Remote condition monitoring of critical valves

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Traditional approach to maintenance

- Traditional approach to maintenance in the water industry is to run to failure. This is not acceptable for critical assets
- When scheduled maintenance is performed it is usually based on factors such as elapsed or runtime
- This has not served the industry well, the policy has resulted in under as well as over-maintained assets
- A very hit and miss approach when there is no basis for calculating risk
- In the case of critical assets such as valves, the run to failure or fit and forget can literally be fatal. Human life is at risk
- When the risk is extremely high, the consequences of the wrong level of maintenance could threaten the operational licence upon which a water utility depends

Asset lifecycle applied to a valve

Plan → Design → Procure → Build → Operate → Maintain → Retire & Recycle

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‘Fitbit for the water industry’

Prognostics for equipment condition monitoring

Blood pressure is condition monitor
for the human distribution network

Wireless &
Cloud
services

BLOOD PRESSURE CHART			
Blood Pressure Category	Systolic mm Hg (upper number)		Diastolic mm HG (lower number)
Low Blood Pressure (Hypotension)	less than 90	and	less than 60
Normal	90 to 120	and	60 to 80
Prehypertension	120 to 139	and	80 to 89
High Blood Pressure (Hypertension Stage 1)	140 to 159	and	90 to 99
High Blood Pressure (Hypertension Stage 2)	160 or higher	and	100 or higher
High Blood Pressure Crisis (Seek Emergency Care)	180 or higher	and	110 or higher

More likely to be wireless today.

Industrial Internet of Things WaterWorx (WWX)

Technology for Remote Service Management, monitoring & optimisation of assets.

Sensors- pressure , temp, flow,

+

Secure wireless networks & satellite communications

+

Cloud Computing

+

Mobile

ThingWorx

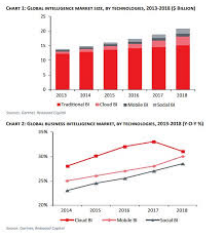
Low-cost, low-power Microcontrollers

+

Valves & Actuators

+

Real-time data analytics



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Remote Service Management – Critical valves

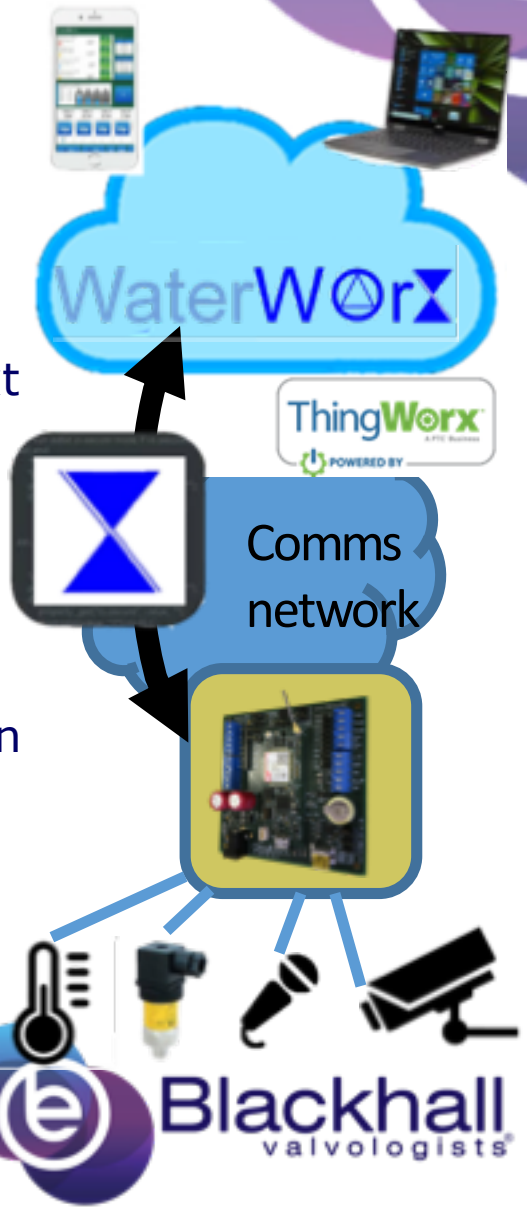
Benefits to end-user customer

1. Real-time valve monitoring enables known asset and system operating condition.
2. Remote Asset optimisation and management- real time view of operational parameters allows improved situational awareness.
3. Increase asset life in excess of 100 years!
4. Understanding how assets are actually used and operated, duty and load cycles.
5. Regular exercising ensures valve is operable when required.
6. Audit trail of operations / incidents / changes in operational parameters.
7. Knowledge of what is happening to the asset enables greater awareness of security risks.
8. Comprehensive training of personnel and/or O&M type contract.

Remote Service Management – Critical valves

WaterWorX platform features - 1

1. Three components:
   a) WaterWorX – a cloud-based, secure virtual server built on Thingworx. Standard templates based on a detailed data model of the asset.
   b) 'App' – application software, specific to the context of the asset or system
   c) Watergate: an 'edge' device interfaced to sensors on site: handles wide-area comms, GSM or satellite, local analytics, health indicators.
2. System data / status provided to operators / maintenance team smartphones / tablets and client on site, at client and supplier offices. Different profiles to different users.



Remote Service Management – Critical valves

WaterWorX platform features - 2

1. Cloud based – minimize Capex, software as a service (SAAS) model.
2. Mobile or desktop
3. Scalable – single valve or site to multiple valves and sites. Potential for Global coverage.
4. Multiple tenants, so can provide different access to different levels of user.
5. Intelligence at the valve (edge of the network) and at 'centre'.
6. Secure 1-way data monitoring, no IP related cyber vulnerability.
7. Mimic diagram representation of system.
8. Duplicate system information from Clients' telemetry or SCADA depending on their policy. Can install independent sensors if necessary.
9. Remote tuning of the system / operation

Remote Service Management – Critical valves

Proof of concept – pilot project (1)

Stage 1 - Workshop with Blackhall

1. Scoping workshop with Blackhall – ½ day
   a) Classification of product groups
   b) Classification of condition assessment and failure modes
   c) Prioritisation of most critical issues for customer and Blackhall
   d) Technical analysis of what parameters we need to measure and how
   e) Development of initial datamodel for typical application
   f) Outline typical user interfaces and how we visualize the data
2. Business case and project scoping – ½ day
   a) Articulate why the end-user would want remote service management.
   b) Identify potential client and site we can develop as pilot.
   c) Scope out a prototype Valvology application, thinking about local and remote diagnostics and AHI – Asset Health Indicators
   d) Plan project development

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Remote Service Management – Critical valves

Proof of concept – pilot project (2)

Stage 2 – Prototype on friendly site

1. Design and development/testing at Blackhall – 6 weeks
   a) AQX will prepare a Functional Specification (FS).
   b) Customer User eXperience (UX) workshop to evaluate the FS
   c) Design test/simulation rig, Blackhall to build at Brighouse.
   d) Aquamatix to build prototype, procure instrumentation & comms.
   e) Setup WaterWorX tenant, design dashboard.
   f) Deliver to Brighouse, set up test rig with instrumentation.
2. Testing at Brighouse. – (3 months?)
   a) Develop test plan and success criteria
3. Install on site – Blackhall
4. Site testing – determine success criteria.
5. Develop marketing and PR campaign promoting concepts.
6. Find new customers.