Solutions for Water & Waste Water

Smart Water Solutions technology leader enhancing key processes & applications across the water cycle
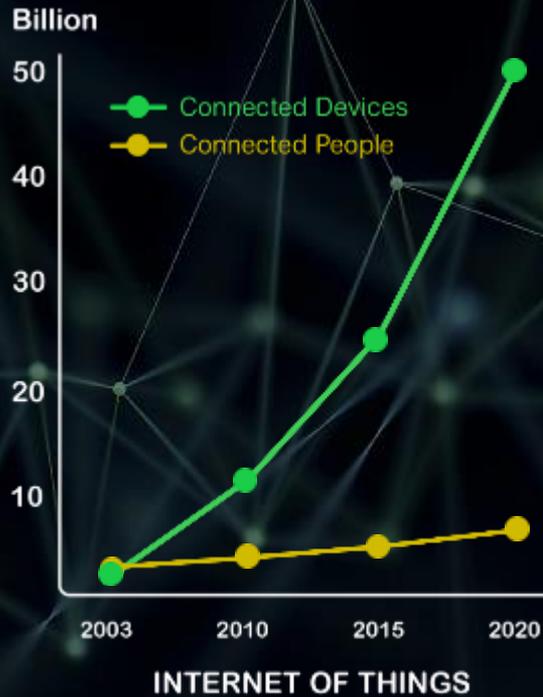
Schneider Electric's IoT & Smart Water Solutions

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Efficiency gains will come from IT/OT convergence

Efficiency gains will come from IT/OT convergence
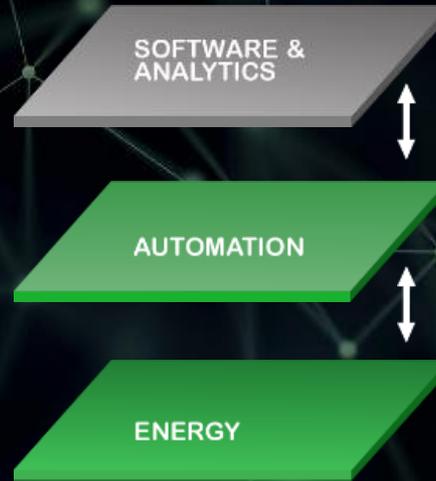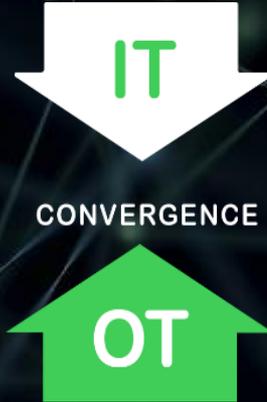
Schneider Electric, the Global Specialist in Energy Management and Automation

€26.6Bn

FY 2015 revenues

~ 5%

of revenues devoted to R&D

~160K+

people in 100+ countries

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...with Balanced Geographies

27% **26**% **29**% **18**%

North America   Western Europe   Asia Pacific   Rest of the world

FY 2015 Revenues

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Eco Struxure™
Innovation At Every Level

IoT-enabled solutions that drive operational & energy efficiency

SMART system - sensing, actuation & control that describe & analyze a situation - making decisions based on available data in a predictive or adaptive manner

EcoStruxure Platform

Building	Data Center	Industry	Grid

End to End Cybersecurity

Cloud and/or On Premise

Apps, Analytics & Services

Edge Control

Connected Products

BUILDING   **POWER**   **DATA CENTER**   **MACHINES**   **PLANT**   **GRID**

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EcoStruxure™
Innovation At Every Level
Water & Wastewater

End-to-end cybersecurity

Cloud and/or On Premise

Apps, analytics and services

Power Management
Plant Energy Performance / Power Monitoring Expert

Energy and Sustainability Management
Resource Advisor

Integrated Software Systems
Water loss management
Water network optimization
ClearSCADA

Operations Control and Management
System platform
Historian
Mobile data collection
Dashboards and data analysis

Wonderware **System Platform**
Wonderware **Historian**
Wonderware **IntelaTrac**
Wonderware **Intelligence**

Avantis **Condition Manager**
Avantis **.PRO**

Asset Management
Condition manager

Edge control

Power Monitoring and Control
PowerStruxure™

Discrete Process
PlantStruxure
Modicon, PES

Continuous Process
PlantStruxure
Modicon, Foxboro

Connected products

Communication Infrastructure
ConneXium
Trio

Field Devices
Foxboro
Accutech

Variable Speed Drives
Altivar

Uninterruptible Power Supply
Gutor

Electrical Distribution
Masterpact MTZ
Smart Panel
iPMCC

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Solution to help optimize shop floor to top floor across the full water cycle

Eco **truxure**™
Innovation At Every Level

Products, solutions & services from field to enterprise

Plant & Network optimization
Pump optimization, pump asset monitoring, network operation optimization, temperature optimization

Plant & Network management
Energy monitoring, GIS, water network online simulation, cooling/heating network online simulation, EAM, NRW management, mobile asset management, weather services

Automation & Control
SCADA/HMI, DCS, telemetry, PAC/PLC, instrumentation, motor control, communications
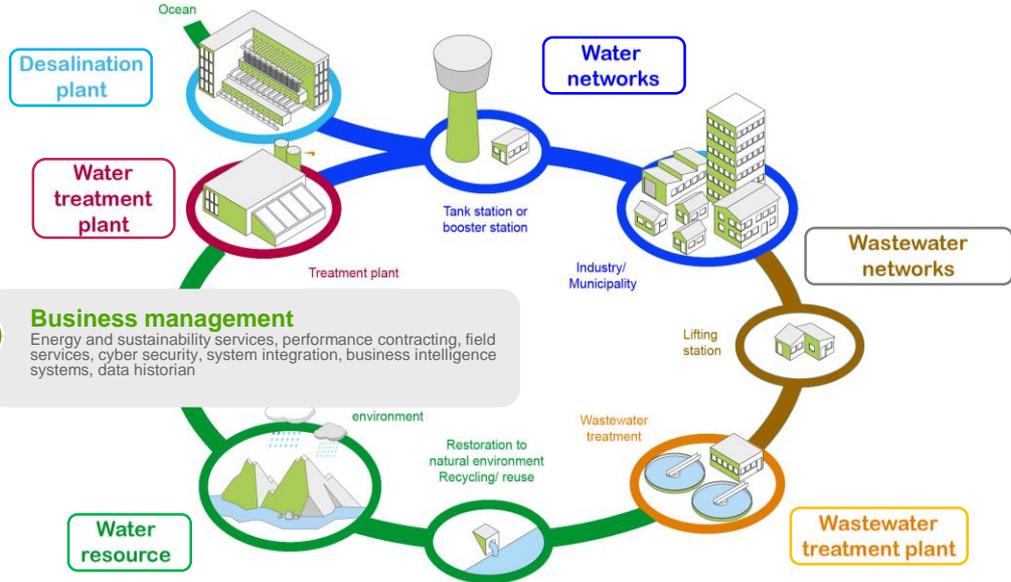
Electrical Distribution
Power monitoring and meters, substation automation, LV, MV, power protection and control

