



On-off and safety valve diagnostics

Juha Kivelä

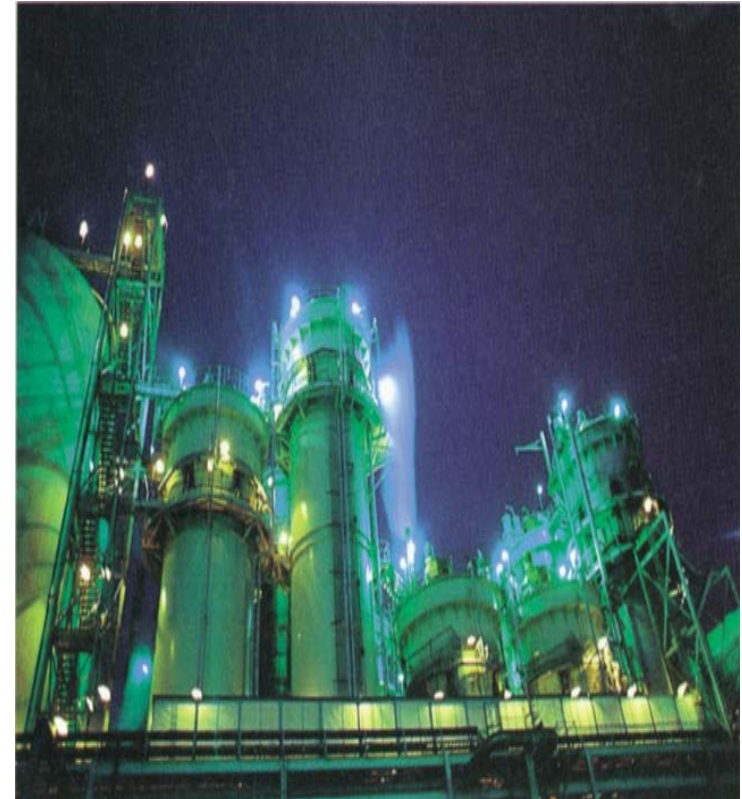
Business Development Manager

Valve Controls Business Line



Agenda

- Brief history to valve diagnostics
- From control valve to safety and on-off valve diagnostics
- Different 'generations' of valve diagnostics
- On-off & safety valve diagnostics – Latest developments
- Benefits of predictive valve maintenance
- Summary
- Questions, comments & discussion



Brief history to valve diagnostics

Brief history to valve diagnostics

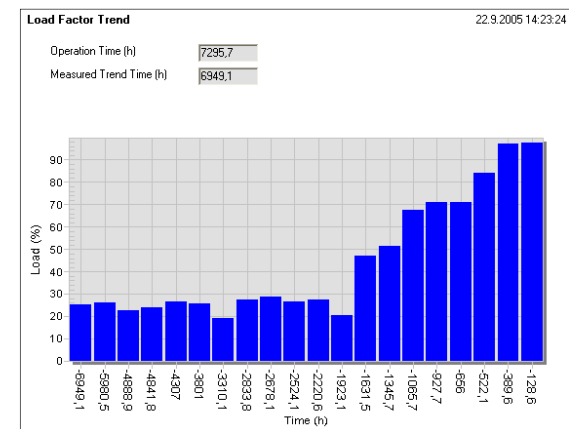
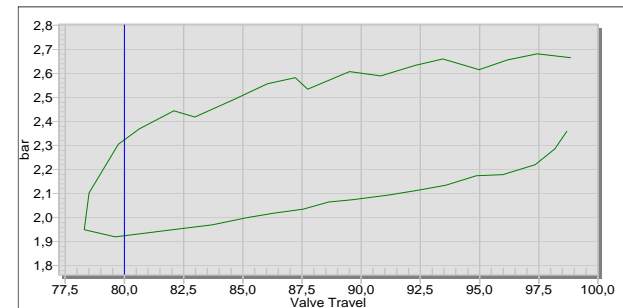
- First separate diagnostics tools available already in the 1980's
 - Standalone devices for control valves
 - Offline tests needed to collect the diagnostics
- Digital positioners in the 1990's
 - Enabling offline testing for control valves without standalone diagnostics tools
- First intelligent valve controllers, early 2000's
 - Collecting control valve diagnostics data also when the process is online
 - Capability to analyze the data and provide online alarms



