

# Turning asset data into actionable strategy.

Intelligent asset management for the water industry.



**Atos**

## Foreword

Asset health plays an essential role in delivering safe and resilient water services. Looking forward to the next 25 years and more, the water sector faces challenges from population growth, climate change, tightening environmental standards and changing customer expectations. Many of these challenges are not new and require significant change in the way that water companies operate today. Balance this with the adapting regulatory and consumer pressures it becomes imperative for the water industry to adapt.

In this outline, in the context of risk to serve and investment planning, we share our views on the way that asset health is currently understood. We have reviewed the existing data use and data management and the importance of a network-wide view of good data insights. We believe, whilst there are few immediately serious issues of asset health on service, there are longer term concerns which require ongoing scrutiny. Good quality integrated data is a vitally important factor to better measurement and management of asset health.

This outline gave us an opportunity to explore the examples of good practice and areas where water companies explore new ideas and innovation. It became apparent that, the water industry is relatively experienced in terms of technology pilots and innovative trials. Further cross-industry collaboration and awareness of the work going in other sectors will be beneficial to raise the bar. By working with partners, other water companies, other industries, and start-ups and by collaborating with regulators and academia, water industry will be able to intelligently operate, provide decision support information and react in real time; adapt for the future we are facing.



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# Driving forces behind investment in asset transformation over the last few years.



## Increasing demand

Our population is growing, and we are seeing demographic changes that include an increase in single occupancy households using more water per head than multiple occupancy households. As a finite resource, water access is at risk from "a growing population", and "an increase in need" that will continue to put pressure on infrastructure planning and requirements; particularly in cities and areas such as the Thames Valley that already has water challenges.



## Doing more for less

There is a continuing drive for the sector to transform by doing more with less and becoming more efficient. This isn't just about the sector doing the same things in the ways they have always been done with a focus of taking 10 percent out of the cost base, it is about finding a sustainable efficient operation with a step change in operating cost. We need to consider how we are allocating the scarce resources we have, our water sources, our customers' money and investors' capital. We must also address how we are operating and delivering the services including asset lifecycle management, advanced network management and assuring services are that are secure by design.



## Ageing infrastructure

As the assets age and need replacing, their impact on capital maintenance requirements and depreciation costs becomes significant. Many water companies have already made investments in enhancing their asset base. However, unless the relationship between condition and asset performance is known, it is difficult to determine the appropriate target for the state of the assets. This is particularly challenging in the case of critical assets, where extrapolation from a model introduces significant uncertainty at the individual asset level. Understanding the criticality of individual assets and their wider network impact can help to prioritise resources and investment for determining the condition and likelihood of failure for these assets.



## Climate change

The added pressure of climate change is bringing more severe weather events, more drought, more flooding, less drizzle and more places and times where we don't have enough water or where we have far too much where we really don't want it. Operational stability relies on the full water cycle; climate change is making that more unpredictable, demanding greater sophistication in how services are delivered. The consequences are the challenges are increasing in the provision of essential services when combined with the limitations of an ageing infrastructure that lacks responsiveness. It is essential to raise the bar on asset health and decarbonisation. There are projections in some UK regions that these acute pressures when combined with demographic pressures will reduce water access to their customers by as much as 50% by 2050 if not addressed.



## Technological advancements

In the last few years, the availability of high volumes of data has enabled more evidence-based decisions. More recently, significant technological advances have converged to truly transform Utilities operations, investment, and maintenance planning. We are now utilizing new advances in digital twin technologies combined with the power of machine learning (ML) and artificial intelligence (AI) to optimize use of assets at every stage of their lifecycle.

[Read more about digital twin technology and condition-based maintenance](#)



## Read more

The Water sector alone cannot address all of these challenges. It requires all of us, as consumers, we have a responsibility in the way we use water. This needs to be supported and enabled by regulators, contractors, NGOs, researchers, the water companies as well as technology and service providers. In order to succeed this needs to be a team effort!

# What do we mean by asset health and is that definition changing?

## What we currently mean by asset health

Asset health is regularly valued in terms of its cost and benefits with respect to service. It's measured by failure rates or rates of deterioration to forecast future probability of failure.

Currently water companies have key customer experience targets to achieve, measured through the outcome delivery incentive, ODI. These annual performance commitments and outcomes are re-assessed at the end of each AMP. This leads to the situation where short term service is maintained at the same time as underlying asset health is deteriorating. Such a situation is unsustainable in the longer term, ultimately asset failures will overwhelm the ability of the utilities to respond in a timely manner and maintain service.

## So what needs to change, we need:

1. An increased mutual understanding with the regulators around the necessity of long term investment planning and wider asset renewal programme to avoid escalated system failures.
2. Good, long duration data on asset health is an important asset in itself; a lead indicator is understanding the state of the asset before failure, this helps avoid significant costs and cliff edge failures.