Critical Power and Cooling
Secure power, racks and enclosures, IT room management

Facility Security & Safety
Video security, access control, fire and life safety, emergency lighting

Business management
Energy and sustainability services, performance contracting, field services, cyber security, system integration, business intelligence systems, data historian

Ocean

Desalination plant

Water networks

Water treatment plant

Tank station or booster station

Treatment plant

Industry/ Municipality

Wastewater networks

Lifting station

environment

Restoration to natural environment Recycling/ reuse

Wastewater treatment

Water resource

Wastewater treatment plant

You deserve smart water

Method and integrated systems
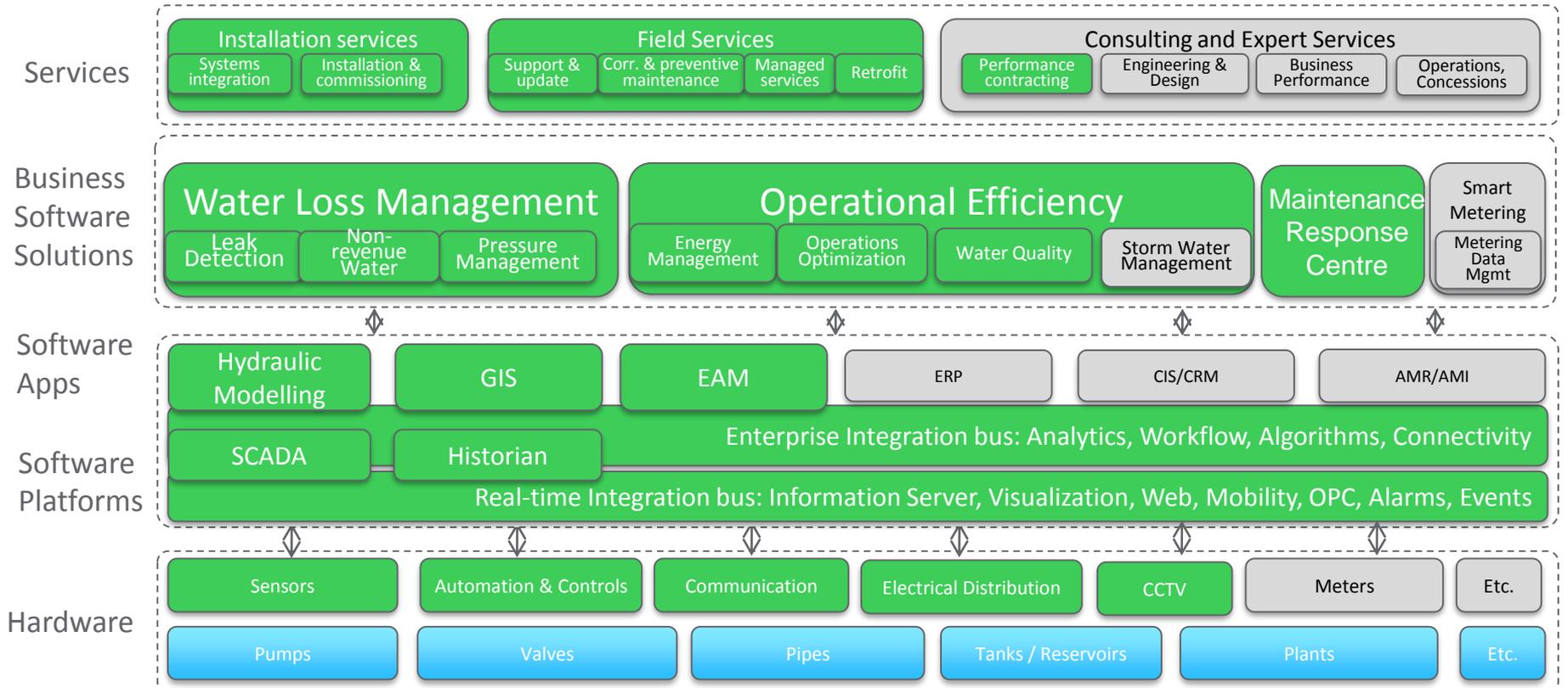
+

Right information, right user, right time

=

Up to **20%** savings on OpEx & CapEx

How do we make a system SMART…   **Managing entire Water Cycle**

sensing, actuation & control that describe & analyze a situation - making decisions based on available data in a predictive or adaptive manner

Services

Installation services
- Systems integration
- Installation & commissioning

Field Services
- Support & update
- Corr. & preventive maintenance
- Managed services
- Retrofit

Consulting and Expert Services
- Performance contracting
- Engineering & Design
- Business Performance
- Operations, Concessions

Business Software Solutions

Water Loss Management
- Leak Detection
- Non-revenue Water
- Pressure Management

Operational Efficiency
- Energy Management
- Operations Optimization
- Water Quality
- Storm Water Management

Maintenance Response Centre

Smart Metering
- Metering Data Mgmt

Software Apps

- Hydraulic Modelling
- GIS
- EAM
- ERP
- CIS/CRM
- AMR/AMI

Software Platforms

- SCADA
- Historian
- Enterprise Integration bus: Analytics, Workflow, Algorithms, Connectivity
- Real-time Integration bus: Information Server, Visualization, Web, Mobility, OPC, Alarms, Events

Hardware

- Sensors
- Automation & Controls
- Communication
- Electrical Distribution
- CCTV
- Meters
- Etc.

- Pumps
- Valves
- Pipes
- Tanks / Reservoirs
- Plants
- Etc.

