IIoT in Pumping

How IIoT and intelligent pumping can contribute to solving the global water crisis

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AGENDA

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The global water crisis

Introduction

Global water shortages, growth in urban population, environmental regulations, and process inefficiencies are all contributing to a crisis in the Water & Wastewater industry.

It is estimated that the amount of energy wasted as a result of traditional methods of water processing and delivery can be cut by **up to 25%.**
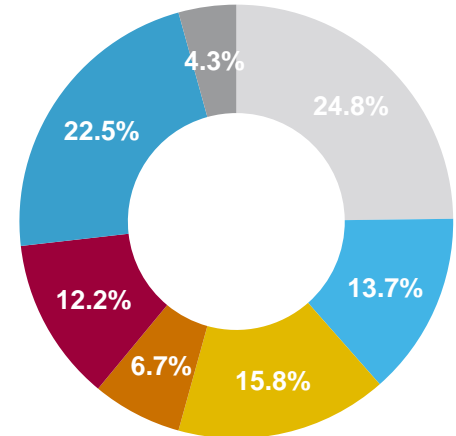
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Challenges

Driving factors for the pump industry

1. Energy efficiency

2. System efficiency

3. Pump efficiency

4. Traceability

Object model increases system efficiency

Industrial motor energy use

- Pumps
- Fans
- Compressed Air
- Refrigeration
- Material Handling
- Material Processing
- Other

- 24.8%
- 13.7%
- 15.8%
- 6.7%
- 12.2%
- 22.5%
- 4.3%

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Solutions

Two major pillars

Smart pumping

The concept of "smart pumping", also referred to as an "intelligent pumping system", combines greater efficiencies with sensors and software to drive the ability to regulate and control flow or pressure. This approach results in energy savings, increased equipment lifetime, and maintenance cost reductions.

Industrial Internet of Things

IIoT incorporates machine learning and big data technology, harnessing sensor data, machine-to-machine (M2M) communication and automation technologies that have existed in industrial settings for years. The driving philosophy behind IIoT is that smart machines are better than humans at accurately, and consistently capturing and communicating data.

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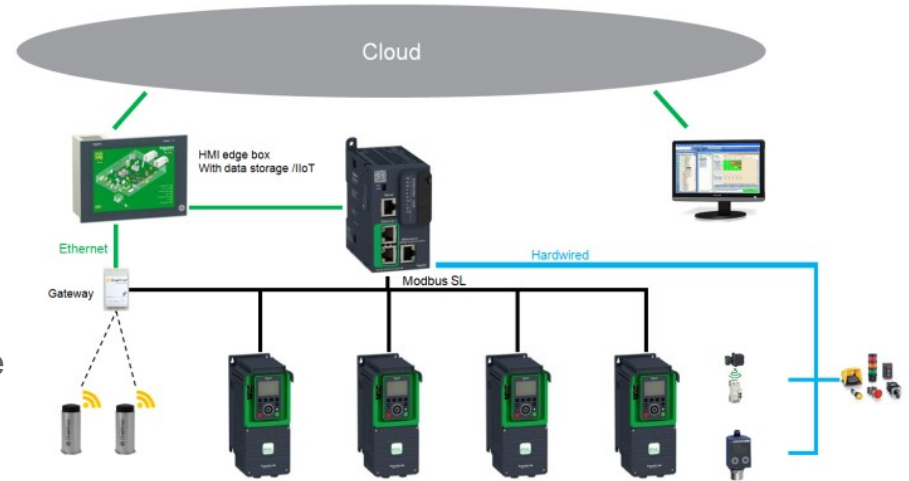
Challenges

Energy efficiency

Electricity costs account for 40% of the total cost of ownership (TCO) of a pump.

By following energy management best practices, a manufacturer can decrease the electrical consumption of its pumping system by at least 30%, yielding a 20% reduction in TCO and a return on investment within 24 months for the pump operators.

