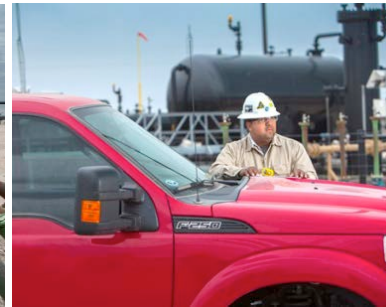


MRC Global

ValveWatch Introduction



MRC GlobalTM
*We Make Energy Flow*TM



Produced by

MRC Global

Condition monitoring on valves

History:

- MRC Global have been doing valve diagnostics since 1991
- In 1994 we started with diagnostics on Fieldvue DVC via Valvelink
- Since 1997 we have participated in the ValveWatch development
- In 2002 we got our first on-line monitoring contract for offshore
- In 2003 we started our training department
- We have / had contract on 17 platforms and plants
- Total of 24 persons working with condition monitoring and training
- Solberg & Andersen took over the ValveWatch product in 2011



What is valve diagnostic for MRC Global?

- Diagnostic - on control valves through smart instrumentation
- Diagnostic – on pneumatic on/off valves through smart instrumentation, “partial stroke”
- Diagnostic – on on/off valves through PT/strain gauge in actuator and adapter, using ValveWatch
- Leakage measurement through acoustic sensor on-line, using ValveWatch
- Diagnostic through wireless instrumentation
- Diagnostic through electric actuators – use available information (profibus...fieldbus..)
- Mobile equipment to hook direct on valve, using Valvelink on ATEX PC, VDT (ValveWatch Portable Tool), acoustic leak detector or using test rig for measuring leakage through critical on-off



What is ValveWatch?

ValveWatch is a condition monitoring system for valves that delivers proven results. ValveWatch utilizes advanced technology to remotely monitor valves and actuators, detecting problems before they impact production.

ValveWatch as an online continuous valve monitoring solution has been installed on safety critical valves (typically ESD/ESV, HIPPS) . This trend is continuing but our customers are now also including production critical valves, such as the monitoring of x-mas trees, wellheads, Safety Relief valves and production valves (i.e the “money valves”).



Why ValveWatch?

Safety:

If an emergency occurs, pipeline operators rely on critical isolation valves to operate successfully on-demand with absolute reliability.

Critical valves may often be installed in remote locations, which can be difficult to access for manual testing and inspection. A failed valve or actuator can halt production without warning and create a dangerous situation for personnel.

A valve monitoring system displays the real-time condition of valves and actuators, often reporting problems before they impact the production.

Cost Savings:

A valve monitoring system identifies valves that are in need of overhauling or repair. The system can also save costs by identifying which valves that are in good condition and therefore no action is needed!

Today, maintenance is performed periodically, typically every 12 or 24 months. Valve monitoring allows these intervals to extend to every two or four years.

The goal is to detect faults before they occur, so that parts can be ordered and replaced before failure occurs. This increases the "uptime" and reduces production loss.



What is possible to achieve with Valve Diagnostic?

- Reduced maintenance cost
- Reduced production losses
- Increased safety
- Pinpoint major faults
- Reduced personnel



ValveWatch- What can be found

Valve Problems Detected

- Leaking Valve Seats
- Bent Stem
- Debris or damage after pigging
- Loose or Over-tightened Packing
- Excessive Breakout Torque
- Valve Galling
- Ejected Cavity Sealant
- Solenoid valve degradation

Actuator Problems Detected

- Internal Corrosion
- Broken Return Spring
- Cylinder Damage
- Undersized Actuator
- Restricted Solenoid Exhaust
- Actuator Pressure Leak
- Insufficient Air Supply
- Limit switch deviation



