of device features available to meet the widest range of requirements. Therefore there are a number of device variants for use in the field.

Housing:

- High-quality synthetic material (Makrolon) for outdoor use
- Degree of protection IP65

Input signals:

- structure-borne sound sensors
- 4 universal inputs, each usable for
 - Active/passive digital signals
 - NAMUR (not for EX)
 - Analog signals 0/4...20mA

Output signals:

- 6 digital outputs for free use
- For example:
 - Outputs for single alarm messages
 - Output for alarm group message
 - Output for device status message

Communication is always provided:

- PROFIBUS DP (Non-Ex version)
- PROFIBUS PA (Ex version)

Human-machine interface:

- Local display – display segments and symbols provide a complete overview of the pump status
- Membrane keyboard – for complete parameterization of the device, even without the aid of SIMATIC PDM
- User-friendly parameterization – is also possible with our parameter assignment software SIMATIC PDM as stand alone or as part of SIMATIC PCS 7

Permissible ambient temperatures:

- -20 to +60°C (-4 to 140°F) Non-Ex version
- -20 to +50°C (-4 to 122°F) Ex version with T6

Dimensions:

- 172 x 320 x 80mm (6.8 x 12.6 x 3.2 inches)

Auxiliary power:

- 24 V DC, < 100mA power consumption, Non-Ex version
- From intrinsically safe power source (e.g. valve control module)

Ex approval certificate for use in Zone 1 according ATEX:

- II 2(1) G EEx ia [ia] IIC T4/T5/T6



Acoustic emission sensor:

The acoustic emission sensor is designed so that it can easily be mounted on the outside of the pump housing. The cable is connected to the diagnostic device.

Housing:

- Stainless steel
- Degree of protection IP66/IP68
- Embedded electronics

Available cable lengths:

- 20m (standard)
- 40m
- 100m

Permissible ambient temperatures:

- -40 to +110°C (-40 to 230°F) Non-Ex version
- -20 to +50°C (-4 to 122°F) Ex version with T6

Dimensions:

- 26 x 40 x 29mm (1.0 x 1.6 x 1.1 inches)

Ex approval certificates:

- If the structure-borne sound sensors are used in the Ex Zone.
II 1 G EEx ia IIC T6/T5/T4 or
II 1 D EEx ia D 20, 21, 22 T160

Accessories:

The two-channel EX barrier for safe separation between Non-Ex Zone and Ex Zone can be used if only the acoustic emission sensors are to be operated in the Ex Zone. In this combination, the acoustic diagnostics unit must be operated outside the Ex Zone.

Permissible ambient temperatures:

- -20 to +60°C (-4 to +140°F)

Ex approval certificate:

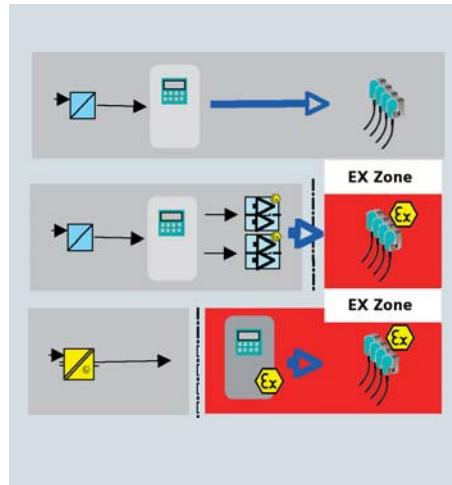
- EEx ib IIC



In Non-Ex Version and Ex Version available



EX Barrier



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