From control valve to safety and on-off valve diagnostics

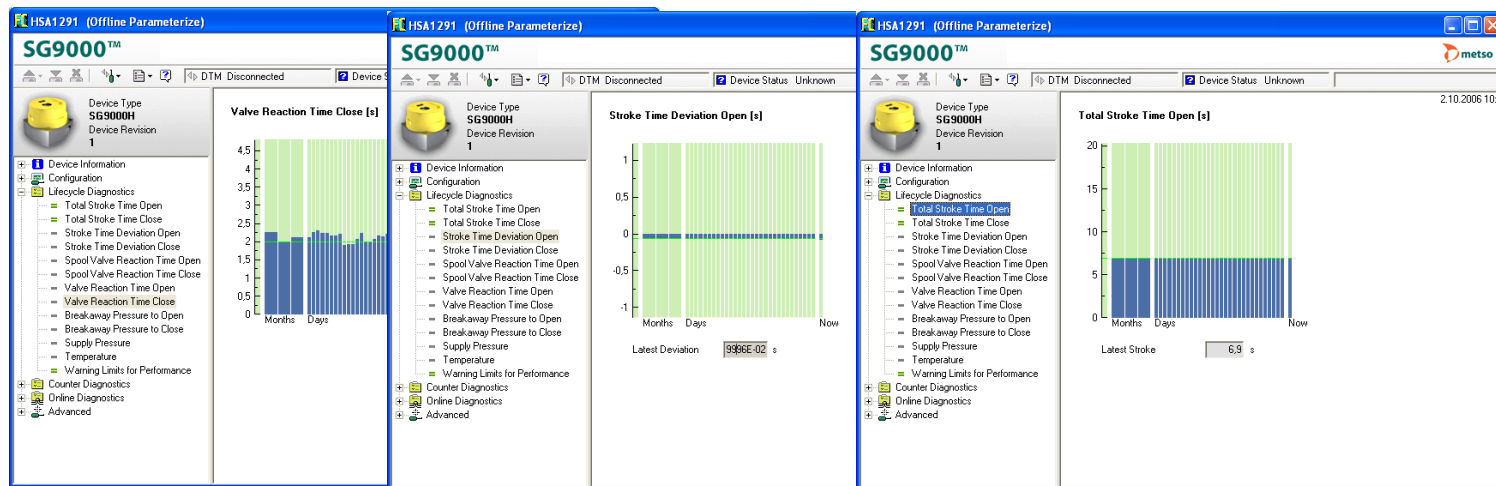
From control valve to safety and on-off valve diagnostics

- Following the development of control valve related online testing and monitoring capabilities, the first automatic safety valve testing devices were introduced to the market almost 15 years ago
- These devices brought along online diagnostics also for safety valves (both ESD & ESV valves)