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References & related solutions

Examples of references with current solution implementations

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SYABAS, Malaysia

Support NRW reduction - state of Selangor, Kuala Lumpur & Putrajaya

Customer Challenge

- 43% leakage level - appx 1.3 million m3 of drinking water lost every day

The Solution

- Dividing distribution network into 1400 sections/models using Aquis
- Detailed network models support & verify the establishment of approximately 600 DMZs (Demand Meter Zone = Pressure zone)

Customer Benefits

- Full overview of hydraulics & water quality of the entire distribution network of 24,000 km
- Planning tool for future development & pipe replacement in the rapidly growing urban & rural areas of Kuala Lumpur, Putrajaya & Selangor

The Results : Life is On with...

supporting the NRW system **5% - 9%** progressive reduction

Over 6 million consumers of drinking water across Selangor, Kuala Lumpur & Putrajaya
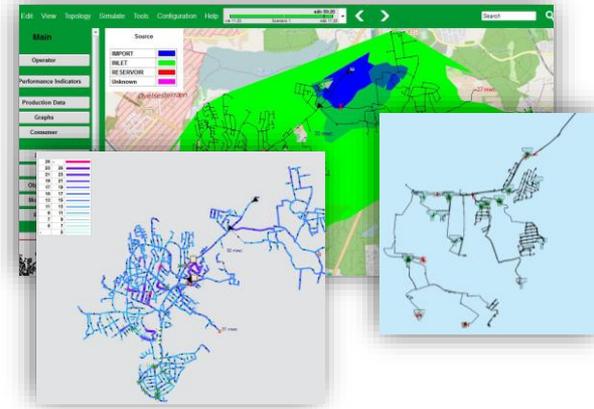
More than 1400 network models, with 6000 reservoirs, 500 pump stations

Currently taken over by the state govt under Air Selangor - major improvements in NRW%, plant & network.
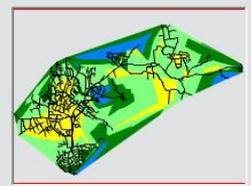
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Safe to close valve!!!

State without Water Network Optimization: Scattered Data >> No Analytics for Decisions

Water Utility Issues:
- **Lack of Coordination**
- **Lack of full visibility**
- **Deep hydraulic knowledge**

End up **reactive decisions** rather than anticipation

Hydraulic Dept.
- Offline / Theoretical Model
- Pump and Reservoir Usage
- Pressure Calculations
- Leak / Loss Assumptions

GIS

CRM/Billing
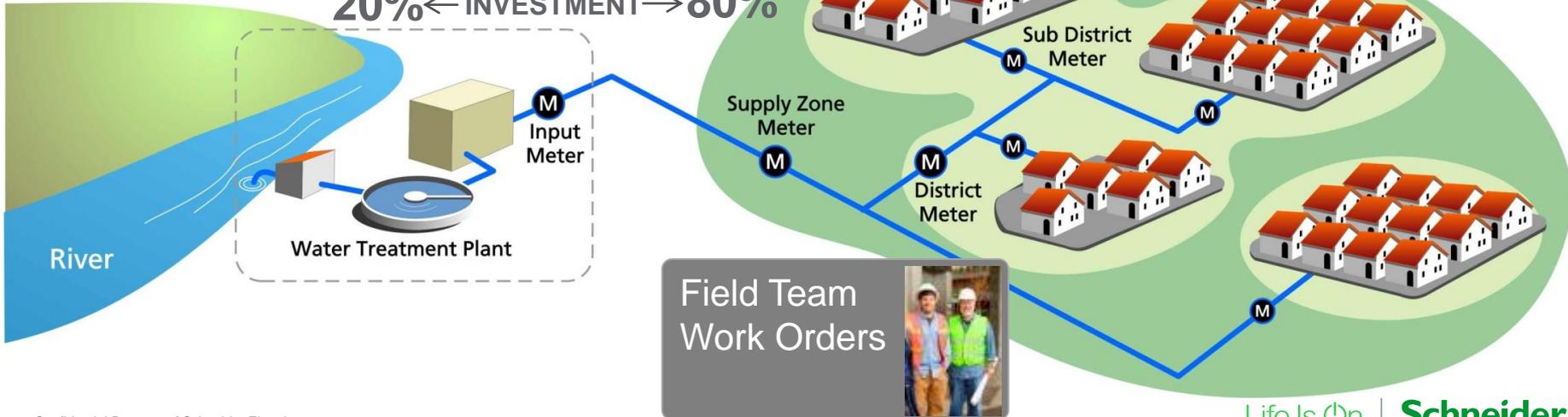
SCADA Operators

Management

20% ← INVESTMENT → 80%

River

Water Treatment Plant

Input Meter

Supply Zone Meter

Sub District Meter

District Meter

Field Team Work Orders

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Water Network Management Team: System Without WNO >> Pain Points
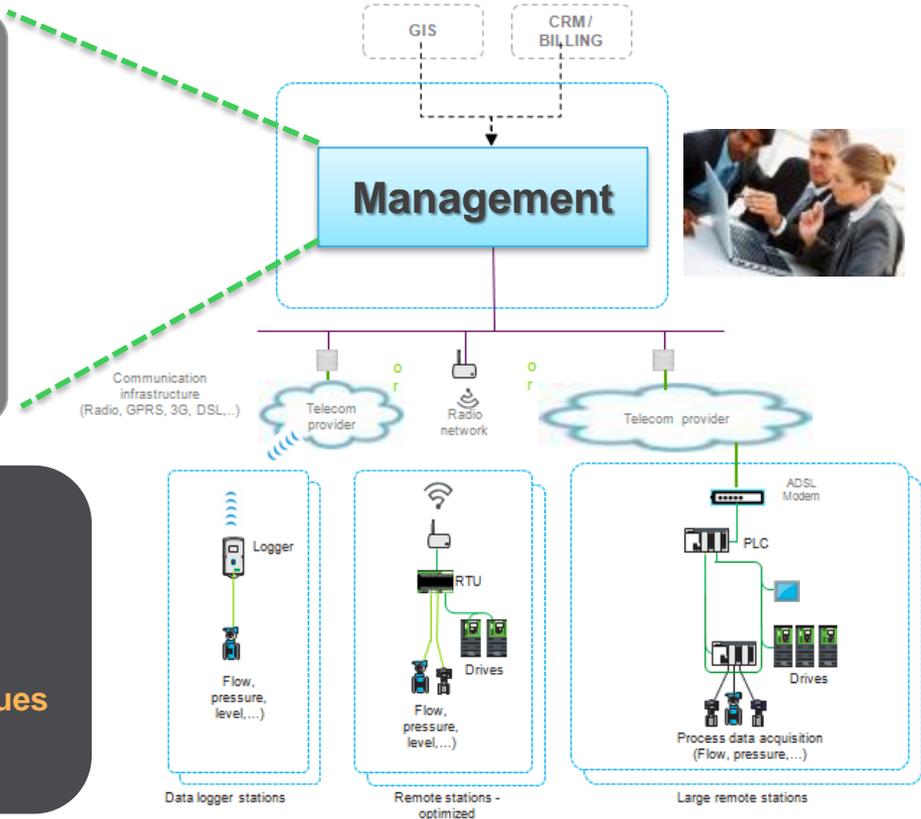
Field Team Work Orders

SCADA Operators

DATA

Hydraulic Dept.
- Offline / Theoretical Model
- Pump and Reservoir Usage
- Pressure Calculations
- Leak / Loss Assumptions

GIS

CRM / BILLING

Management

Communication infrastructure (Radio, GPRS, 3G, DSL,..)