Potential energy savings

■ Pumps ■ Fans ■ Compressed Air ■ Other

- 50.5% (Pumps)
- 10.0% (Fans)
- 27.0% (Compressed Air)
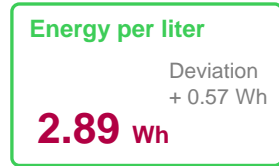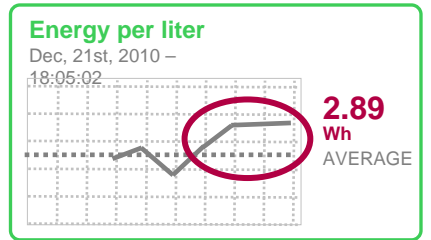- 12.5% (Other)

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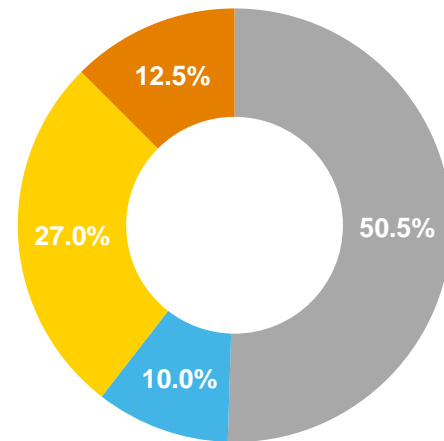
Solutions

Energy efficiency

A smart pumping system along with IIoT enables energy efficient systems through:

a. Monitoring of pumps, which helps operators to detect higher energy usage

b. Libraries and algorithms to ensure that pumps are running in energy efficient manner

c. Pumps driven by variable speed drives which can save up to 30% energy compared to fixed speed pumps

Weekly Report

Energy per liter
Dec, 21st, 2010 – 18:05:02

2.89 Wh
AVERAGE

Energy per liter
Deviation + 0.57 Wh

2.89 Wh
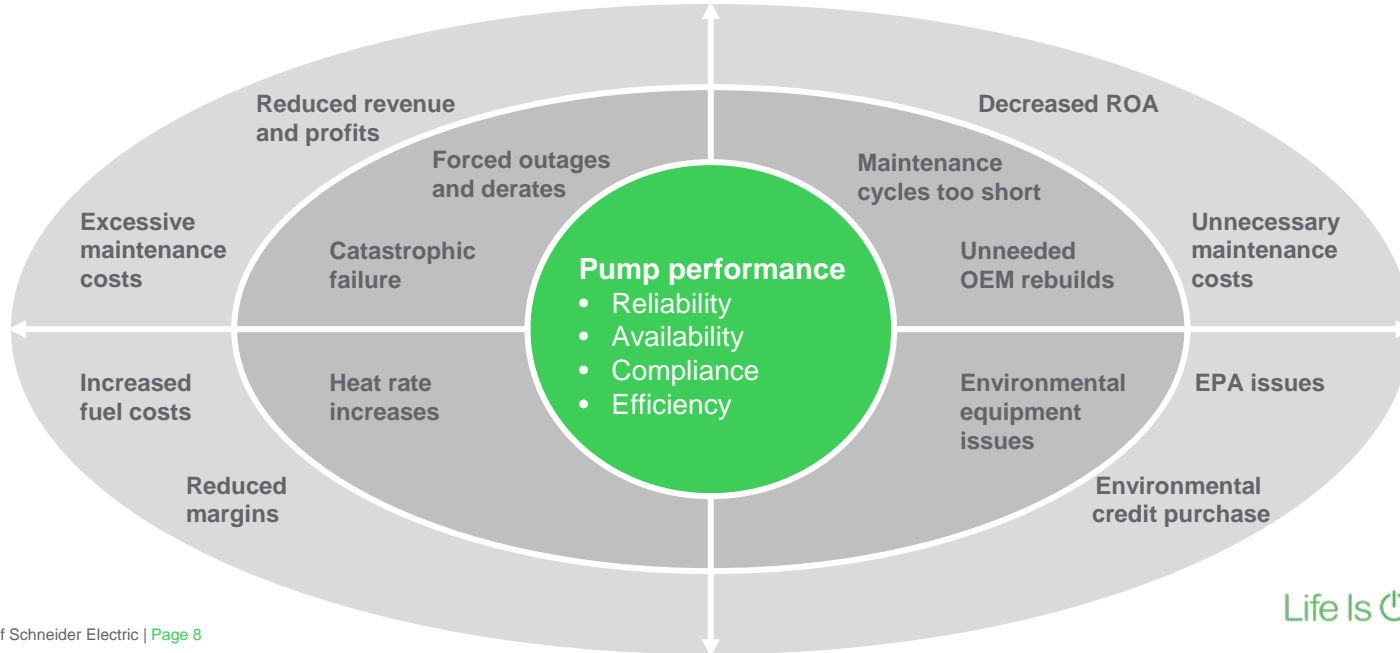
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Challenges

System efficiency

A pumping system is considered "efficient" if it is:
a. Available
b. Reliable
c. Compliant