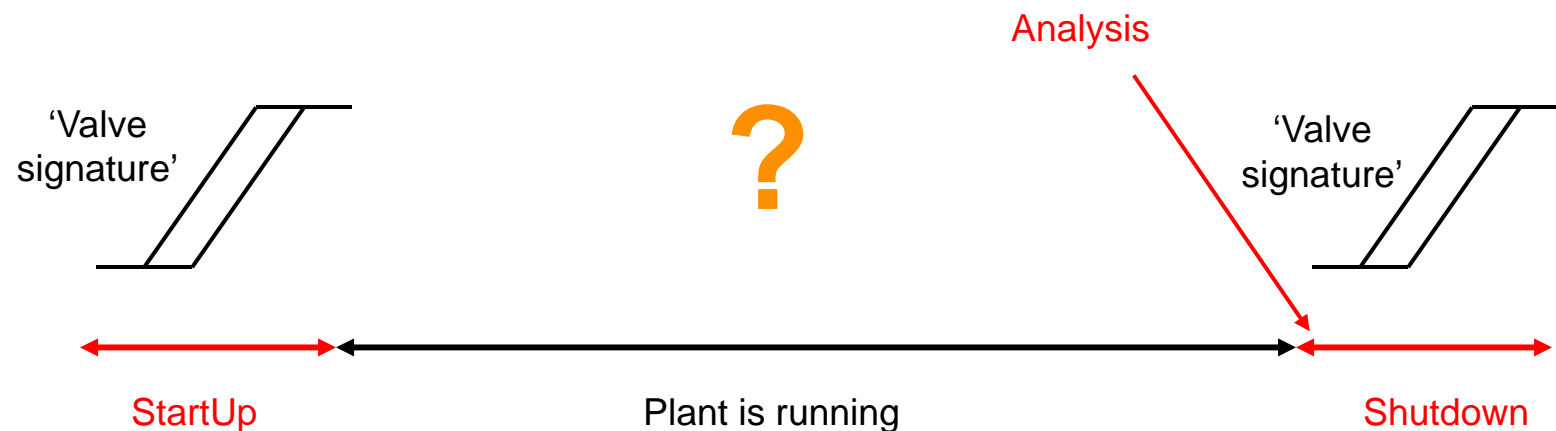
From control valve to safety and on-off valve diagnostics

- Besides safety valves, online diagnostics have been available for cycling on-off valves as well for more than 5 years already



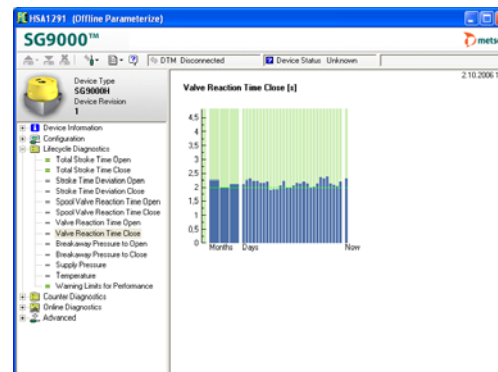
Different 'generations' of valve diagnostics

First generation diagnostics

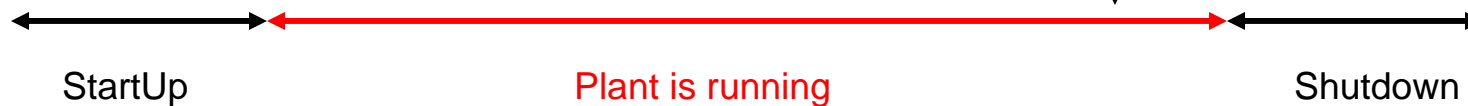


- Diagnostics are based on tests that are run during start-up / commissioning and shutdowns
 - This information doesn't help with maintenance planning
- Valve is not under true process conditions and the analysis result doesn't necessary reflect the real condition of the valve
- Often there is not enough time to test, analyze and make decisions on every valve during the shutdowns