Telecom provider

or

Radio network

or

Telecom provider

Logger

ADSL Modem

PLC

RTU

Drives

Drives

Flow, pressure, level,...)

Flow, pressure, level,...)

Process data acquisition (Flow, pressure,...)

Data logger stations

Remote stations - optimized
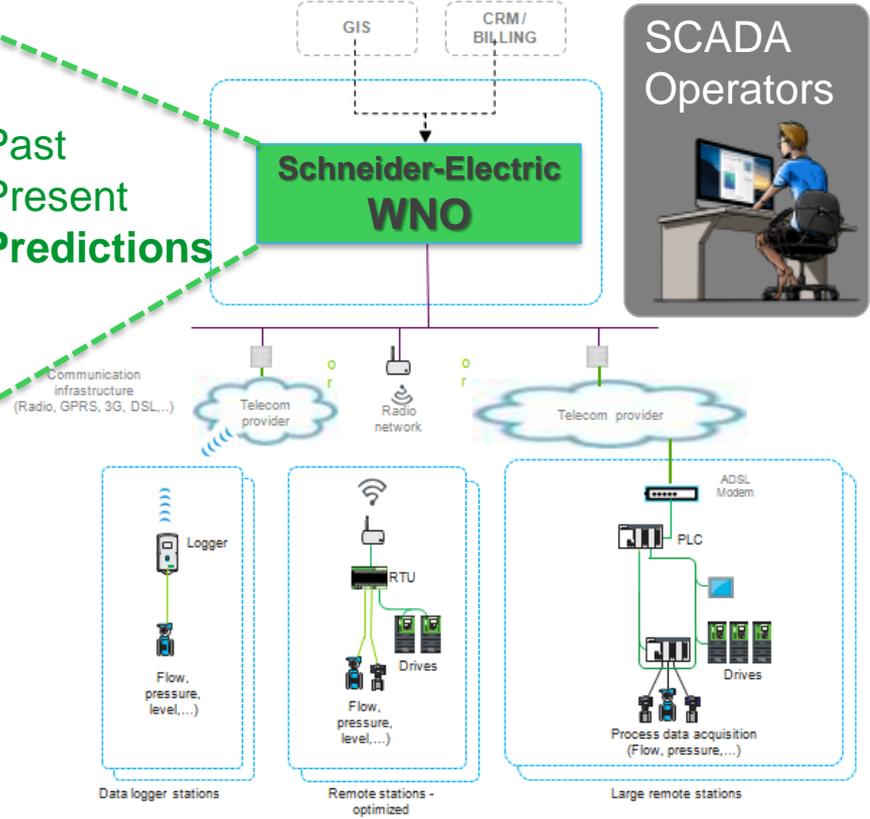
Large remote stations

Water Utility Pain Points:

- How to Reduce **Water Loss / Leakage** (NRW)

- How to Reduce risks of **Low pressure and water quality issues**

- How to **Optimize energy and chemicals usage**

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With WNO: Water Network Management Addresses Issues & Pain Points

Workflow Management

Visualization and SCADA Platform

A N A L Y T I C S

AQUIS Hydraulic Model
- **Simulation and Real-time Modeling**
- **Pump and Reservoir Optimization**
- **Pressure Optimization**
- **Leak / Loss Detection**
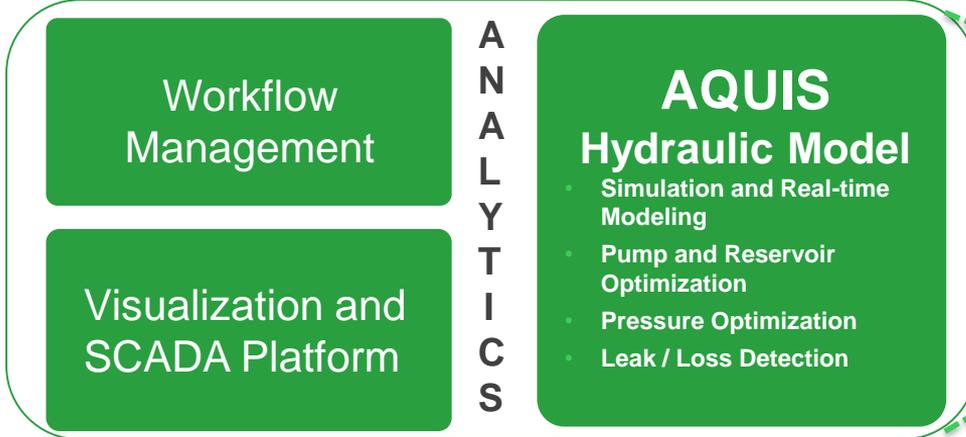
Past
Present
Predictions

GIS

CRM/ BILLING

Schneider-Electric WNO

SCADA Operators

Communication infrastructure (Radio, GPRS, 3G, DSL,...)

Telecom provider

Radio network

Telecom provider

ADSL Modem

Logger

RTU

PLC

Drives

Drives

Flow, pressure, level,...

Flow, pressure, level,...

