Leveraging Big Data for Intelligent Water Utility Management

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OSIsoft
Data Is Your Most Important Resource

Barrick Gold
Digital mine $700 gold
Improving water quality

White House UD
Saved $900,000 reducing leaks

IBM
Reduced water and power costs by $10 million in semiconductor fab

Thames Water
Reduced energy usage by 10% and saved millions in fines
## Water Industry Challenges

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**Water Industry Challenges**

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- Process Productivity
- Asset Health
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- Secure Supply
- Contamination
Opportunity or Integration Nightmare

Financial Systems  GIS  Cloud  LIMS  Other Applications  Asset Management

Microsoft  esri  Business Systems  IBM  ORACLE

Flowchart depicting data management infrastructure with integration arrows between various systems.
A Data Infrastructure Strategy

- Financial Systems
- GIS
- Cloud
- LIMS
- Other Applications
- Asset Management

Operations Data Management Infrastructure

- SCADA
- DCS
- Automation / Control Systems
- HMI
- Meters
- Loggers
Impact of a Data Infrastructure Strategy

“Every front page news event Water Corporation can avoid saves them $1M.”
- Ian Scott, Asset Management Lead at Water Corporation

“The PI System is an important part of the information system of Veolia Eau d’Île de France. It has become the repository for all real-time measurement.”
- Guillaume Gallon, IT Manager, Veolia Water

Halifax Water manages water loss in real time with the PI System to save $600,000 per year.
- Carl Yates, GM at Halifax Water

“Our industry is data driven. Without data, we are operating two meters in front of us, hoping that we don’t hit a wall 10 meters away.”
- Max Chung, Electrical Engineer, SFPUC

Since 2005, the PI System has enabled Metro Vancouver to save $1.5M / year on energy at one wastewater treatment plant.
- Mike Kennett, Metro Vancouver
Maynilad’s Fast ROI

- Quicker response to unusual distribution network changes
- Better asset condition management
- Faster assessment on operations efficiency
- Reduced costs (labor and outsourcing)
- Reduced downtime
- More secure, scalable and redundant data management system
Video: CIO @ Maynilad Water
90,000 people served

Water loss savings over the past 2 years: $900,000
About United Utilities

WHERE WE OPERATE

This is what it takes to serve 7 million customers every day...

- hectares of catchment land: 57,000
- km of sewers: 72,000
- water treatment works: 96
- reservoirs: 184
- wastewater treatment works: 575
- km of aqueducts: 1,400
- km of water mains: 42,000

...And around 5,000 skilled employees.
Challenges at United Utilities

• Regulatory and customer commitments
• Improve key performance metrics
  – Outcomes, blockages, spills
• Increase efficiency
  – Reduce tot.ex: cap.ex and op.ex
• Leverage technology disruptors
• Apply innovation
Demand Forecasting

Performance Indicator: Nash-Sutcliffe index

- Normalized statistic
- Determines the relative magnitude of the residual variance compared to the measured data variance
- Ranges between $-\infty$ and 1
- Robust in terms of applicability to various models

Performance levels usually categorised as:

- $> 0.65$  EXCELLENT
- $0.65-0.5$  VERY GOOD
- $0.5-0.2$  GOOD
- $< 0.2$  POOR

POC Prototype: Smart Alerts

- Intervene when needed: e.g., spilling during dry weather
- Reduce call-outs: e.g., wet weather spills
- Get ahead of incidents: e.g., flooding, pollution
POC Prototype: Accurate Forecasts
Municipal Water and Sewage Company Inc. in Wroclaw (MPWiK)

One of the biggest municipal water and sewage utilities in Poland, its steady operations have continued since 1871 when the water treatment plant “Na Grobli” was first commissioned.
Results

The Red Carpet Incubation Program (RCIP) from Microsoft and OSIsoft helped MPWiK to connect production and customer data. In particular, Azure Machine Learning:

- Forecasts water demands for future scheduling (next 24 hours)
- Provides data relations allowing creating predictive analytic models
- Improves pump scheduling and production planning
▪ Research project H2020 GAMEs Playground
  ✓ Geographic Asset Management @ Evides
  Don’t interfere with other important ICT-projects

▪ “Serious GAMEs” = production version
  – 20 mature functionalities

▪ Keep on developing in the Playground
  – PublicSonar (social media) – “human” sensors
  – GlobeSpotter (resembles street view)
  – More “tactical” functionalities e.g. Asset Management, Water Quality Index
Condition-Based Maintenance yielded a 70% reduction in labor

4 pumps saved $16,000/year

From 100 pumps an expected savings of $400,000/year
Analytics @ the Edge: Finding Lost Revenue

Revolutionary Edge Analytics

Advanced Cloud Services

Unhealthy and missized water meters, leaky pipes, and energy costs

Recent installation identified over 60% of AMI provisioned meters were failing to accurately report water delivered, yielding a 330% return on investment!
Real-time Energy Management

Daily Power/Gas

Electricity Import/Export

Plant Electricity Demand

Daily Engine Uptime Up To Selected Timestamp

Engine Power Output At Selected Timestamp

Natural Gas Flow to Engines

Digester Gas Flow to Engines

Previous Day's Energy Import/Export Breakdown
Communities: Data Sharing

- Equipment Vendor
- Supply Chain Suppliers &
- Service Companies
- Analytics Companies
- Contract Manufacturing Organization (CMO)
- Academic Institutions
- Your Industry Peers / Competitors
- Regulatory Agencies
- Local Government
- Your Customer
- Utility Company
- Public / Private Partnerships
- Communities: Data Sharing
Contact Information

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Questions

Please wait for the microphone before asking your questions

State your name & company

Please don’t forget to…

complete the Post Event Survey
Thank You