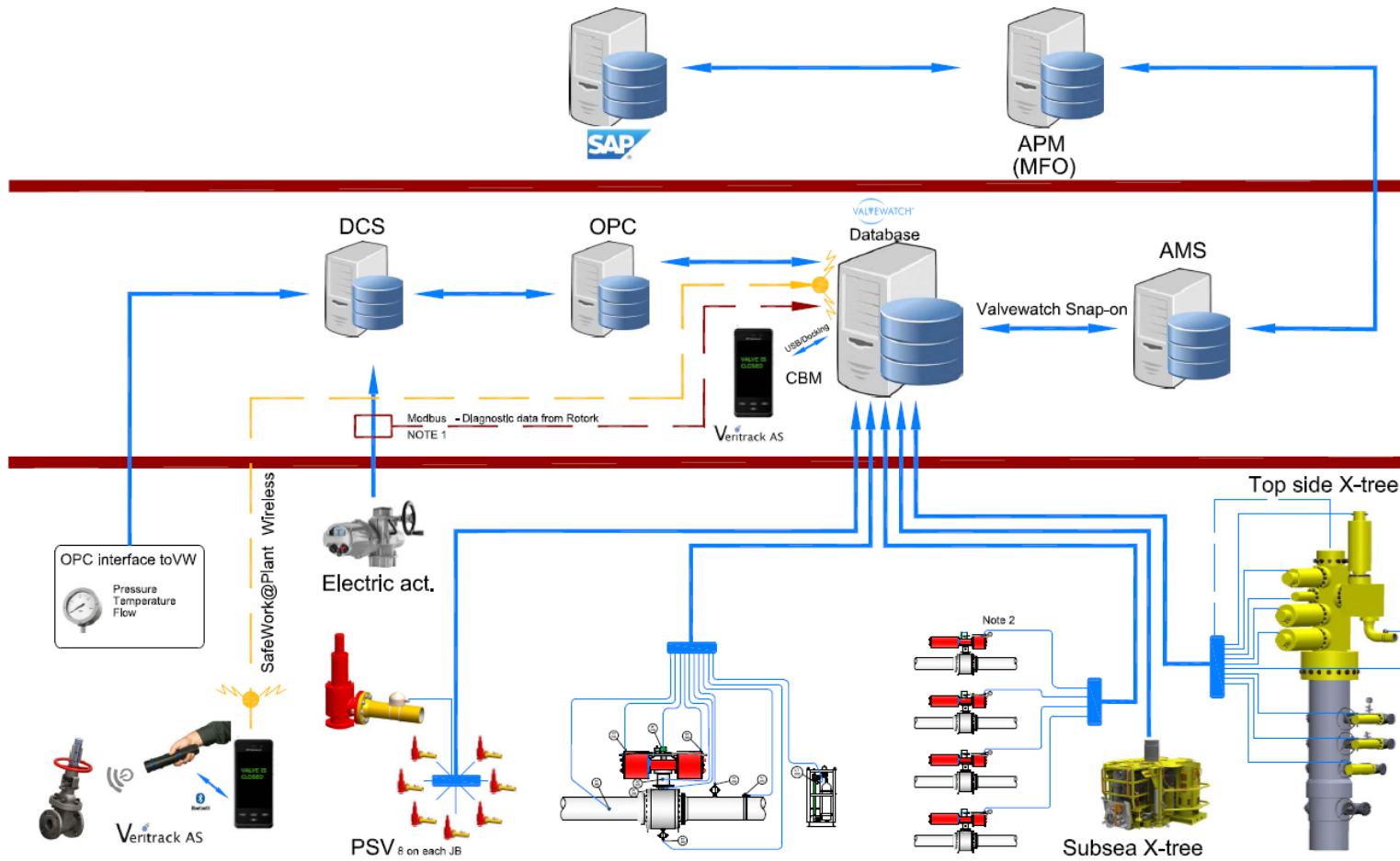
Monitoring system - ValveWatch

Monitoring systems is by design meant to help companies run their plants as safe as possible and make them able to take the right decisions when needed. The system should start automatic tests whenever the valve moves.