Process data acquisition (Flow, pressure,...)
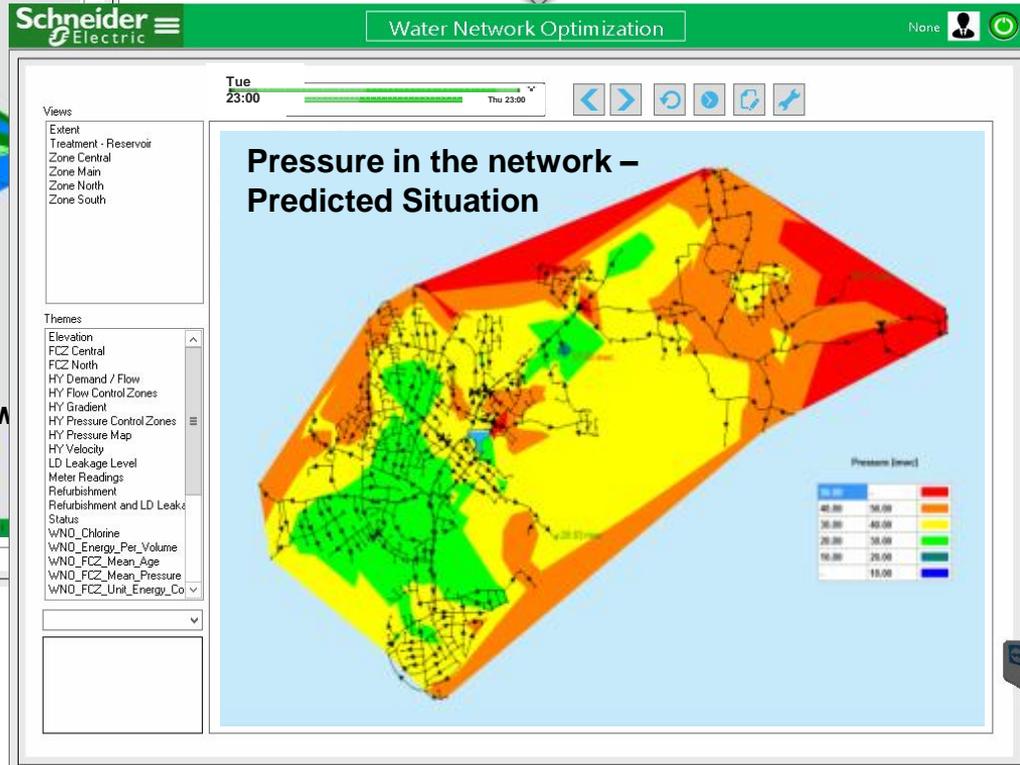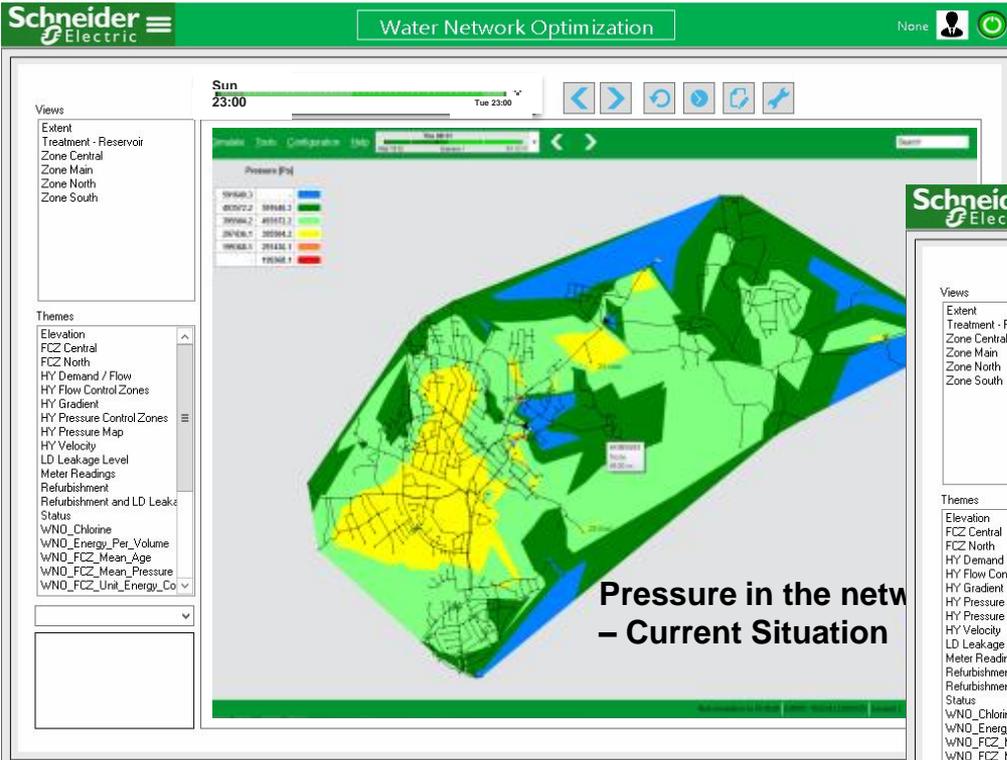
Data logger stations

Remote stations - optimized

Large remote stations

Up to **15%** — Reduction of leakage (NRW)

Up to **20%** — Reduction of energy costs

Up to **20%** — Reduction of CO2

Potential **25%** — Operational Efficiency Increase

- **Reduces risks** of low pressure and water quality
- Reactive to **Proactive management**
- **Energy savings and chemicals usage** optimization
- Enhances **real-time network supervision**
- **Ease of operations**: SCADA operators gets Analytics & Decision support

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Direct visualization from WNO: Current To Predicted Situation

Pressure in the network – Current Situation

Pressure in the network – Predicted Situation

EastWater, Thailand

Water management solution - supporting Eastern industrial estates in Rayong, Chonburi & Chachaengsao

Customer Challenge

- Pumping water from different sources; areas over provinces - ensure constant pressure & volume
- Control pressure & volume to be sufficient, efficient & continuous while keeping the costs (operation & energy) competitive
- Manage water stably & sustainably without interruption

The Solution

- Real-time control from a control center, allowing to control the pumping system
- Enables control & access to all information of pumping system, water pipeline network & distribution stations as well as status of water sources.

