

Wireless development in digital control systems for valves and actuators

Shelley Pike

rotork®



Biography



Shelley Pike

- Joined Rotork as an engineering apprentice in 1988
- Has a degree in electronic engineering
- Joined Rotork's quality department before moving to the electronics design department, where she eventually became a Senior Electronic Engineer
- Attained a Chartered Engineer accreditation
- Shelley helped design and develop a number of network related products, including the Pakscan master station
- Currently Systems Sales Manager for Rotork Controls

Agenda

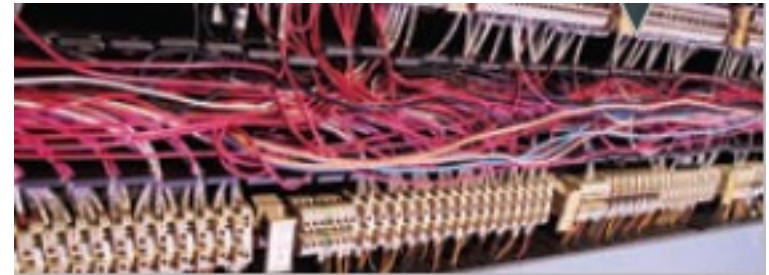
- How we got to wireless
- Smart actuators and the data they provide
- What can we use this data for?
- Wireless case study
- Questions

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Why do people use networks?

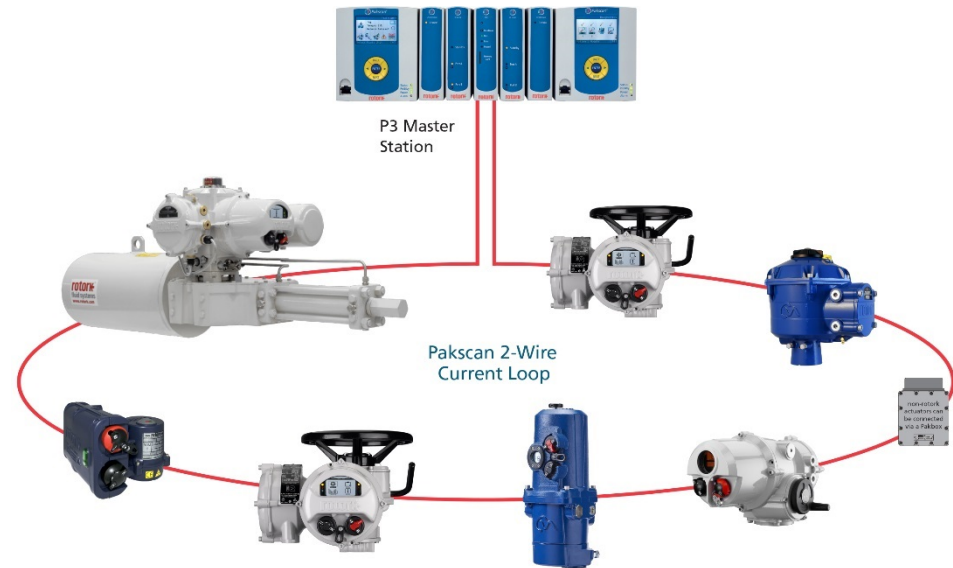
Signal	Conductors
End Position Indication	3
Open Close Stop or proportional control	4
Emergency shut-down	2
Continuous valve position	2
Available for control	1
Local / Remote switch position	1
Stop button pressed	1
Motor running	1
Torque switch tripped	1
Torque throughout stroke	2
Total conductors	18



- More data = more wires
- More wires = more potential failure points
- More wires = more cost for installation and infrastructure
- More wires = more complexity in engineering

Why do people use networks?