**The maturity of asset data systems and analytics varies across organisations, this includes disconnected data systems and a lack of skills and experience of doing complex data analytics. Building relationship with technology partners is key to addressing this and to the delivery of long-term asset transformation.**

## Reference:

Machine learning-driven process optimisation for wastewater treatment plant.

Recently, a French wastewater treatment plant began a project to optimise its processes from a cost, time, and quality perspective, while avoiding the risk of regulatory penalties that may result from water quality issues. Leveraging plant data and Atos' big data solution, the plant team developed multiple smart solutions to optimise plant operations, leading up to 20% cost reduction and lower environmental impact driven by water quality improvement.

The output of this project provided algorithms for machine learning and advanced analytics created and packaged centrally in the **Atos Codex Data Lake Engine** downloaded and executed in real-time at the edge. Combined with clean historical data, third-party external data and batch and real-time IOT data collected at the plant, the algorithms are constantly trained, and models created. Thanks to analytics and **Atos Codex Smart Edge**, a comprehensive tool for real-time decision making has been achieved. This led to predictive process optimisation on a day-to-day basis and reduced costs for better profits management.

# Bridging layers of data to build a full picture of asset health

Creating greater value from existing and new incoming data is achieved by utilising that data to greater effect; more than the purpose that it was originally derived. To achieve this, we address the following 3 layers of data:



## Asset data

- leaks, bursts, chokes, blockages, water quality, GIS, satellite data for visualisation.
- Flow, pump pressure, surge – real time monitoring to understand network dynamics (-> potential risk)
- Condition monitoring, CCTV of sewers.



## Operational data

- Asset health monitoring using vibration, acoustic, thermographic sensors
- Digital twin
- Data from fixed cameras, drones
- Planned and Unplanned Outage information
- Customer complaints for taste, colour, and smell
- Water Chemistry.



## Enterprise data

- Managing data quality – process to control the creation, access, sharing, usage of data
- Data to drive right decisions.
- Collation of asset and operational data in real time to support day to day decision making
- **Reference:** Atos brings right eco-systems to deliver cutting-edge solutions and specialist expertise. [Discover more - Link to Atos Horizons](#)

By addressing asset information with operational influences, impacts and outcomes and linking this with the organisation enterprise and governance, the water companies can drive the greatest efficiency and optimise how they serve their customers.

### Reference:

Atos helped Scottish Water to develop and validate a roadmap to net-zero by running a one-day StratHack event on the problem statement: 'How can Scottish Water deliver beyond net-zero by 2040 across its operational and capital activities, and how can it be delivered sooner?'

We brought together a diverse audience of engineers and managers from the workforce, Scottish Water's digital partners, academic niche vendors and other water companies to explore the challenge and develop innovative solutions. After the StratHack event, we worked with the General Manager for Zero Emissions at Scottish Water to prioritize the key target areas for emissions reduction.

We discovered opportunities to apply AI to existing asset data to provide early-identification of excessive energy consumption and a proactive response. This led to an initial proof of concept where Atos provided a skilled team to deliver the use case on a limited set of pump stations in 33 locations, which resulted in 7% energy savings. We also provide a team to scale Scottish Water's leakage detection capability, providing the data platform and infrastructure to expand across the region

This partnership has formed an effective model for finding innovative solutions to pressing strategic challenges, and then accelerating into execution and providing the platform and infrastructure to scale



# What are the challenges of uniting these data insights into a network-wide view and why is it so important to address this?

From a legacy perspective, over the decades, a complex control network has grown across the water supply chain with many functions collating their own independent data. Many water companies don't have the right systems and technology available or in place to extract meaningful insights and predictions from already established and available data as well as the agility to derive or introduce new data. Ensuring data quality, integrity, access and security demands different end to end design considerations across an integrated Smart Water Network that is embracing newer more advanced technologies.



## Data value

Utilisation of existing data to derive meaningful information and decision support.



## Lack of skills to turn data into value

Modern technologies enable us to connect patterns of "data behaviour" and digital signatures in complex hybrid datasets from multiple sources. Making sense of data insights, embedding these insights in organisational processes is the key to uncover value from data and technology advancements.



## Third party data

Data available within water operations is often not enough to understand the wider cause of environmental impact such as weather predictions, supply and demand patterns.

## Why a "network-wide" view

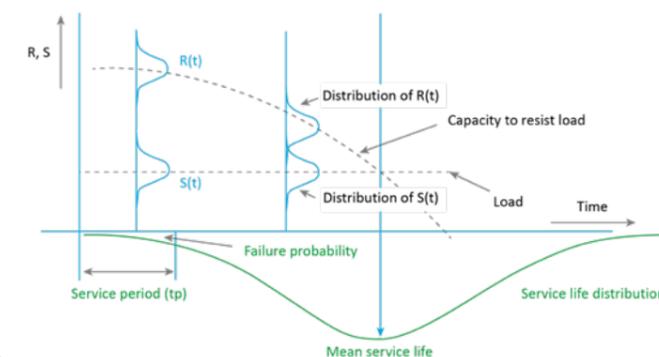
Many of water assets are exposed to aggressive operating environments and as they age, the resistance (R) decreases, and the asset becomes more vulnerable to failure under load (S).