Customer Benefits

- Reducing loses within the system - costs of pumping & water lost, instant problem rectification 24hrs/day
- Energy saving by 5% of electricity cost - main cost of water pumping

The Results : Life is On with...

reduction in detecting losses 5% in
electricity pumping cost

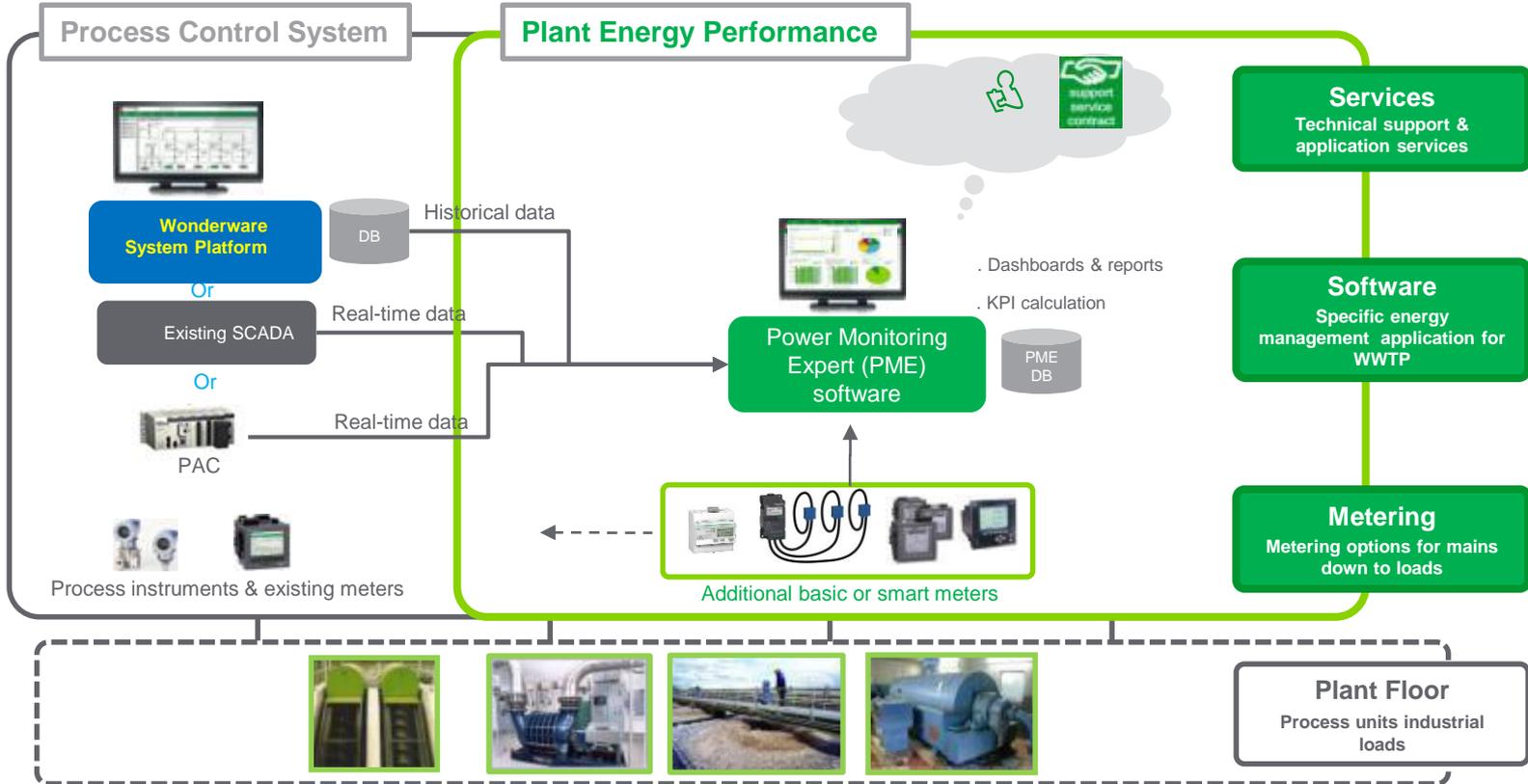**Largest** supplier of untreated water in the eastern region of Thailand

East Water has 15 pumping & distributing stations. Pipeline is approximately 400 km long, connecting important water sources in the eastern region: Nong Pla Lai, Dok Rai, Klong Yai, & Prasae reservoirs in Rayong, Nong Khor & Bang Phra reservoirs in Chonburi, & Bangpakong River in Chachaengsao, making a solid water grid.

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Plant Energy Performance – Architecture General View

An architecture serving different use cases

Process Control System

Plant Energy Performance

Wonderware System Platform

Or

Existing SCADA

Or

PAC

DB — Historical data

Real-time data

Real-time data

Process instruments & existing meters

Power Monitoring Expert (PME) software

PME DB

. Dashboards & reports

. KPI calculation

Additional basic or smart meters

Services
Technical support & application services

Software
Specific energy management application for WWTP

Metering
Metering options for mains down to loads

Plant Floor
Process units industrial loads

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Main KPIs Monitored and Measurable through Plant Energy Performance

Plant-wide energy indicators

• Plant specific electrical consumption (kWh/m3 of water treated)

• Electricity usage ratio (by area/sub-process)

• Gas usage ratio (process / non production)

• Specific chemical product xxx consumption (kg/m3 of water treated)

•

Key equipments / loads efficiency

• Pump xxx specific energy (kWh/m3 of water pumped)

• Aeration blowers efficiency (kWh/ Nm3 of air forced)

• etc.

Sub-processes efficiency

• Raw wastewater lifting specific energy (Wh/m3)

• Aeration efficiency (kg DO/ kWh)

• BOD removal specific energy (kWh/kg of BOD removed)

• Sludge dewatering specific energy (kWh / kg of dry sludge produced

Energy related costs

• Purchased electricity cost (LCU*)

• Specific energy cost (LCU/ m3 treated)

• Purchased energy cost by area

• etc.

* LCU: Local currency unit

Onsite energy production

• Electricity production from Biogas (kWh)

• Electrical autonomy from Biogas (%)

• Heat production from Biogas (kWh)

• Backup generators production (kWh)

• Biogas valorization ratio

Sustainability (carbon footprint)

• Energy use related emissions (tCO2e)

• Chemical use related emissions (tCO2e)

• Specific emissions - from energy + chemical use (tCO2eq / m3 of water treated)

• etc.