Second generation diagnostics

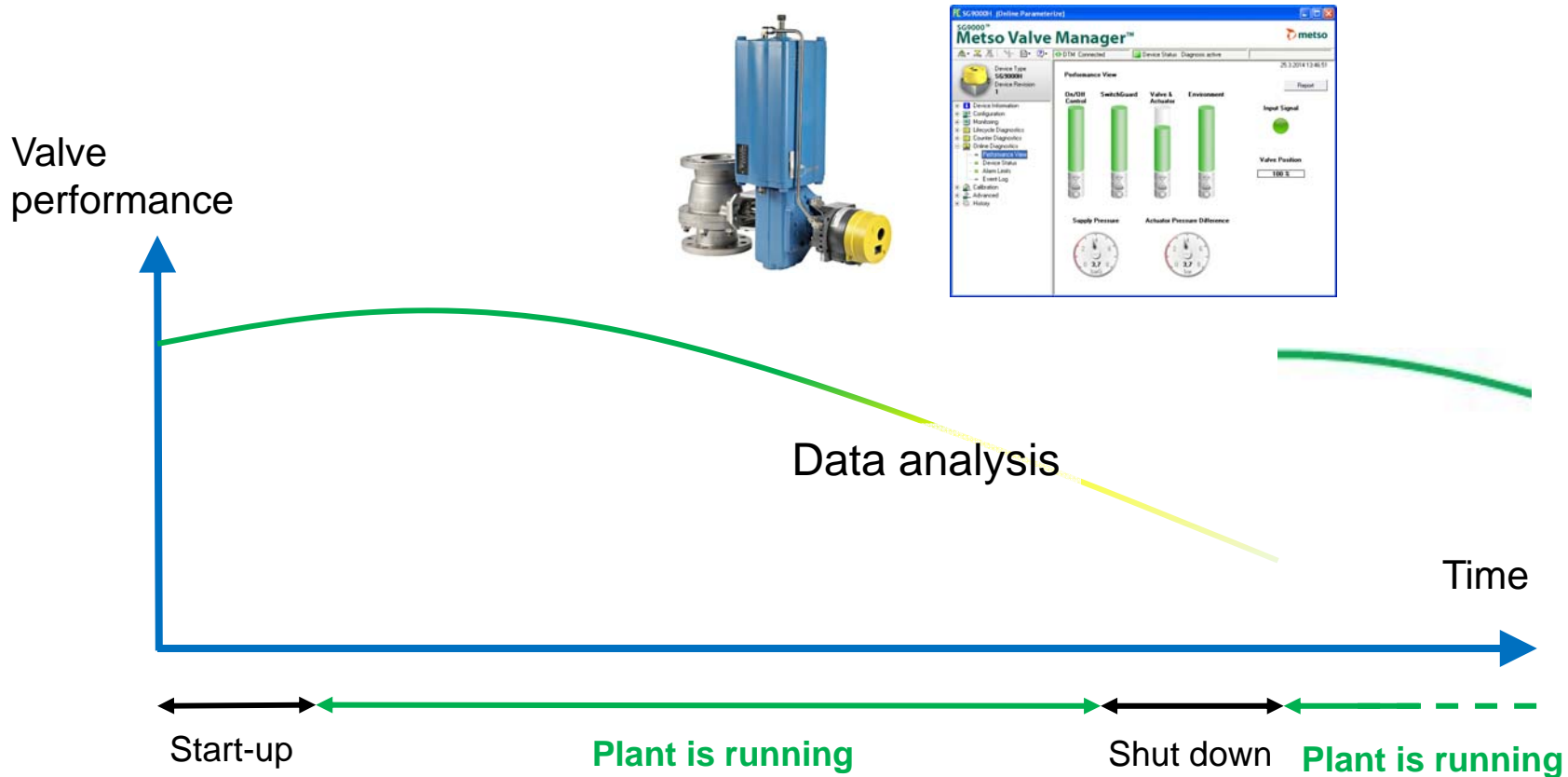


Data analysis



- Besides the offline tests, the valve performance is assessed also during process run-time
- The intelligent valve controller measures and stores the diagnostic data
 - Real-time information available on the valve condition via asset management system
- Diagnostics analysis can be conducted continuously and/or prior to shutdowns
 - Enabling predictive maintenance planning