It is essential to know where these assets are, what the consequences of such failures can be and how to predict and deal with potential failures. Relying on disparate data sources and systems, water companies are challenged to understand the end-to-end state of their assets and also the overall risk of failure.

Pressure is a key element of this, it needs to be consistently high enough to satisfy the customer, excessive pressure drives up asset deterioration, leakage, burst frequency, energy consumption, and operational costs. Whereas pressure that is too low can

cause water decay and allow contaminants to enter the system. Pressure changes in one part of the network can have impacts further down the pipe.

This can be improved with automatic pressure optimisation and remote sensors being introduced appropriately across the network. This can help adjust pressure instantaneously according to current demand patterns and operating characteristics of the network. Because leakage is directly related to pressure, any balancing in pressure will result in a proportional reduction in leak levels.



Targeted review of asset health, p.39

### Reference:

Atos worked with Scottish Water to install acoustic sensors on pipes to track the noise and range of frequencies at night in water supply areas. The difference in noise levels indicated that there was a potential leakage. First pilot we ran, improved leaks discoverability by 50% and saved 200M litres of water/year.

## Smart water network vision

A Smart water Network is often described as bringing together Operational and Information technologies, devices and data, including sensors, remote control, and enterprise data sources, data collection, data management and display, communications and increasingly data fusion and predictive analysis. At Atos we understand that it is more than that. By bringing together services, adaptations to the operating model to assure automation value with the necessary business outcomes, this provides the overall holistic vision.

## Asset Health Performance and ODI outcomes

Addressing where should water companies invest their time, effort, money for the best return requires the understanding of how and where asset health performance will deliver the best ODI outcomes.



### Ensuring that ODI's are enabled through technology

Technology delivery is the easy part. Impacting business outcomes and improving the reliability of assets through technology and digitisation, that is the most important element of all. How we utilise that technology and the data that is derived enables water companies to be confident in achieving and managing in line with the ODI targets.



### Making the right big investment choices

It's important that the role of asset health is understood in the context of risk to service and investment decision making. Prioritisation in line with cost to serve and penalty avoidance enables the appropriate focus on the right investments.



### Increased value to customers

Better asset management is directly associated with improved water quality, reduced cost to serve and customer and developer experience. Customers tend to value service and outcomes as opposed to asset health, so it is important to show how asset health impacts service and demonstrate how investment can affect asset health, addressing the value chain from asset health through to customer service and business outcomes.



### Zonal approach

A holistic investigation into the factors influencing performance in a Water Quality Zone. By utilising all mains hydraulic modelling, engineering principles, statistical analysis and the experience and knowledge of local operations, the investigation can help identify the root cause of different aspects of poor performance. The outputs are qualitative and allow a targeted investment approach, which in turn lowers cost and drives value for money. This provides the ability to address the full water journey from "water source to customer tap" and fully understand the asset impacts.



### Transforming relationships across the sector

Partnerships with technology partners are becoming key in the context of strategic planning, outcomes, business continuity as well as changing the way that we operate from employee through to customer. There are key opportunities for a broader engagement across industry with the energy sector. An example of this is the [British Gas and Thames Water partnership](#) to provide sustainable solutions for 1.8m customers, saving them time and money.



### Scaling up innovation

Most water companies have been active in innovation forums, trailing, testing, and adopting technology; however, we are still on a journey to a clear step change in asset performance. There is considerable interest in technology for collecting and processing data and in big data and analytics. If we consider that an AMP period runs for 5 years and there is a belief that ROI on innovation often takes up to 5 years, then this does not encourage taking risk on new technology within the management periods.

As a result, we need to adapt our operating models to be more agile, improve the speed to market and create confidence in the value of new innovation investment. This will drive investment re-prioritisation, new partnership models and JVs, quality of innovation, improved collaboration with technology partners and start-ups as well as being able to anticipate what can be achieved in the next AMP period.

# About Atos

Atos is a global leader in digital transformation with 105,000 employees and annual revenue of over € 11 billion.

European number one in cybersecurity, cloud and high performance computing, the Group provides tailored end-to-end solutions for all industries in 71 countries. A pioneer in decarbonization services and products, Atos is committed to a secure and decarbonized digital for its clients. Atos operates under the brands Atos and Atos|Syntel. Atos is a SE (Societas Europaea), listed on the CAC40 Paris stock index.

The purpose of Atos is to help design the future of the information space. Its expertise and services support the development of knowledge, education and research in a multicultural approach and contribute to the development of scientific and technological excellence. Across the world, the Group enables its customers and employees, and members of societies at large to live, work and develop sustainably, in a safe and secure information space.

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Let's start a discussion together