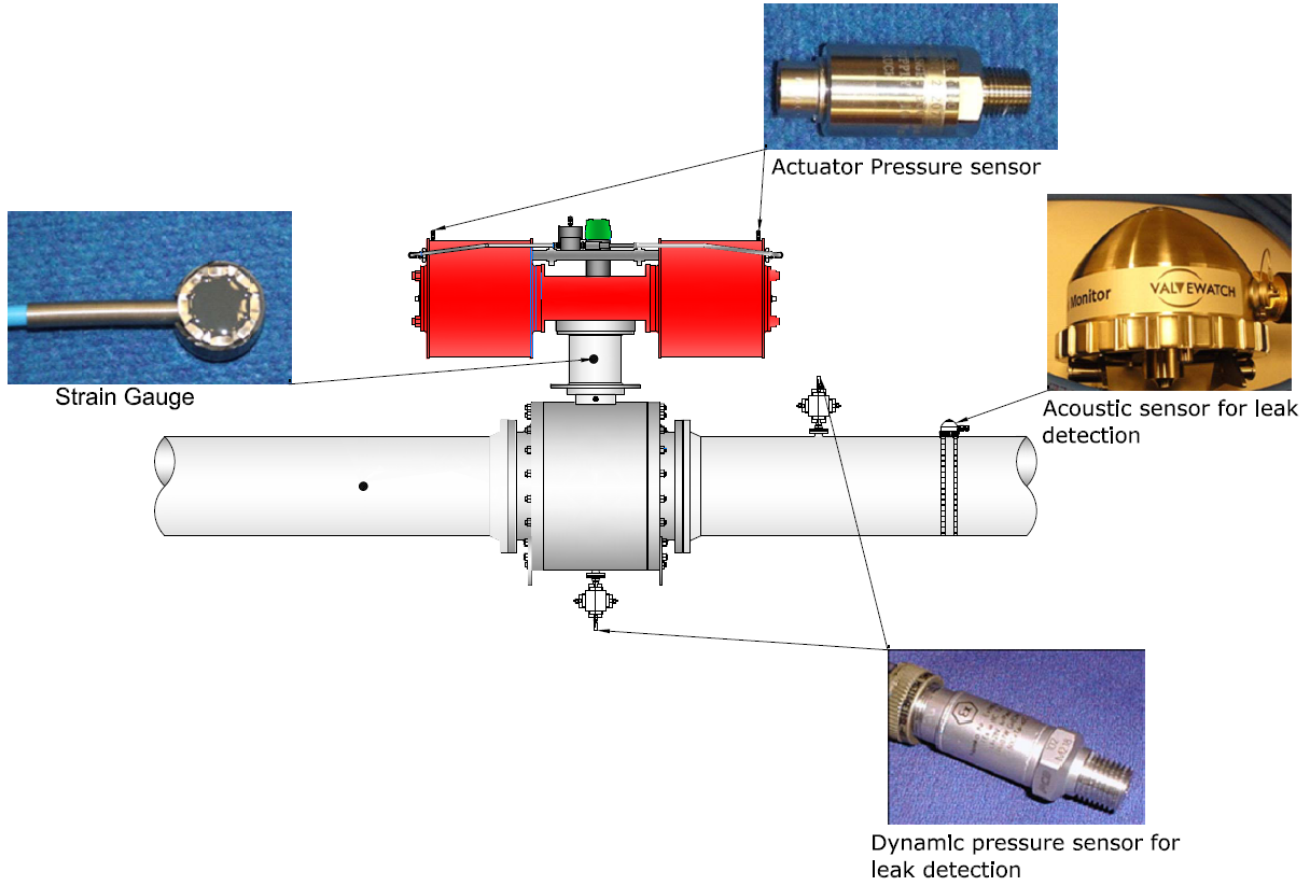
Valve Type	Monitors Condition	Detects Valve Problems	Detects Actuator Problems	Detects Leaks: Valve Closed	Detects Leaks: Valve Open*
Ball	●	●	●	●	●
Gate	●	●	●	●	●
Plug	●	●	●	●	
Globe	●	●	●	●	
Butterfly	●	●	●	●	
X-tree	Automatic safety factor			●	
PSV	Detects valve lift and leak			●	



ValveWatch network overall



ValveWatch Sensors for Valve Monitoring



Pressure sensors for Actuator

The sensors are used to measure pressure to actuator.