Third generation online diagnostics

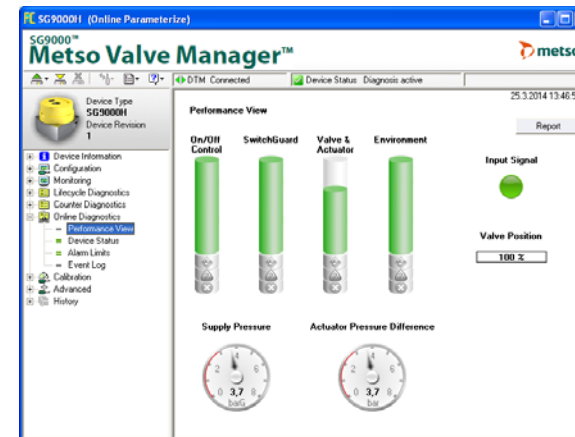
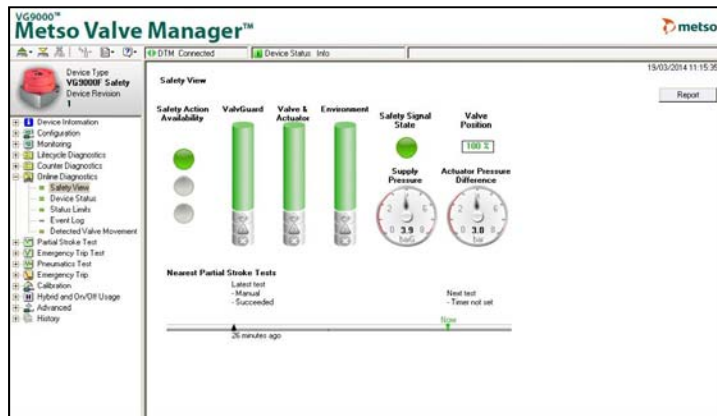


- Intelligent valve controllers are capable of analysing the diagnostics data those collect and to present it in user-friendly format

On-off and safety valve diagnostics – Latest developments

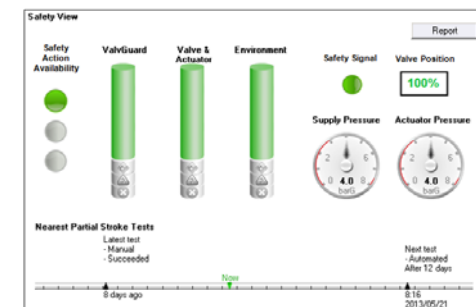
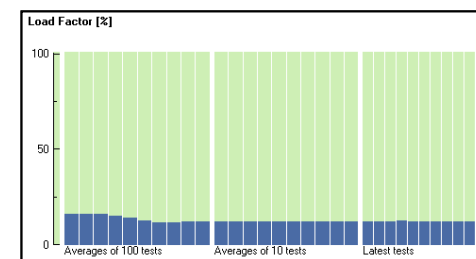
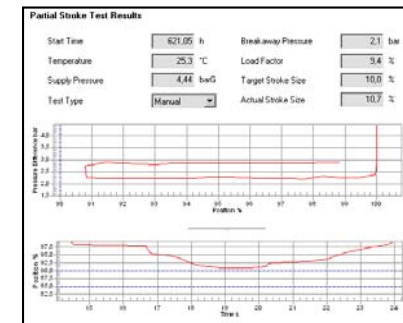
Latest developments

- As with control valves, also the safety and on-off valve related diagnostics capabilities have been further developed since those were introduced
- The industry benchmark devices available can nowadays offer similar online diagnostics with safety and on-off valves as are available with control valves



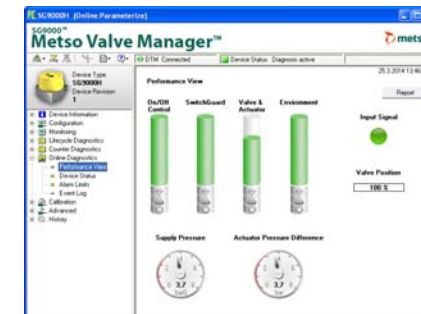
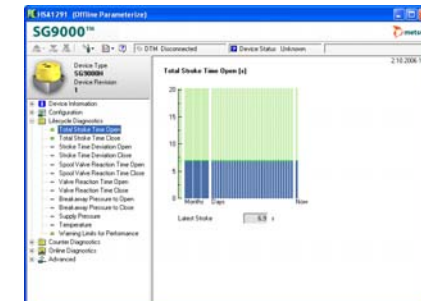
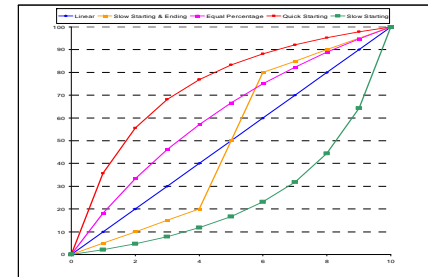
Safety valve diagnostics