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Energy Usage and Performance Overview dashboard
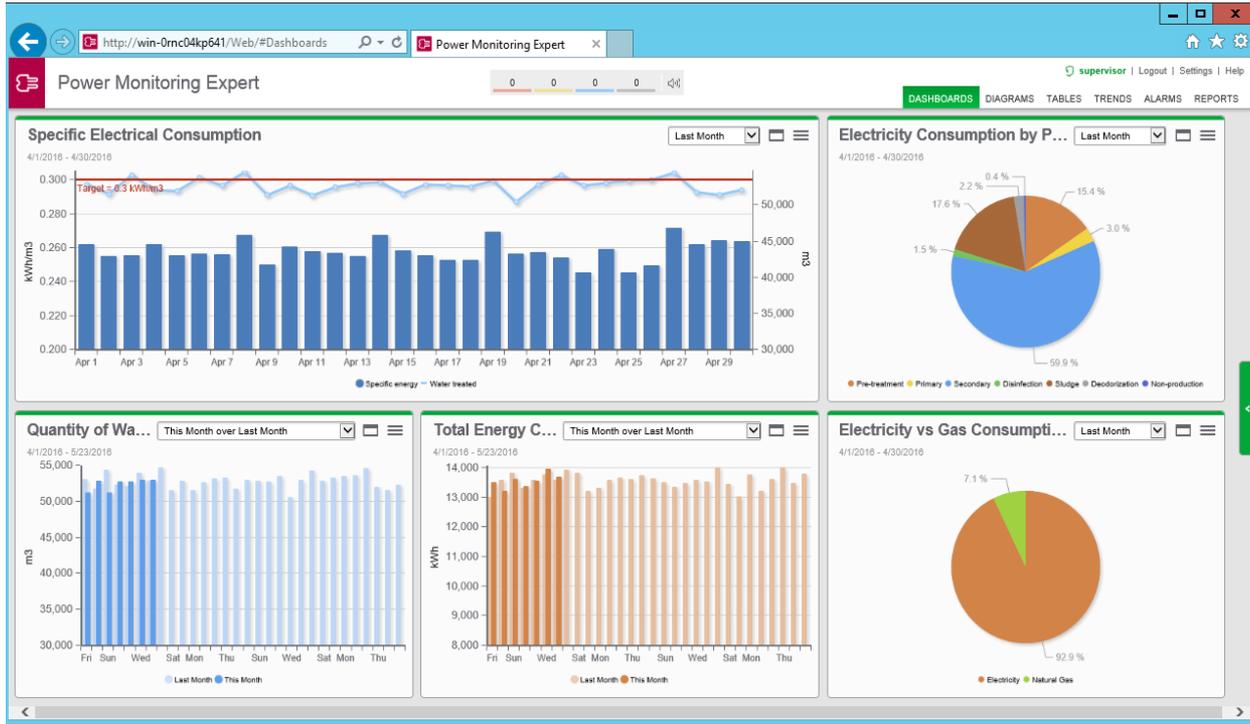
Dedicated to
*Energy manager
Plant manager*

Specific energy consumption

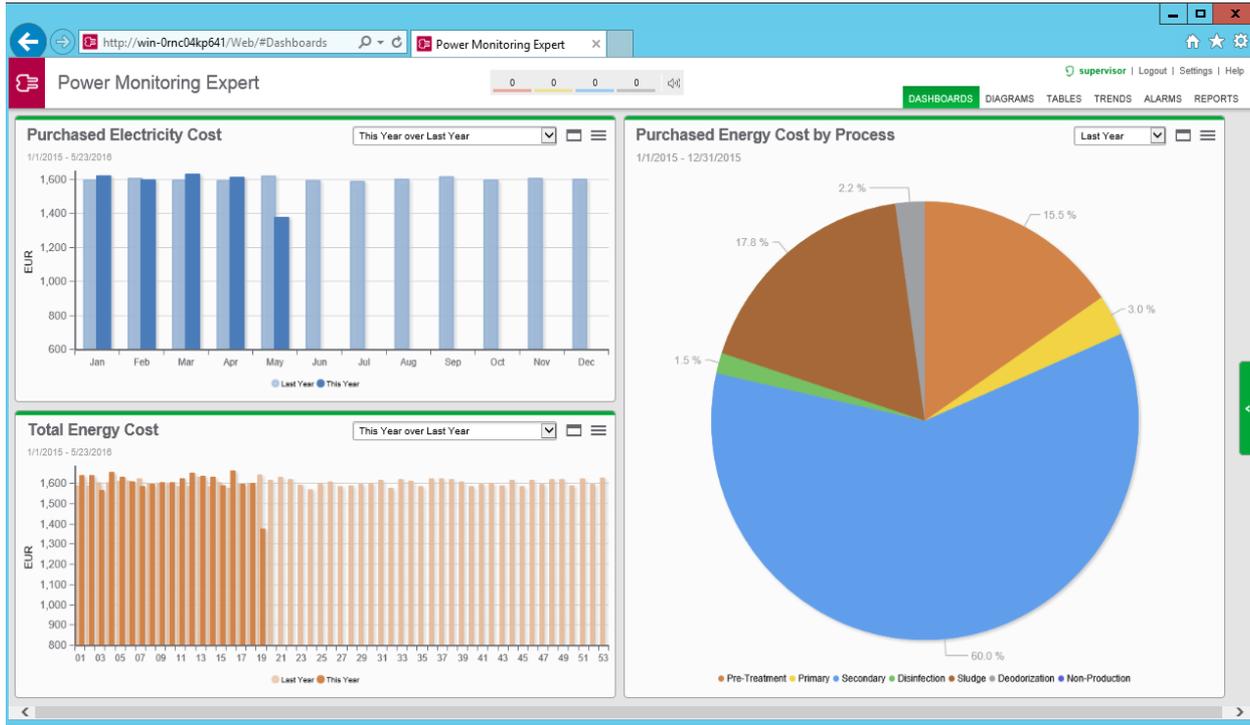Quantity of water treated

Total energy consumption

Energy cons. by area

Electricity vs. gas usage

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Energy Costs Estimates dashboard