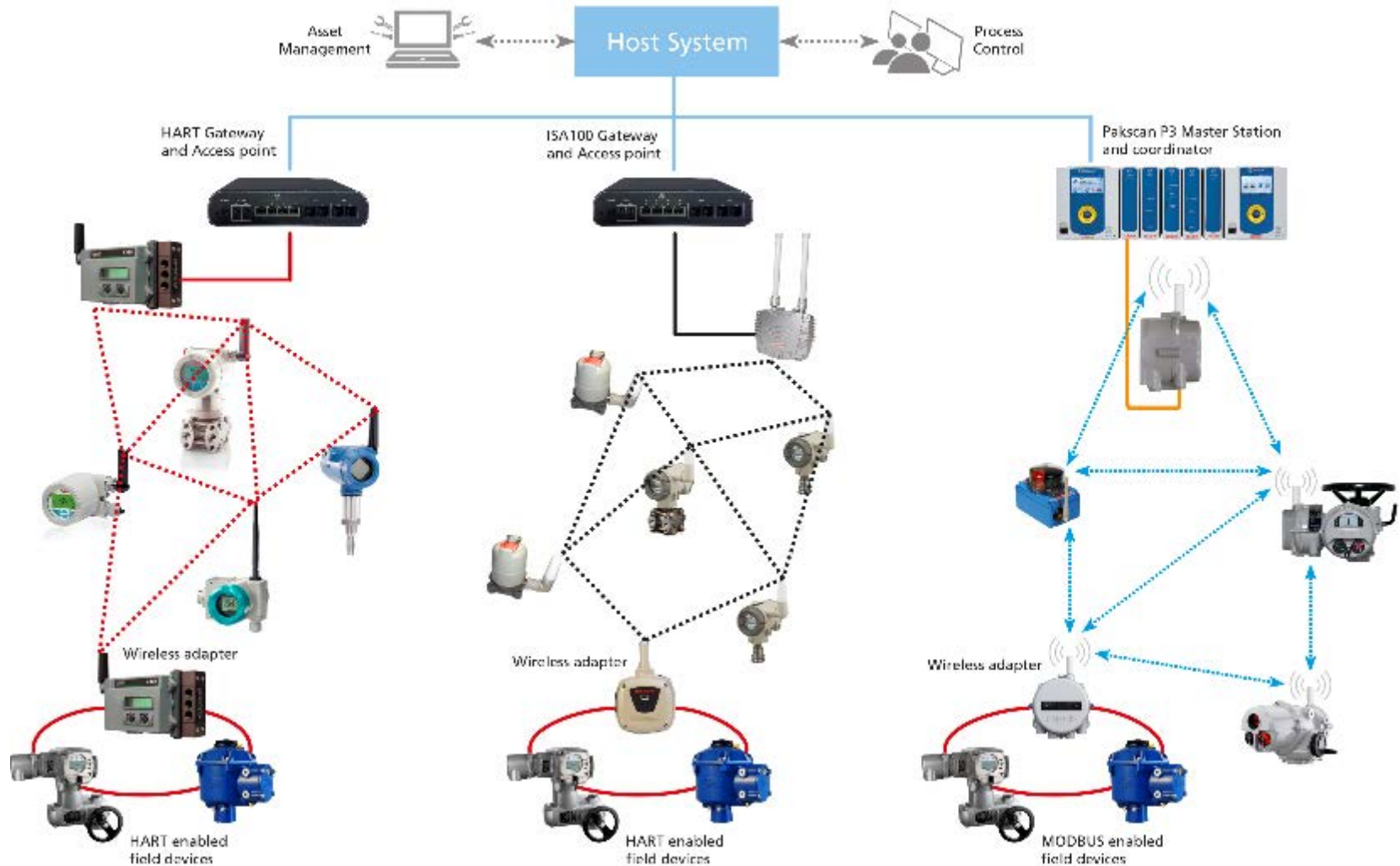
Signal	Conductors
End Position Indication	-
Open Close Stop or proportional control	-
Emergency shut-down	-
Continuous valve position	-
Available for control	-
Local / Remote switch position	-
Stop button pressed	-
Motor running	-
Torque switch tripped	-
Torque throughout stroke	-
Total conductors	2