An "inefficient " system can result in:
a. Frequent breakdowns
b. Increased operational and maintenance costs
c. EPA issues

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Solutions

System efficiency

A smart pumping system along with IIoT enables an efficient system by:

a. Establishing preventive maintenance plans for systematic inspection to detect potential failures

b. Enabling condition-based maintenance by monitoring pumping system data for an accurate status and risk assessment

c. Deploying corrective maintenance measures as needed in response to an unanticipated problem or emergency

By monitoring operational parameters, an operator can ensure smooth operations and adjust maintenance schedules as needed.

Wireless sensors

Pump info from drive
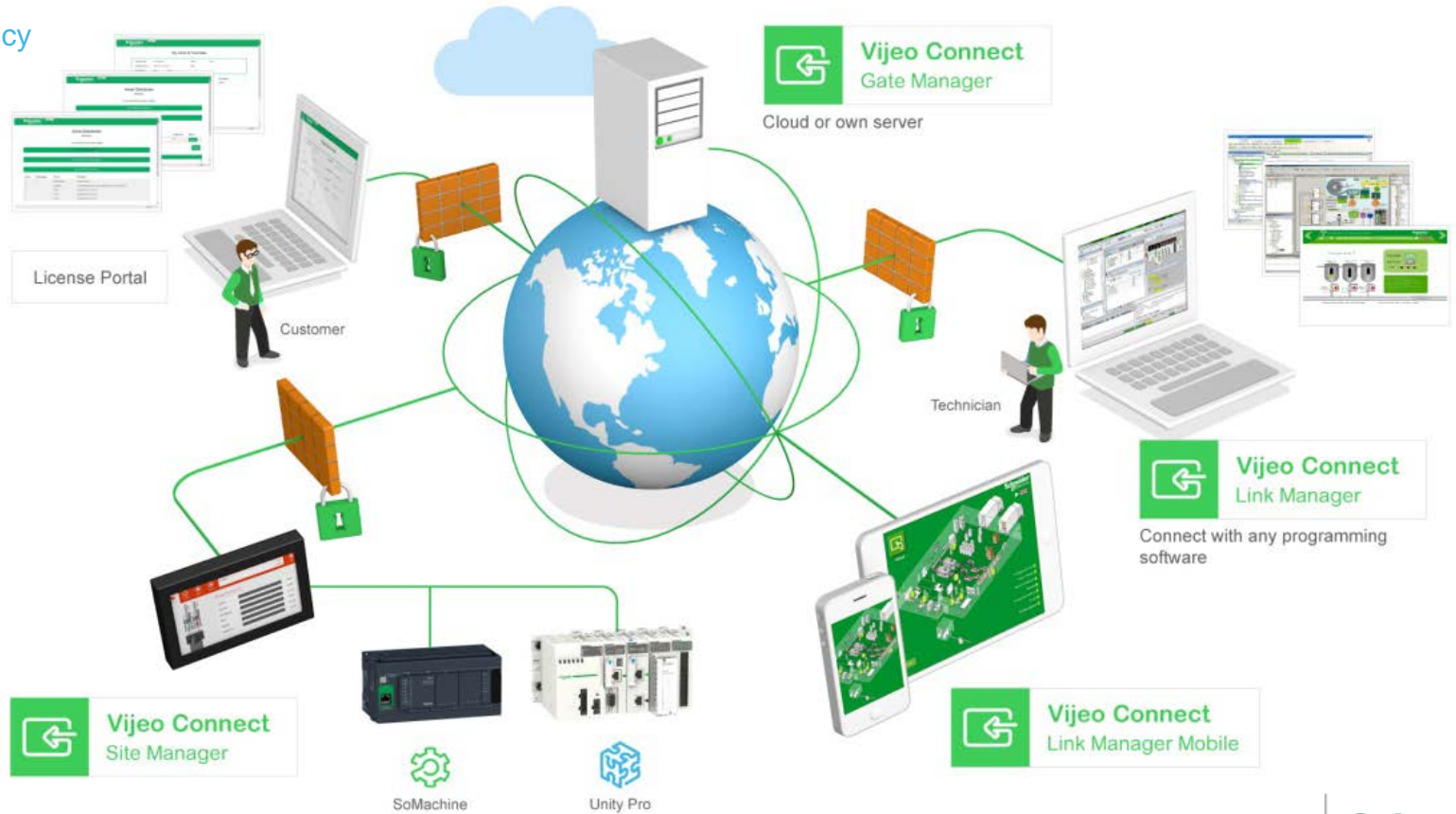
Intelligence programmed in controllers

