



## Using AI to tackle water utility losses

### Water SAT - Pipeline Risk

**US water distribution companies and municipal utilities are turning to new risk-based tools to tackle their network losses. By accurately predicting where and when failures are most likely to occur, they are able to maximise their use of resources and deliver a competitive edge.**

Like many nations, America's water distribution system needs urgent attention. With more than 2 million miles of underground water pipelines, much of the country's infrastructure is already decades old and is becoming increasingly frail.

According to the American Society of Civil Engineers (ASCE) Infrastructure report card for 2021, a water main breaks in the US every two minutes and the losses of treated drinking water from these breaks add up to around six billion gallons every day.

Indeed, figures from the Environmental Protection Agency (EPA) indicate that an average of 14 per cent of all the water treated by water systems is lost to leakage and that some water systems have losses exceeding 60 per cent. With nearly a quarter of a million water main breakages annually, there is an inevitable cost associated with this non-revenue water. EPA figures put this cost at some \$2.6 billion a year and these are costs that are ultimately borne by consumers, but they also have a significant impact water utilities and wider society too. In California, for example, the latest U.S. Drought Monitor update shows almost the whole state is facing drought conditions before this year's hot and dry summer even gets underway. By comparison, less than half of the state was under drought conditions this time last year. It's not just California though, most of the western states are already facing drought conditions this year.

With water constraints set to impact key economic sectors in California and elsewhere, there are clear and far-reaching implications. But even where water is abundant, utilities cannot afford to waste valuable resources given the cost of producing and distributing drinking water. Recognising this, water utilities are increasing investment in bolstering their networks and accelerating renewals. Utilities were replacing between 1 per cent and 4.8 per cent of their pipelines per year on average by 2019 and by 2020 some 12,000 miles of water pipes were planned to be replaced nationwide.

However, the challenge of aging infrastructure and the sheer scale of the water networks is pushing water utility financial resources to the limit. ASCE reports a recent survey which found that almost half of all the maintenance work undertaken by utilities is done reactively as elements of the system fail, for instance.

Consequently, water utilities are placing far greater emphasis on increasing the efficiency of leak management through proactive prevention in a bid to cut both operational and capital expenditure. Indeed, ASCE report that about a third of US utilities have now established asset management programs to help prioritize their network investments. This is a significant increase from the 20 per cent seen in 2016, but still leaves considerable scope for more effective resource deployment among US water utilities.

## Using AI to determine pipeline risk

Under pressure to radically improve their leak prevention performance, US water utilities are turning to new technologies such as satellite data and AI to dramatically reduce non-revenue water losses and associated costs. Pipeline failure risk modelling developed by Rezatec features sophisticated bespoke algorithms as part of a tool that enables utilities to target resources on failure risk. Using satellite observations and artificial intelligence the model produces likelihood of failure risk maps. The geospatial artificial intelligence algorithm enables water distribution companies to identify highest risk pipeline sections and focus upgrade resources on those areas for the greatest impact. With all utilities facing capital and resource constraints, this approach allows water distribution companies to focus their limited investment resources on the top 20 per cent of risks. Most significantly, this top 20 per cent of risks is typically responsible for around two thirds of all the leaks from a distribution system and therefore represents a clear operational benefit.

The key to Rezatec's Pipeline Risk solution is the smart assessment of multiple parameters that potentially influence the failure risk of a pipeline. Its machine learning model analyses data on the diameter and age of the pipeline, for example, as well as the material it is constructed of such as polyethylene, cast iron or steel. The model also considers the soil the pipeline is buried in and the terrain that surrounds it, including the soil pH. Satellite data is used to assess terrain motion such as uplift or subsidence as well as vegetation growth, which also has an impact on failure risk. The model

assesses several years-worth of historic data on the pipeline network and any breakages as a key part of building the predictive model and identifying potential future failure points.

The pipeline risk asset management application not only identifies those parts of the network at higher risk of failure though. Importantly Rezatec's solution also expresses the consequence of failure as a cost function to reveal the potential impact of any failure. This metric thus takes into account both the number and the type of customer that may be affected by a particular failure, as well as any third-party liabilities. This may include potential effects on the transport network for instance, as well as the direct cost of replacing the relevant section of the failed pipeline.

This combination of both the likelihood of failure and any associated consequences gives a full risk profile that is visualised in a simple dashboard format for easy interpretation. The so-called Pipeline Risk Value is the outcome of the advanced, data-driven, approach. Ultimately, this value figure allows utilities to target their investment and field crew resources on those areas with the greatest need for intervention by prioritising any upgrades on those parts of network at the highest risk of failure and the highest consequences.

Indeed, the uptake of pipeline risk modelling is already allowing US utility companies to establish a competitive edge whilst reducing the financial and environmental burden of non-revenue water on their customers.

"Our goal is to use this technology to stay ahead. We intend to use this data to improve our asset management strategies and help us better plan and prepare for any necessary repairs and improvements."

*Billy Cothran, Chief Executive Officer at South Carolina water utility SJWD*

Cothran's comments echo those of Maurizia Brunetti, Coordinamento Acquedotto (Water Supply Technical Coordination Manager) at HERA S.p.A., a large water utility based in Bologna, Italy. HERA adopted Rezatec's Pipeline Risk tool in a bid to reduce losses across its 20,000+ mile water network.

"Rezatec were the first provider to propose a predictive algorithm [for likelihood of failure] that considered not only the diameter, the historical data series about breakages or the age of our pipelines, but also the groundwater level, the kind of soil, and the temperature. It was an algorithm which considers all of these factors and was more integrated than the data we considered."

Beginning with 490 km section of the water network, the Rezatec Pipeline Risk tool allows HERA to focus its investment where it is most needed, cutting leaks and non-revenue water losses far more effectively. The success of the model led HERA to extend the programme to cover 2800 km in 2021.

### Act on data-led decisions

Even as the US Senate passes its \$35 billion Drinking Water and Wastewater Infrastructure Act in order to provide grants and revolving loan funds to upgrade aging infrastructure, almost every water utility is still facing budget constraints. The pressure to reduce water losses, save money for consumers, and support a sustainable water system means the most

innovative US utilities are now turning to the latest tooling to deliver data-driven performance.

"Our mission is to help our clients make data-informed asset management decisions to reduce leaks, improve margins, and optimise their overall asset management. Pipeline Risk can help prioritise investment in infrastructure, or make savings in maintenance and repair. In this way, utilities can become more proactive, efficient and resilient," notes Philip Briscoe, COO at Rezatec, the world's leading provider of geospatial AI analytics.

Using highly accurate satellite data, Rezatec's artificial intelligence algorithm is able to indicate which parts of the network infrastructure represent the highest risk and the greatest bottom-line impact. This predictive approach allows water distribution network owners to target the highest risk areas for focused investment. Presented in an easy-to-use interactive platform that supports timely decision-making, the Rezatec tool delivers critical business insights for water utilities and other infrastructure owners and operators. For US utilities, the proven benefits of Rezatec's Pipeline Risk tool are already being reflected in bottom-line performance but in the face of climate change, worsening drought conditions and tightening budgets, addressing pipeline failures and water losses in a timely and efficient manner will be critical to the future of every water business.

Ready to take a look? [Click here](#) to see how the Rezatec solution can support your plans to reduce pipeline risk.



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