- Lifecycle diagnostics are based on online tests, e.g. on partial stroke tests
- The intelligent devices conducting the partial stroke test not only record the result graphs, but can also do a pre-analysis on the results
- Online warnings and alarms based on valve performance degradation
- Visual presentation of the condition of the valve
- Trouble-shooting guide available



On-off valve diagnostics

- Similar level of information available than with control and safety valves
- Lifecycle diagnostics are based on the open and close strokes the valve does during process run time
 - No need for separate tests
- Online warnings and alarms based on valve performance degradation
- Visual presentation of the condition of the valve
- Trouble-shooting guide available



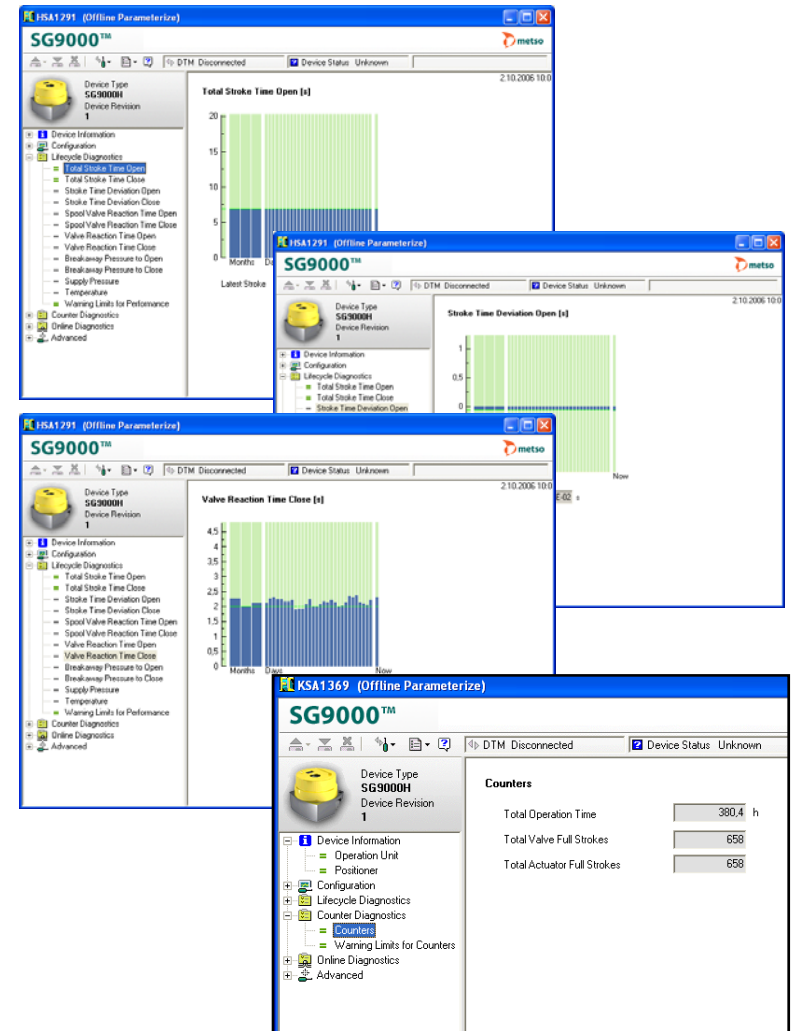
Examples of diagnostics information available for on-off valves