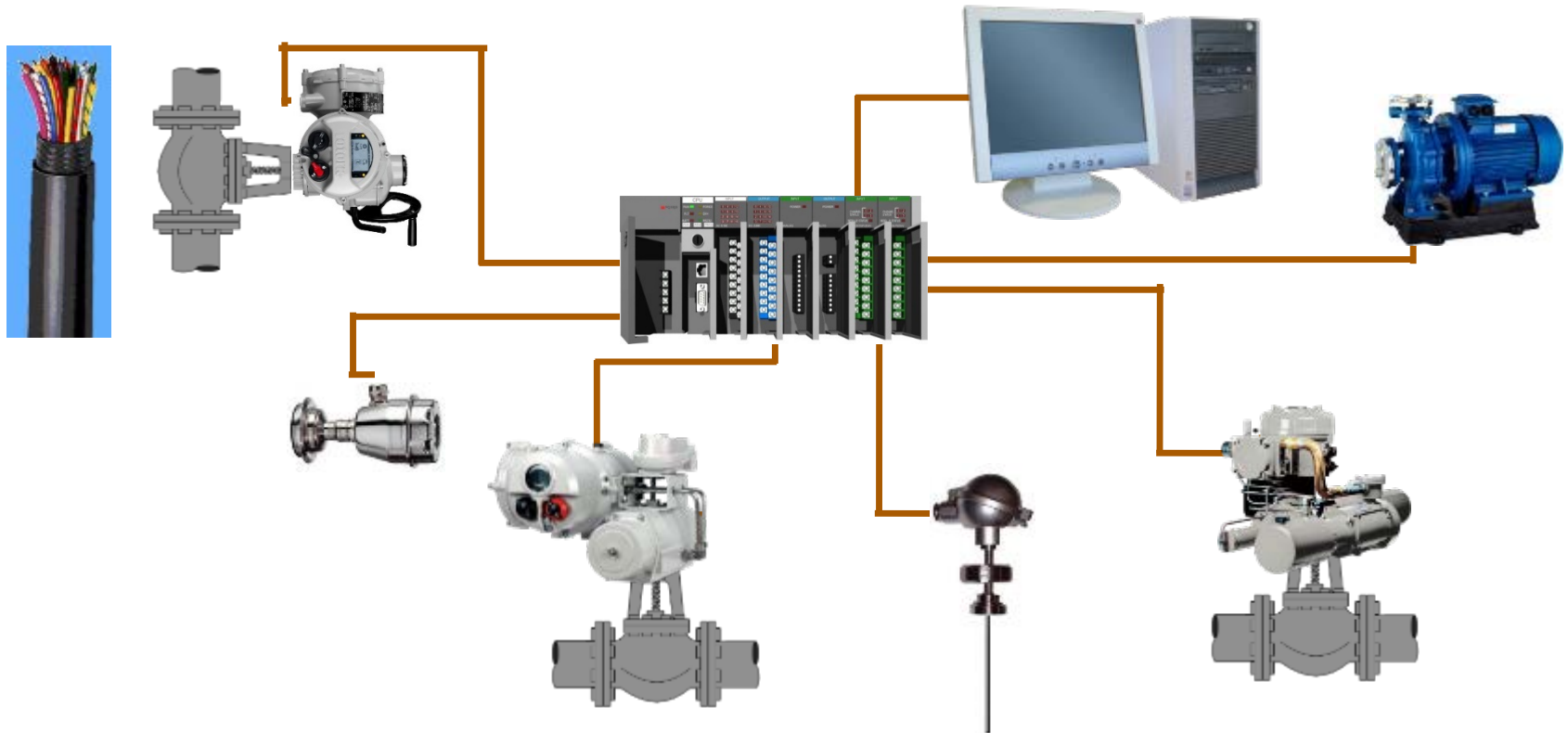
Wired networks



Wireless networks

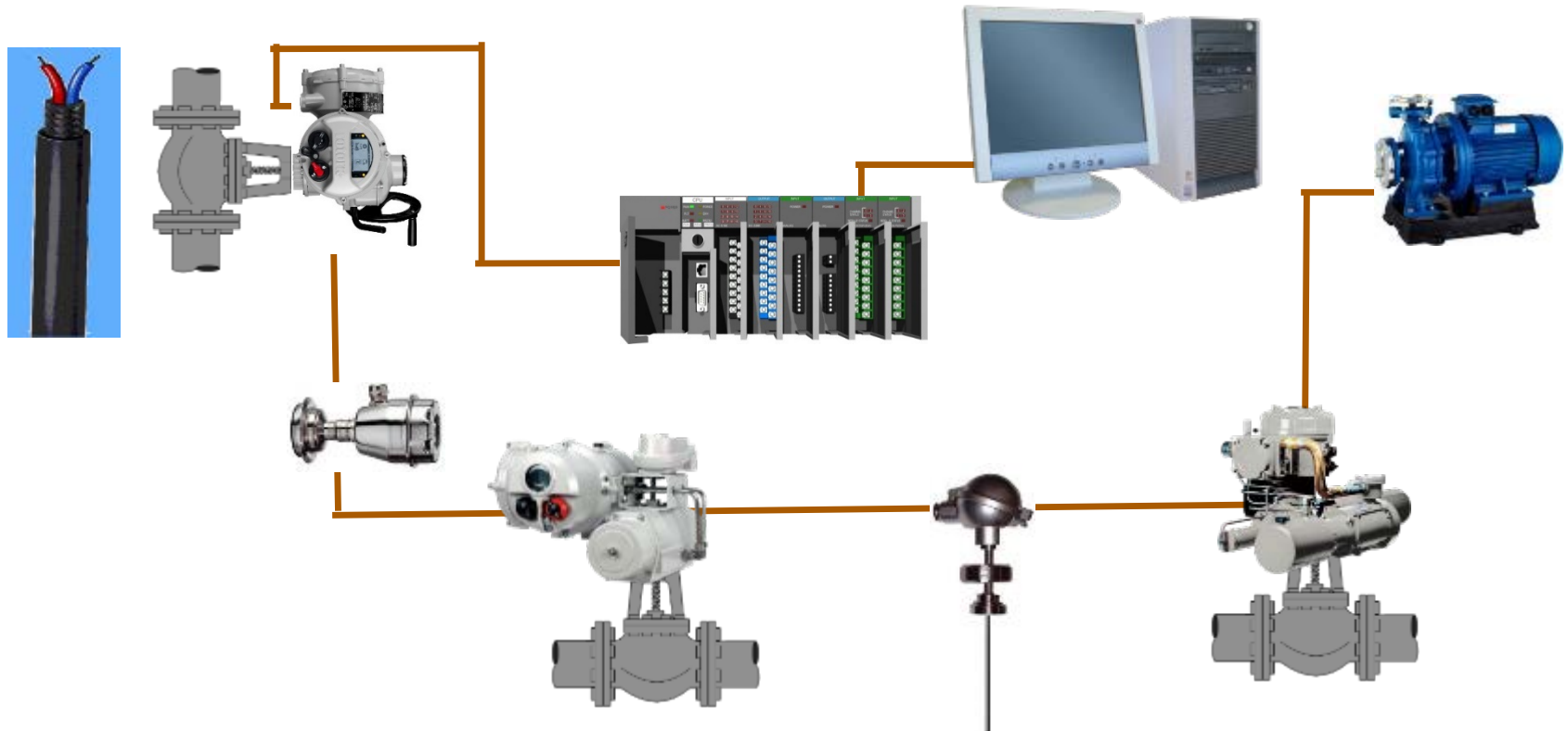


Field device connection progression – Parallel Wiring



From this...

Field device connection progression – Serial Network Wiring



To this...