Gateways

HMI edge box With data storage /IIoT

Remote monitoring platforms

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Solutions

System efficiency

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Keep talking to your boosters

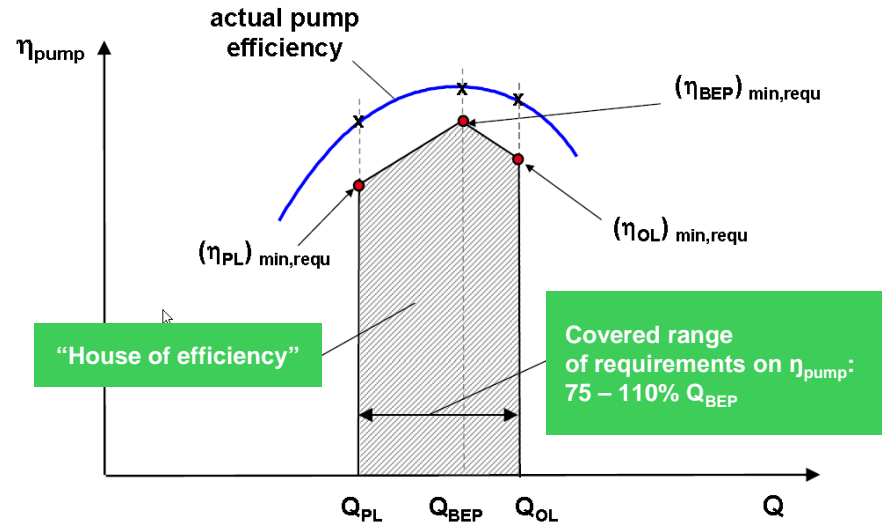**Data from boosters in multiple locations (1, 2, n…)**

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Challenges

Pump efficiency

Are you sure the pump is running
at an optimal point?

It is estimated that **75% of pump systems
are oversized**, many by **more than 20%.**

η_{pump}

actual pump
efficiency

(η_{BEP}) min,requ

(η_{PL}) min,requ

(η_{OL}) min,requ

"House of efficiency"

Covered range
of requirements on η_{pump}:
75 – 110% Q_{BEP}

Q_{PL} Q_{BEP} Q_{OL} Q

Source: EuroPump

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Solutions

Pump efficiency

A smart pumping system along with IIoT enables pump efficiency by:

a. Monitoring operating curves in real time

b. Ensuring, with intelligent algorithms, that pumps operate at their most optimized point – which is defined as Q(bep) by EuroPumps

c. Enabling pump system manufacturers and operators to ensure that the pumps used are the appropriate size

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Challenges

Traceability

To perform better maintenance, it is vital you know what **condition** your pump is in, and what **support** it may need.

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Solutions

Traceability

A smart pumping system along with IIoT enables traceability through:

a. Variable speed drives with active QR codes can be used not only for diagnostics but also to help operators more easily access information for support

b. By remaining in contact with pumps, manufacturers not only know the exact location of the pumps but are also able to provide timely support and spare parts

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Start small, start smart

- Introduce energy measuring devices into system architectures

- Use controllers with intelligent applications for better protection and reduced commissioning time, while following guidelines for standards as set by local and global organizations

- Replace fixed speed pumps with variable speed pumps

- For smart visibility of pumping systems use remote monitoring for maintenance and energy efficiency

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