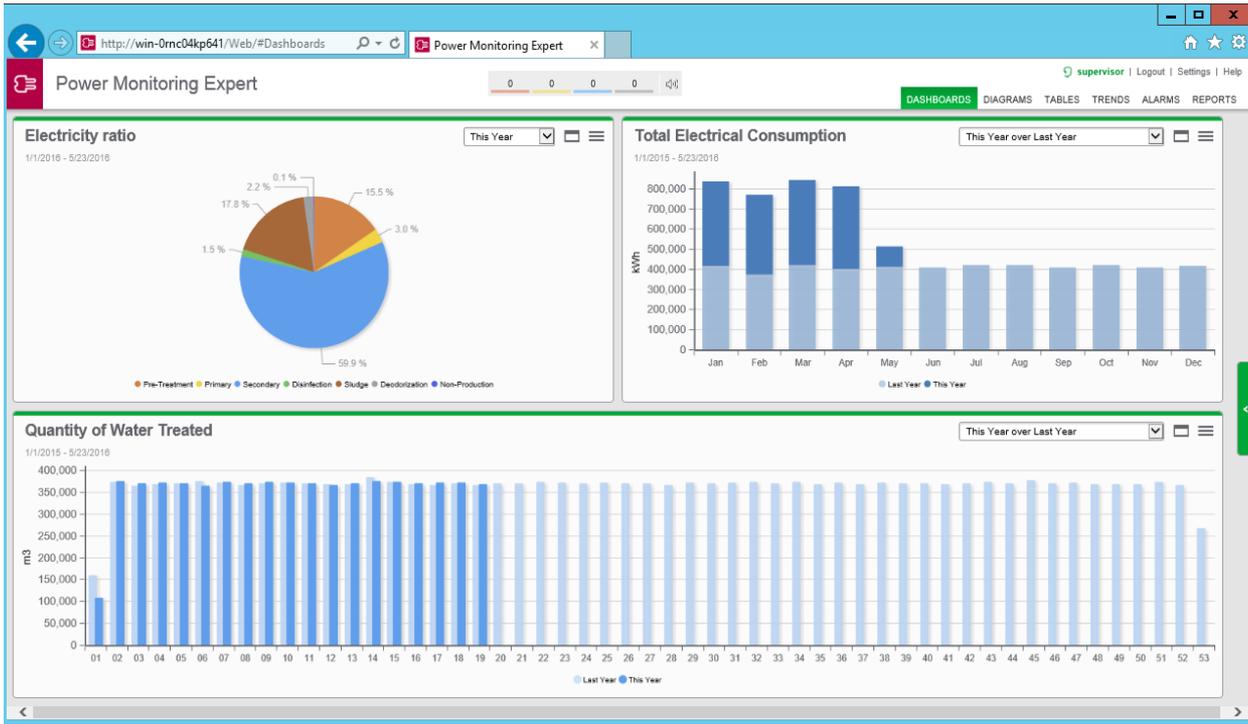*Dedicated to Energy manager Financial manager*

Purchased electricity cost

Total energy cost

Purchased energy cost by area

Specific energy cost

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Plant Electrical Consumption Dashboard

Focus on electrical energy used at plant level

Dedicated to Plant manager

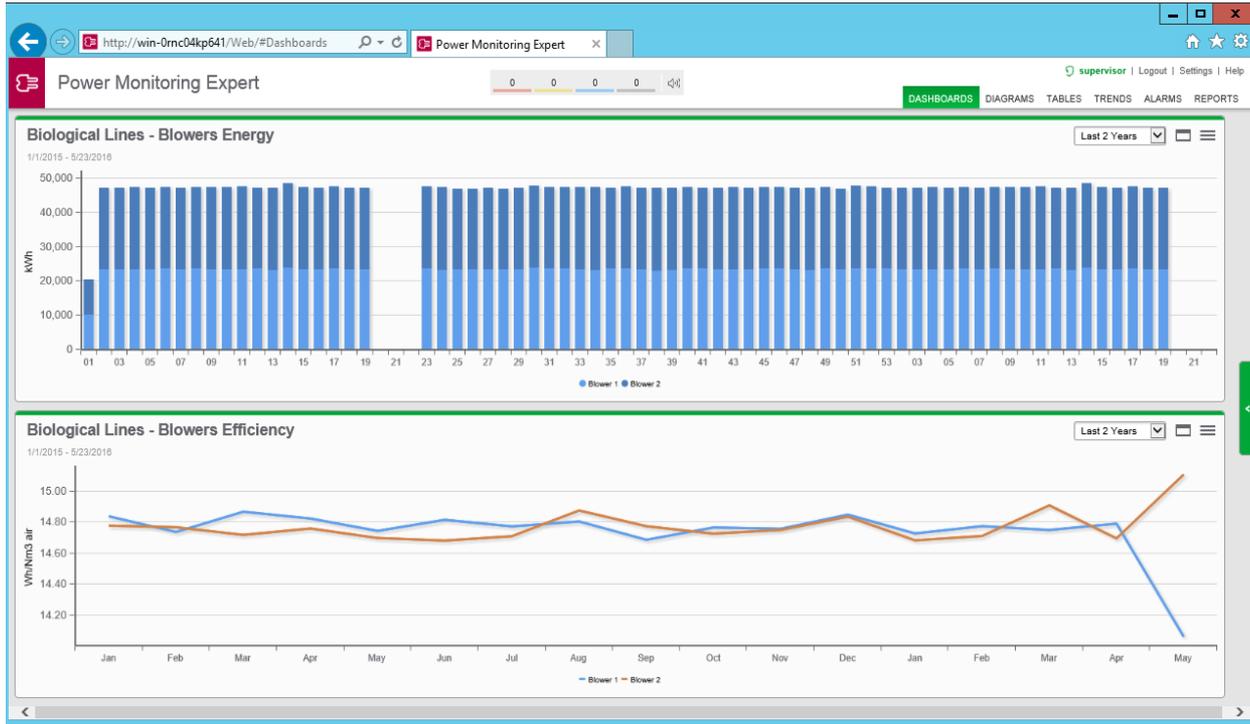Electricity ratio (electricity use distribution)

Total electrical consumption

Quantity of water treated

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Aeration Process Energy Performance dashboard

Monitor energy performance of some energy intensive processes or sub-processes. Allow benchmarking between similar process lines

Dedicated to Plant manager Operators

Biological lines - Blowers energy comparison

Biological lines - Blowers efficiency comparison

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Anglian Water, UK

Water Loss Solution detects leaks for system reliability and operational efficiency

Customer Challenge
- Maintain position as leading innovator in leakage control and water resource protection
- Detect leaks quicker and improve response times
- Reduce the cost of outsourced leak detection
- Regulatory compliance
- Reduce the cost of ownership

The Solution
- Water Management Suite
- Struxureware SCADA Expert ClearSCADA

Customer Benefits
- Improved decision-making
- Improved water loss management
- More efficient and effective operations

The Results : Life is On with...

500,000

connected telemetry data points

25 years of data to inform decision-making

Struxureware SCADA Expert ClearScada

Water Management Suite

"Telemetry is incredibly important to us. We've got a very large geographical area…and several thousands assets spread across that and we have to monitor them and to make sure they are working and working effectively"

Chris Boucher
Dir. of Information Services, Anglian Water

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SUMMARY

- 3 levels of innovation help drive full IoT integration across the water cycle

  - connected products

  - edge control

  - apps, analytics & services

- Maximize the value of data - helping to translate data into <u>operational & energy efficient</u>, actionable intelligence & better business decisions

- Key trends towards SMART water management

  - Water Network Optimization

  - Operation Command Center (OCC)

  - Plant & Network Energy Performance

  - Cyber Security

  - Asset Performance Management

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