Field device connection progression – Wireless

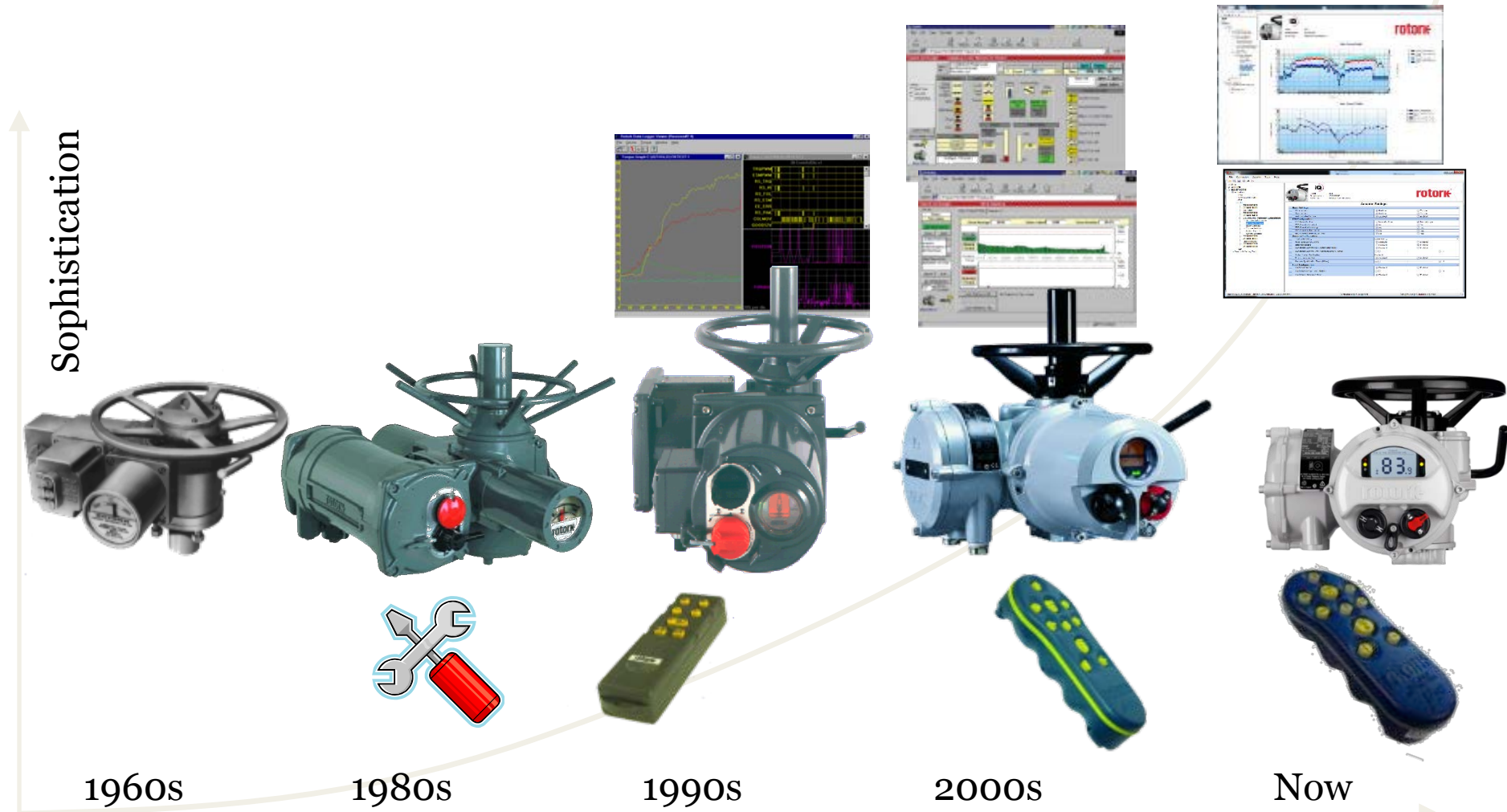


From this...

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Evolution of actuation technology



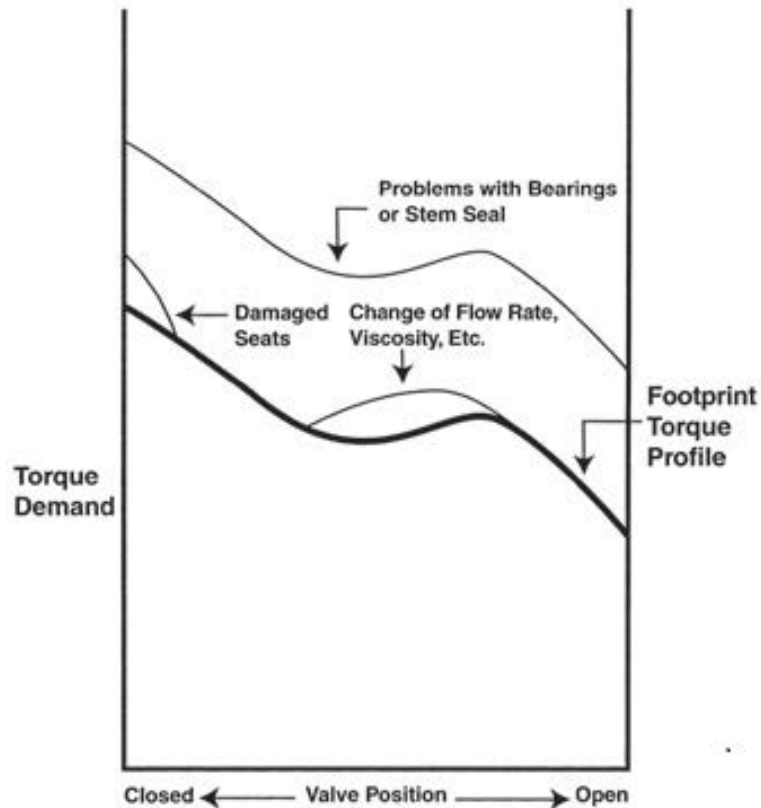
Smart actuators – data they provide

- Torque measurement
- Vibration and Internal Temperature sensors
- Position measurement
- Graphical display
- Configuration and Diagnostic menus
- Time stamped and Service and maintenance Alarms
- NE107 indication
- Error logs
- Power monitoring
- Event data and Motor starts logging
- Torque profiles
- Trend logs
- Asset data – build information
- Service history and notes
- Non-intrusive setting
- Easy incorporation of network cards for remote operation
- Operation statistics, total turns, total motor run time
- Firmware update facilities
- Various features to improve security, inhibit facilities
- Multi-language support
- Positional accuracy