• Trends

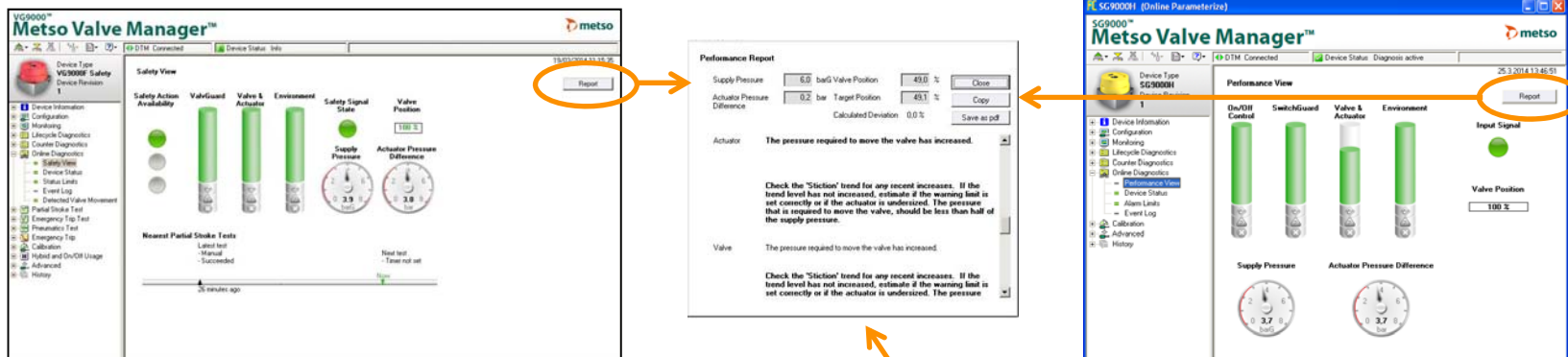
- Stroke time and deviation
 - To diagnose valve mechanical failures
- Spool valve reaction time
 - To diagnose pneumatics problems
- Valve reaction time and breakaway pressure
 - To diagnose valve jamming problems
- Supply pressure
 - To diagnose filter regulator

• Counters

- Total operation time
- Valve and actuator strokes



Advanced diagnostics help to make the right maintenance decisions



Recommended Actions

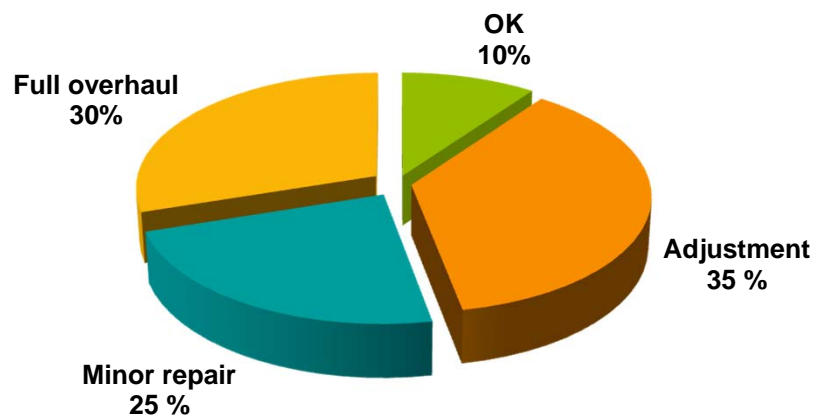
- The diagnostics information is presented in a format that doesn't require true valve expertise to interpret
- A report is provided to highlight the existing problems and to recommend the necessary maintenance actions
- Maintenance resources can focus on the field devices that truly require their attention