They are mounted in the pressurized section of the actuator.

Mounting on the tubing or control panel is not recommended, but possible.

These sensors are available in various pressure ratings to optimize scaling.

The sensors can measure air and hydraulic actuators.



Strain sensor for valve movement force

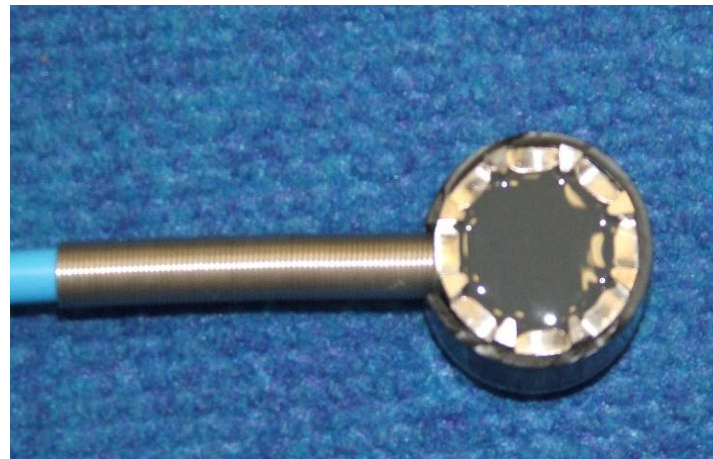
The strain sensor monitors mechanical performance of the valve and the actuator.

Strain gage is mounted directly on the yoke.

Basic idea is to see dimensional changes on the yoke.

Strain gages analyze forces translated between the valve and the actuator.

Sensor can be used to measure Torque or Thrust.



Dynamic pressure sensor for leak detection

This technique uses two equal sensors to compare the signal from the flow in the pipe and the sealed cavity compartment of the valve.

The sensors are used to check seal integrity.

They are mounted in the upstream, downstream and cavity positions of the valve.

As its name states it is dynamic sensor;

therefore, it responds only to changes in pressure.



Acoustic sensor for leak detection

The sensor is non-intrusive and is mounted on the valve it self or on the pipe.

Principle of operation Passive acoustic, intelligent sensor.

The valve needs to be closed and a pressure difference across the valve is needed for the sensor to detect any leak.



ValveWatch – Equipment Installation

The level of valve monitoring can be selected based on the criticality of the valve. Highly critical valves should be installed with the full monitoring capability of ValveWatch, as ValveWatch is a mitigating factor for reaching both increased operational safety and reduced downtime.

Critical valves can be crucial to Safety and the requirements set forth by the petroleum authority.

It is these valves that require frequent testing and evaluation. It is also these valves that need to be managed according to IEC 61511/61508 or in an adequate or equal manner.

It is also these valves where potential faults are required to be managed and determined. Faults can be categorized simply as Dangerous Detectable Faults (DD) and Dangerous Undetectable (DU) faults.

The Advanced ValveWatch solution covers all the potential DD & DU faults. – DU are moved in the DD section with ValveWatch as it monitors the full operational pattern of the valve.