Maintenance required	
Out of specification	
Check function	
Failure	

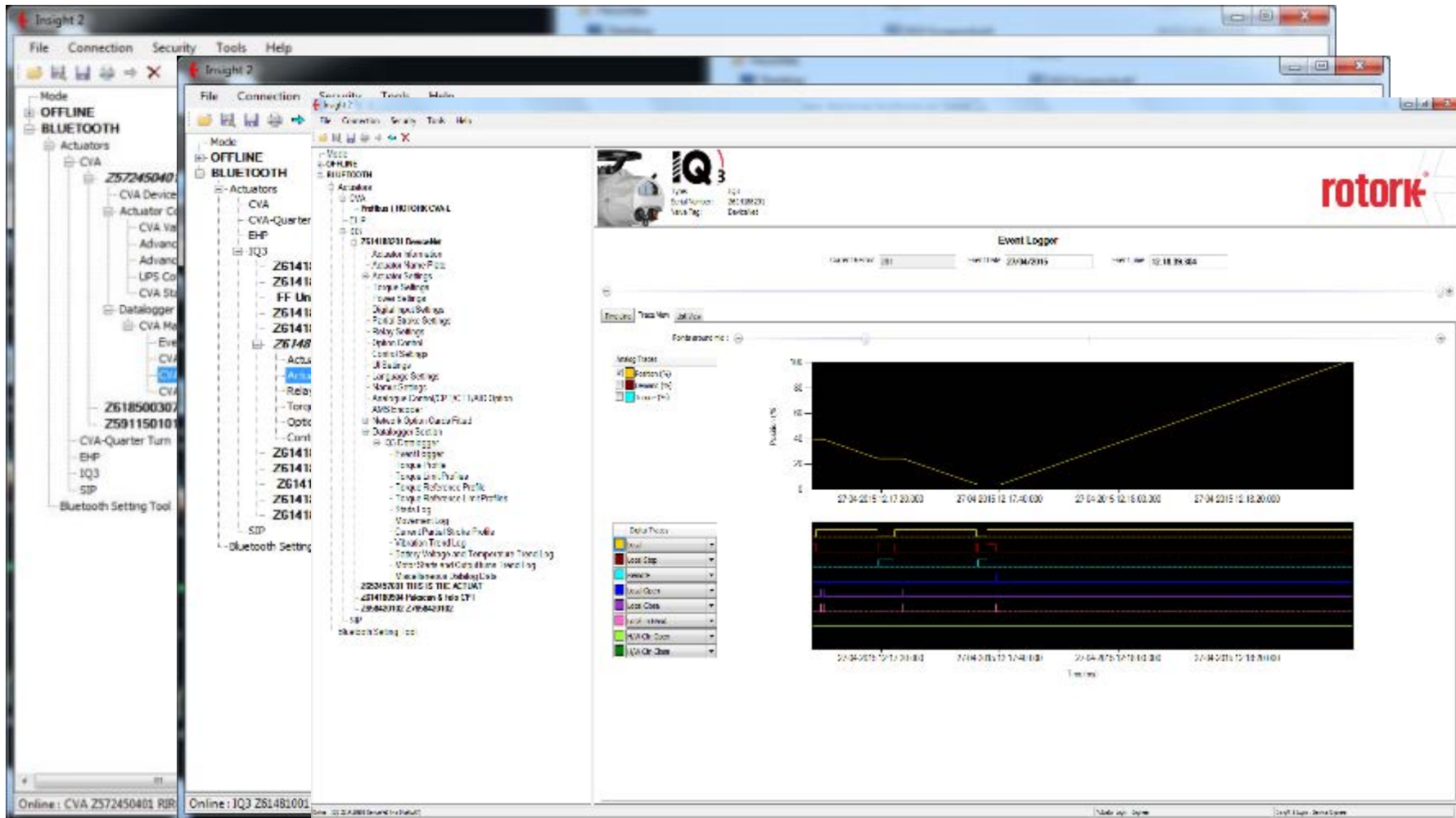
Smart actuators – torque data



Opening Torque Characteristics of a Typical Butterfly Valve



Smart actuators – data viewing



The screenshot displays the Insight 2 software interface, which is used for configuring and monitoring industrial actuators. The interface is divided into several sections:

- Left Panel (Tree View):** Shows a hierarchical view of the system. It includes a 'Mode' dropdown set to 'OFFLINE' and 'BLUETOOTH'. Under 'Actuators', there are three main entries:
 - Z57245040:** CVA Device, Actuator C, CVA Va, Advanc, Advanc, LPS Co, CVA St, Datalogger, CVA Me, Evt, CVA, CVA, CVA, CVA-Quarter Turn, BHP, IQ3, SIP, and Bluetooth Setting Tool.
 - Z618500307:** CVA-Quarter Turn, BHP, IQ3, SIP.
 - Z59115010:** CVA-Quarter Turn, BHP, IQ3, SIP.
- Right Panel (Configuration):** Shows the configuration for a selected actuator (Z6141). It includes a 'Mode' dropdown set to 'OFFLINE' and 'BLUETOOTH'. The configuration tree includes:
 - Actuators:** CVA, CVA-Quarter, BHP, IQ3, FF Un, Z6141, Z6141, Z6141, Z6141, Z6141, ACU, Arisa, Relat, Torq, Card, Z6141, Z6141, Z6141, Z6141, SIP, and Bluetooth Setting.
 - Actuators > CVA > Profile (H1010K0WL):** Includes settings for Actuators, CVA, Torque Settings, Power Settings, Digital Input Settings, Field Status Settings, Relay Settings, Output Control, Control Settings, J1 Settings, Jog Logic Settings, Motor Settings, Auxiliary Control (CP, AC, I, AM, DPM), ABS Encoder, Velocity Output Control Field, Datalogger Section, and IO Controller.
- Event Logger:** A section for viewing event logs, showing a date range from 27/04/2015 00:00 to 27/04/2015 12:18:00. It includes a 'Filter' section with 'Torque' selected and a 'Data Policy' section with 'Torque' selected.
- Graphs:** Two graphs are displayed:
 - Pressure (PS):** A line graph showing pressure over time. The y-axis ranges from 0 to 100 PS. The x-axis shows time from 27/04/2015 12:17:00.00 to 27/04/2015 12:18:00.00. The pressure starts at approximately 40 PS, drops to 20 PS, and then rises to 100 PS.
 - Time (ms):** A multi-line graph showing various data points over time. The x-axis shows time from 27/04/2015 12:17:00.00 to 27/04/2015 12:18:00.00. The graph shows several data series, including 'Torque', 'Position', 'Speed', 'Load', 'Load Cells', 'Limit Inhibit', 'HVA On/Off', and 'VA On/Off'.

Agenda

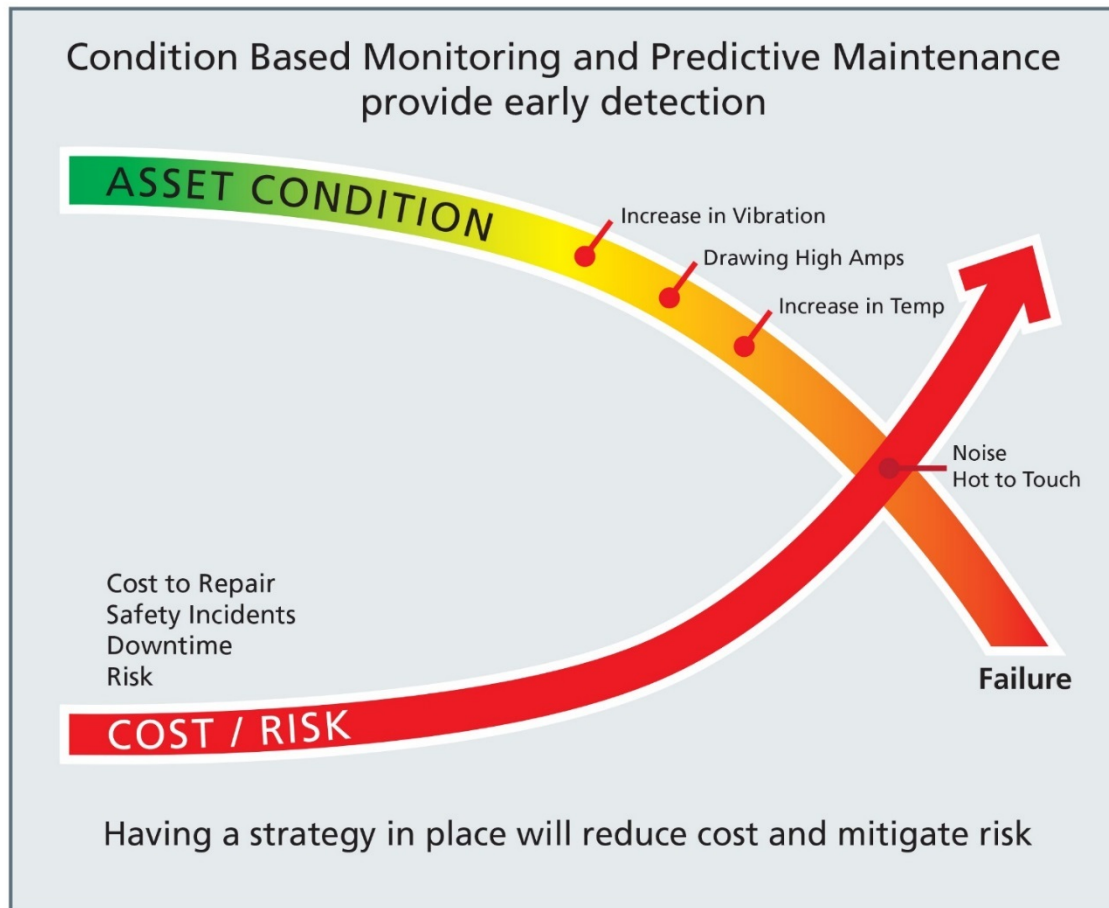
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How do we use this information and intelligence?