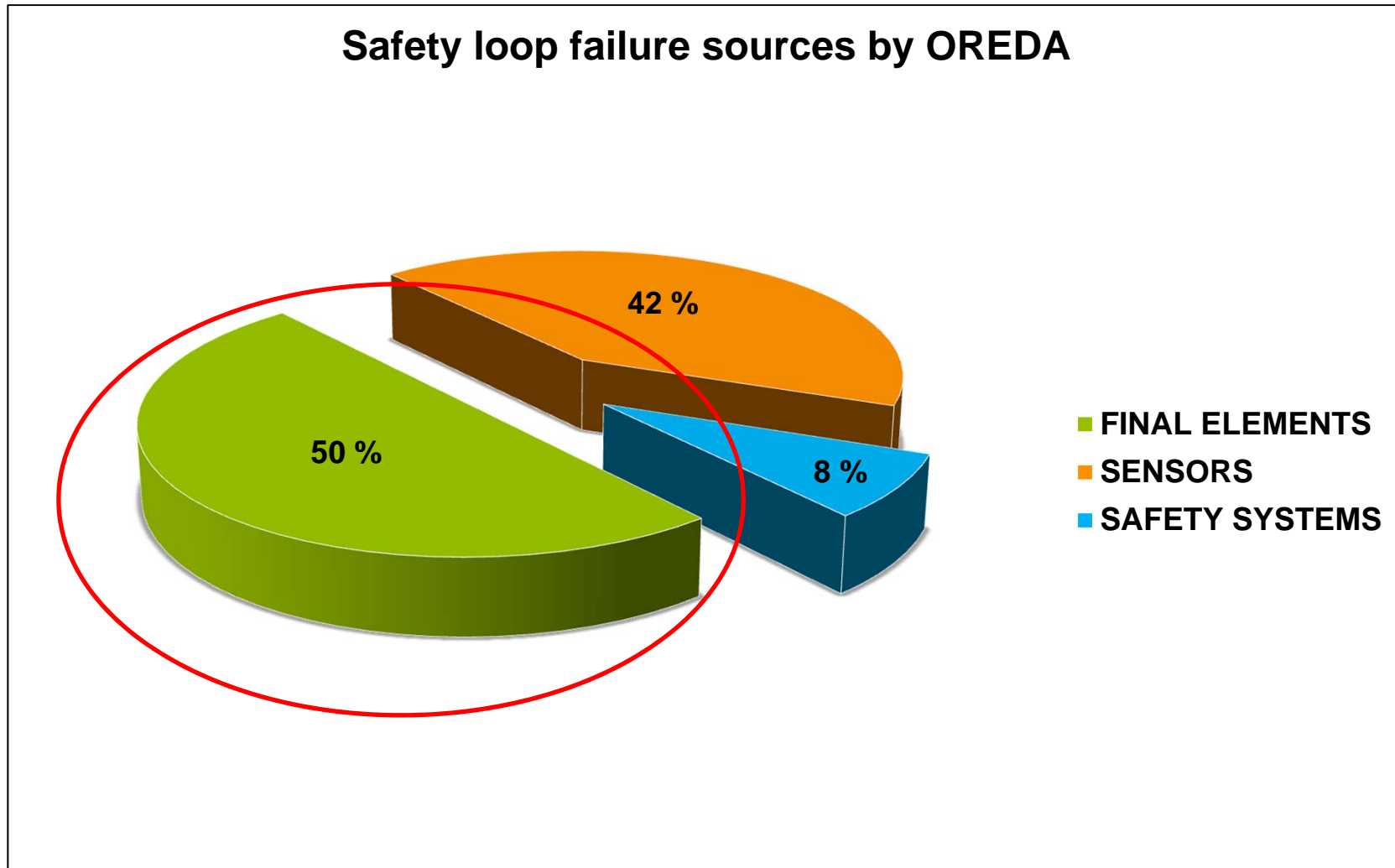
Benefits of predictive valve maintenance

Condition of valves during a shutdown

Typical example of condition of overhauled valves during a shutdown



Significance of valves on the safety side



Condition monitoring and predictive maintenance will help to

- Improve safety and reduce environmental risks
 - Eliminate safety risks in manual inspections
 - Minimize safety and environmental risks related to unexpected equipment failure
- Reach high process availability and performance
 - Avoid unexpected failures by detecting developing defects
 - Minimize downtimes by being able to prepare for maintenance
 - Improve the production process performance by optimizing equipment performance
- Increased maintenance productivity
 - Daily remote checking of the condition of process equipment
 - Plan equipment repairs well ahead with right parts, tools and resources at place
 - Reduce the unplanned maintenance work



Summary

Summary

- Valve diagnostics tools have taken a giant leap since the first devices were introduced in the 1980's
- Online diagnostics are nowadays available also for on-off and safety valves
- The so called third generation diagnostics are taking possibilities for predictive valve maintenance to a new level
- Adopting predictive maintenance helps to enhance maintenance efficiency, improve process performance and to achieve significant maintenance cost savings



Thank you for
your attention!

Questions / comments?