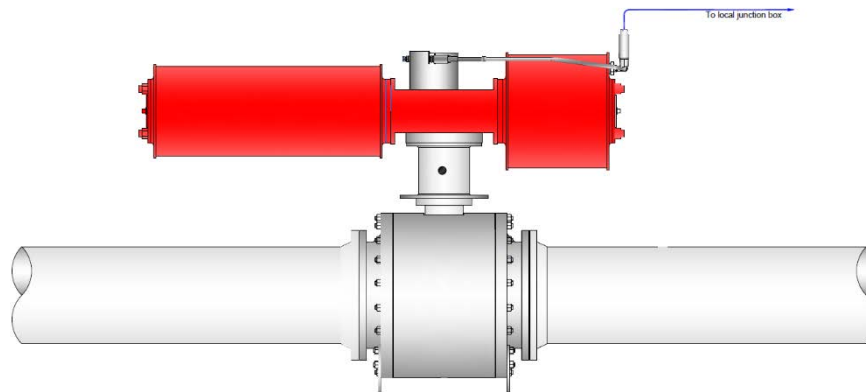


Basic – Monitoring of actuation (Maintenance Critical Valves)

The basic installation of ValveWatch incorporates only the mounting of a static pressure sensor on the actuator. It is of great advantage that the actuator has a separate and dedicated port for mounting the static pressure. (This is an option that can be asked for when ordering new actuators). This allows for greater potential with regards to the diagnostic information that can be retrieved.

A tee section can also be an adequate solution if the actuator does not have a separate “diagnostic port”

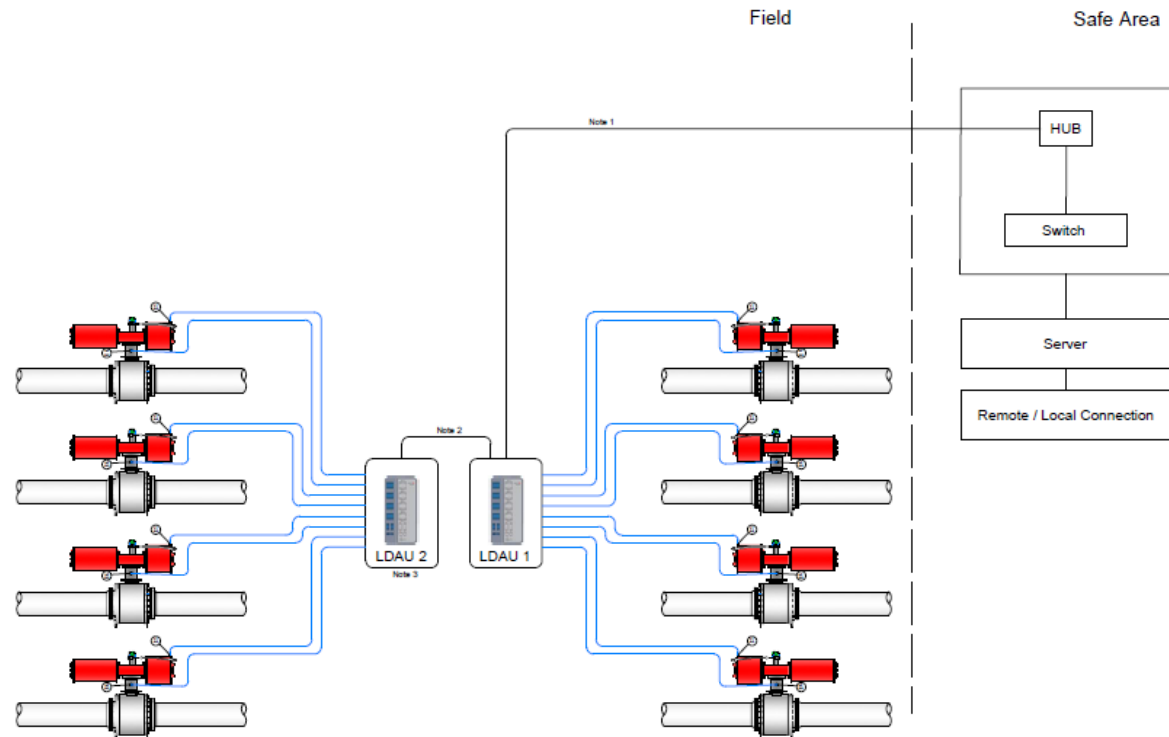
If the actuator is double acting, the actuator must be fitted with two static pressure sensors.