Maintenance regime	Notes
Corrective	Reactive - Run to fail
Preventative	Schedule driven - Calendar maintenance
Predictive	Reliability centred - Online diagnostics

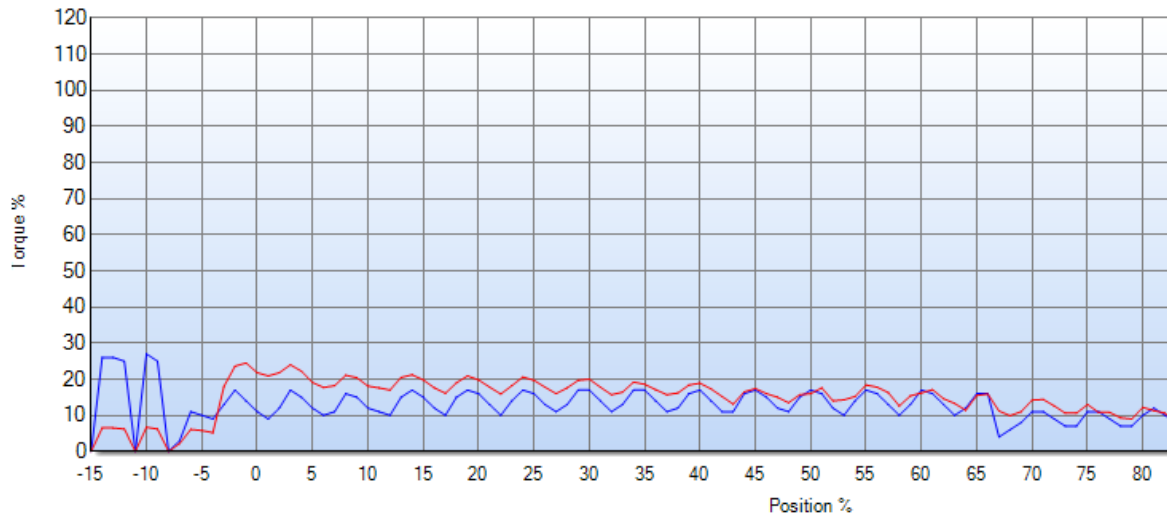


Data can help maintenance

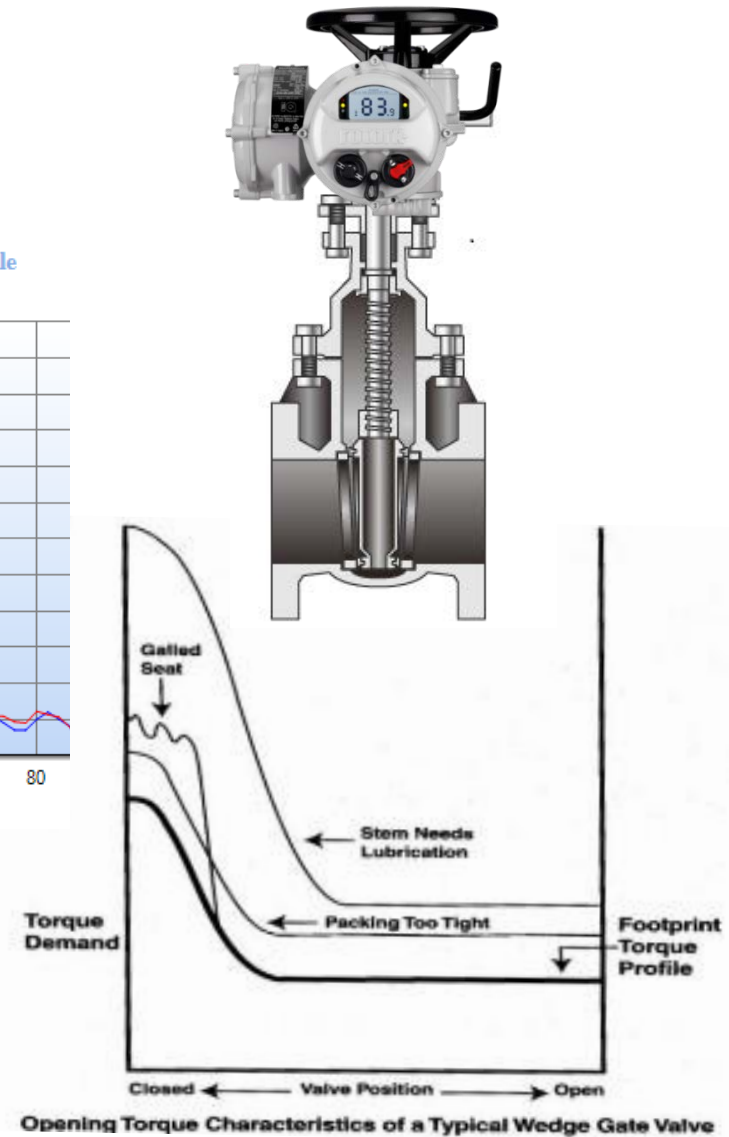


How to use the data

Opening Torque Profile



- Opening Torque
- Average Opening Torque

