

## High performance water loss management combined with Human-as-a-Service

Estimated savings of 1.4 million cubic meters of water and €560,000 per year; estimated reduction of 504,000 kg GHG emissions. **Aquarius Spectrum** explains a recent customer success story in Italy together with A2A Ciclo Idrico, a subsidiary of Italy's largest multi-utility A2A S.p.A.

A2A CICLO IDRICO operates more than 3,000 kilometers of iron water pipes, serving citizens in the municipalities of Brescia and neighboring towns in the northern Italian region of Lombardy. It is part of A2A S.p.A. which is the largest multi-utility in Italy with more than 12,000 employees and 6.5B EUR in annual revenues. A2A distributes renewable energy, electricity, gas, water and collects wastewater. A2A has embarked on an intensive effort to reduce their water losses and energy costs. They retained the services of AQS (Aquarius Spectrum) in 2019 to conduct a pilot test of their Continuous Correlating Acoustic Monitoring (CCAM) system. This pilot was conducted in September 2019 and entailed the

installation of 39 belowground acoustic sensors that covered approximately 15 km of pipe. During the first week the system was installed, 10 non-surfacing, hidden, leaks were identified. One of these leaks was a very large and burst aboveground within a few hours of detection. Based on this successful proof of concept study, A2A decided to implement a full-scale program using the Aquarius Spectrum system.

AQS provides advanced leak detection and in-depth analysis based on fixed base and mobile acoustic sensor systems combined with AI and big data analytics algorithms. The monitoring systems are pipe type agnostic and can be installed above or below ground.

AQS sensors collect daily audio samples and correlation is performed between every two coupled sensors. When a leak noise is detected in the same area an alert is generated with the exact location of the leak. Field crews are then deployed to pinpoint the leak so it can be repaired.

A2A decided to install sensors in the town of Brescia. Brescia is the second largest city in the region and has a population of 200,000 and over 1.5 million people live in its metropolitan area. The sensors were installed in two areas: the city center and in a suburban zone. The sensors in the city center were installed on 48 km of pipeline in the fall of 2020.



A total of 147 sensors were installed. The sensors in the suburban areas were installed in the spring of 2022. The 93 sensors in this area covered 31 km of pipeline. During the study period a total of 134 leaks were detected in the city center and 36 leaks were found in the suburban areas.

The entire project was carried out with the support of Pipecare Italia, Aquarius Spectrum's partner in Italy. As a trusted service supplier to A2A Ciclo Idrico, Pipecare provided valuable engineering expertise, fleet management, and data analysis. Their commitment to innovating the water sector and reducing water losses has been evident in their thorough oversight of the on-site implementation for this project, ensuring both robust maintenance and uninterrupted service.

To evaluate the technical efficacy and value proposition of the AQS system a benchmark must be developed. Fixed base CCAM systems are permanently installed and collect data continuously. The more pipe length that is covered and the longer the sensors are installed all have a bearing on how well the systems functions. It is not adequate to only count the number of leaks found. This does not consider how long they have been active.

CCAM systems detect existing leaks typically as soon as they are installed. The benefit is accrued over time as newly formed leaks are detected and repaired. It is also critical to know how many km of pipe the systems are monitoring. The more pipeline the sensors are monitoring the more leaks will be found.

Therefore, a performance metric that takes into account the number of sensors, time deployed and length of pipe cover must be developed to evaluate the value of the system and to be able to compare it to other systems and other projects. The performance metric used herein is leaks detected per 100km per year; leaks/100km/year. For smaller installations this can be reduced to leaks per km per year.

In the Brescia project the city center sensors have been installed and active for a 36-month continuous period. In the suburban areas they have been active for 18 months. This equates to a performance metric in the city center of 93 leaks per 100km per year and in the suburban area of 75 leaks per 100km per year.

This is an exceptional performance as the system appears to be able to detect all the leaks occurring in the areas covered by the sensors. It has been reported that in Italy, when once year traditional leak detection programs are implemented, one leak per 1.5 km are found. This equates to a performance



metric of 67 leaks per 100km per year. The results obtained in this project are 10 – 50 % higher than this. The AQS system can detect small leaks from inception through the time they are large enough for the utility to deploy a crew to pinpoint the leak and repair it. The AQS system can detect very small leaks and track their progression through its algorithm and dashboard.

The 170 leaks that have been found by the AQS system over the time period analyzed have a number of positive value propositions. The average leak size in this study is estimated to be 16l/minute and it is assumed that each leak would last for 12 months if no proactive leak detection program was in place. The estimated leak life would be one year as well if a utility performed traditional leak detection programs that inspected the same pipe section once a year. This equates to a total estimated volume of water saved of 1.4 million cubic meters per year.

At a cost of water production of 0.4 EUR per cubic meter, A2A estimated saving is 560,000 EUR. A total of 360 g of

GHG is generated per cubic meter of water delivered.

The repaired leaks reduce the GHG emissions by 504,000 kg per year and the amount of energy used by 1 million KWh per year.

Tullio Montagnoli, CEO A2A Ciclo Idrico: “To reduce water loss, in my opinion, it is essential to be able to identify leaks early on. In Brescia historical city center we have installed a number of 180 sensors to cover 50km of water supply network. A few years ago, we had water losses of 32%, which is under the national average of water loss rates. Now we have reached 28%.”

This initiative showcases AQS's unique proposition as a provider of high-performance water loss management solutions enriched by a Human-as-a-Service offering. By coupling sophisticated technology with tailored service, AQS is setting a new industry benchmark for cost-effective, sustainable water management.

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