Intermediate – Monitoring of actuator and valve (Production Critical Valves)

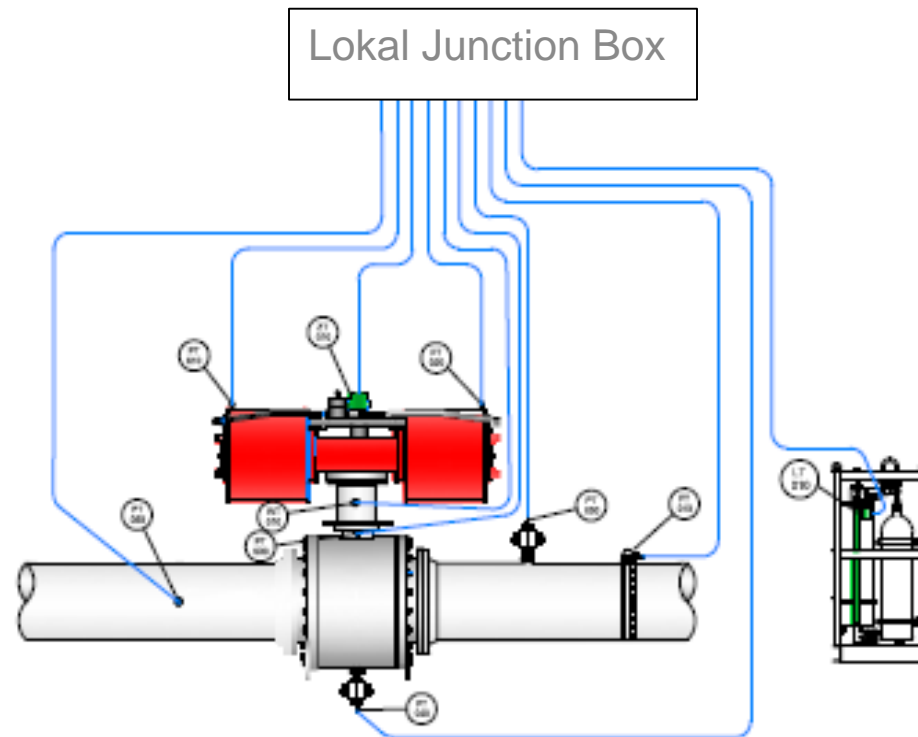
The installation is the same as mentioned on previous slide but also includes a Strain gauge that monitors the force delivered by the actuator and how much is lost due to friction in the valve.

The strain gauge is mounted on the section piece between the actuator and valve (Yoke).



Advances – Full valve/Actuator & Leak Monitoring (Safety Critical Valves)

This solution incorporates the previous mentioned Stain gauge and Static pressure sensors with the addition of leak monitoring.



Leak detection PSV valves

Integrated with ValveWatch

Used on all PSV valves
(also pilot operated valves)

- Method of installation:

Clamped to pipe surface or valve body,
non-intrusive

- Sensor electronics:

Intelligent electronics with signal
processing

- Flow regimes: Oil, gas, water



Picture 1, A Leak Monitor mounted on a PSV in the pressure bench at Statoils Kollsnes Refinery.

VDT (ValveWatch Portable Tool)



System test possibilities:

- Friction force/torque
- Seat force
- Spring Force
- Leakage (actuator)
- Response /travel time
- Safety factor
- Instrument fault
- Valve leak

ValveWatch Benefits

You can detect valve leakage (passing) while the valve is in both open and closed position

→ Optimize maintenance budget.

Accurately record the time for ESD Full Closure Stroking whenever you close the valve during planned/unplanned shutdown or partial stroke

→ Prolong ESD testing shutdown interval.

Save production by monitoring the health of your Export Valve, ESD or any other Actuated Valves that must be online at all time.





VALVEWATCH

PRODUCE WITH CONFIDENCE
PROTECT YOUR PROFITS
PROMOTE SAFETY

www.valvewatch.com