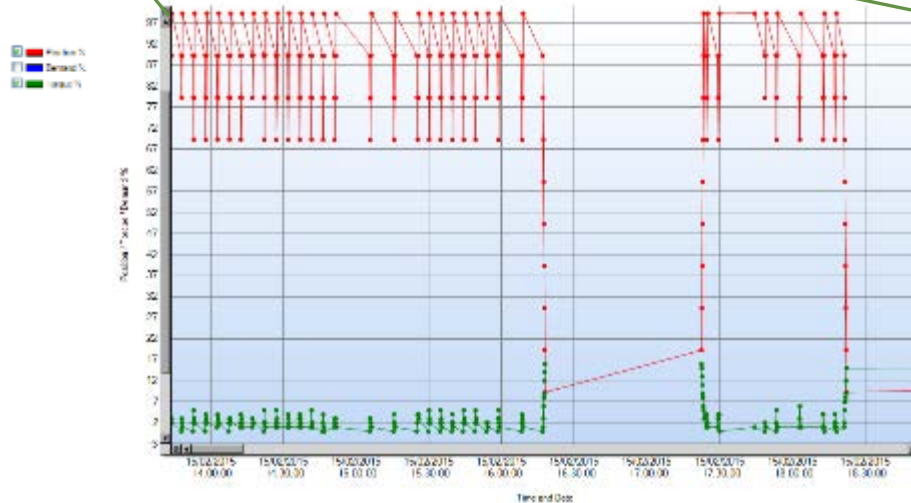


How to use the data

Movement Profile



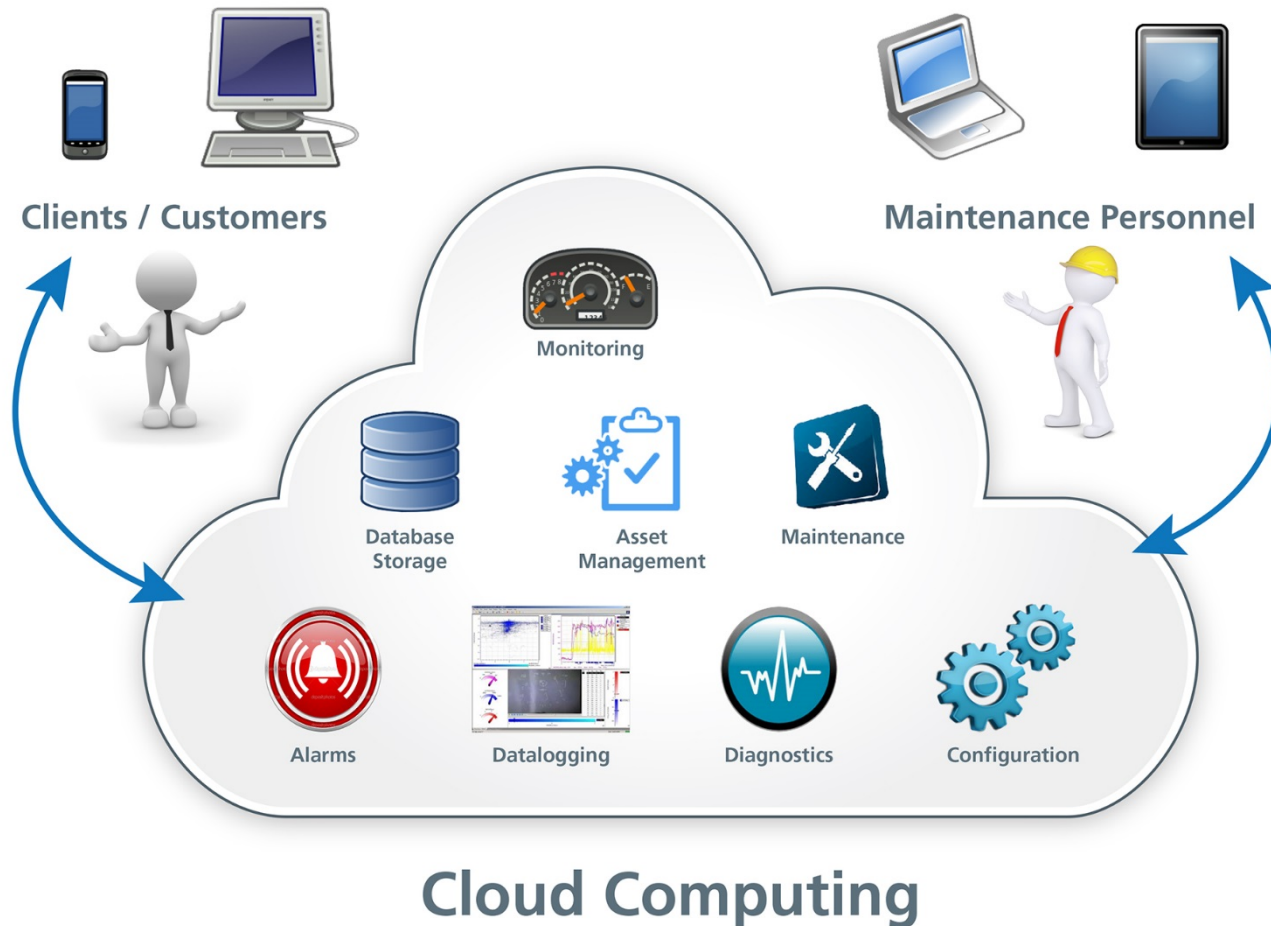
Movement Profile



What we are trying to avoid!!



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Case study – Tank Farm, Port of Corpus Christi Texas



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Thank you

