

Accurately measuring network leakage

Integrating flow and pressure measurement with ABB's AquaMaster



Improved network management through real-time data and enhanced network pressure control

Measurement made easy

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Introduction

The pressures of supplying a growing global population mean that the world's water supplies need to be managed more closely than ever. Estimates from the United Nations point to a 50 percent increase in water withdrawals in developing countries by 2025 and by 18 percent in developed countries. With a finite amount of water available for consumption, meeting this demand requires a combination of finding and treating new sources of water, including seawater and stemming leakage losses in water distribution networks.

The World Bank has estimated that over 32 billion cubic meters of water are lost through leakage, with network losses as high as up to 50 percent in some countries. Reducing losses is not just about saving water. There is also scope for massive savings in energy use as well, as every drop of water lost is a drop that has to be replaced, treated and pumped through the network. Any move to improve water supply management should therefore begin with tracing both existing and potential leaks.

The application

There are many causes of leakage in water supply networks. As well as ageing or poorly constructed pipelines, leaks can also be caused by high pressures, which not only increase water loss at weakened points, but can also cause additional leaks. To help ensure a uniform supply across geographically uneven environments, water supply networks are often operated at exaggerated pressures. This can quicken wear and tear on the pipeline and consume excess energy with pumps running at unnecessarily high speeds.

From this, it can be seen that taking steps to improve water supply efficiency can help to tackle leakage, properly regulate pressure and reduce energy usage.

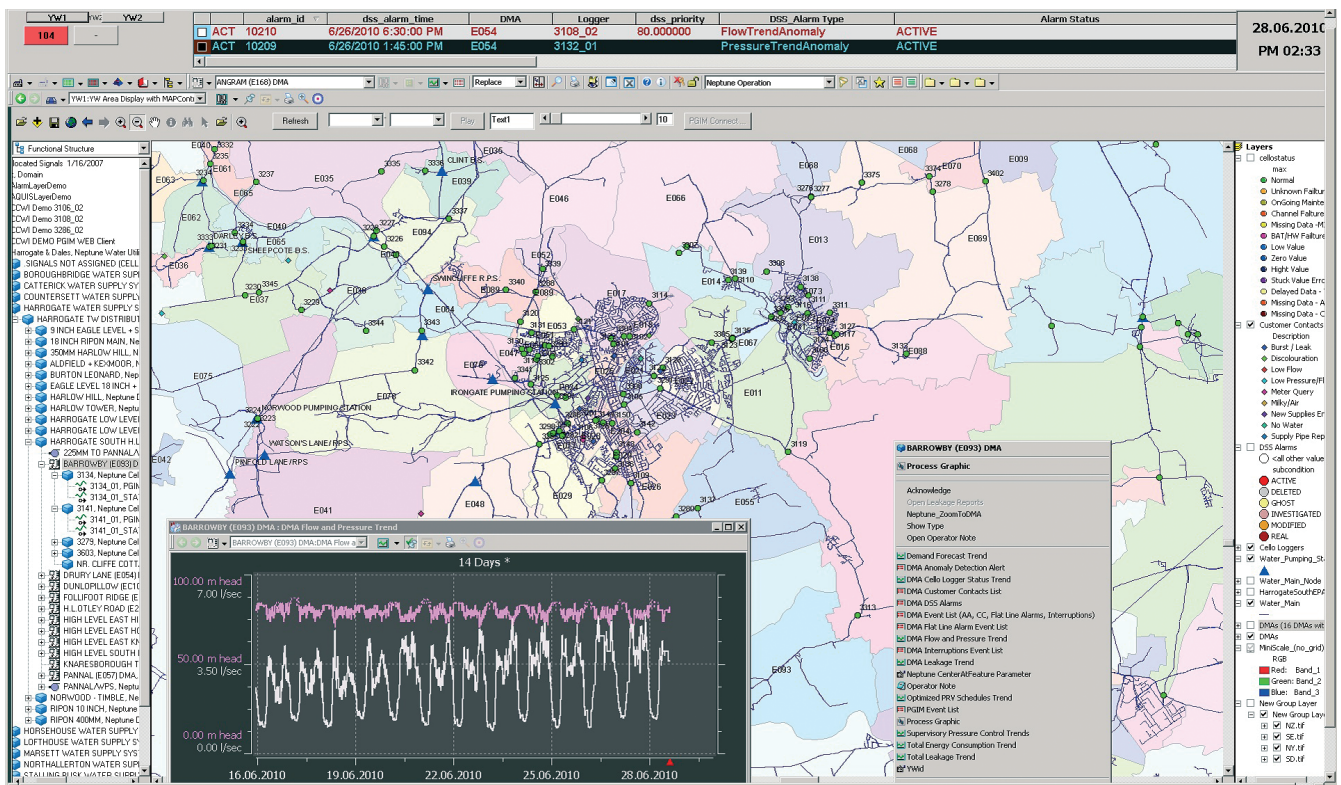
Where leakage is concerned, an effective management strategy should comprise of two different elements. Active leakage management uses optimized pressure management to help minimize both new damage and existing leaks. Passive leakage management detects and locates additional leaks at an early stage and thus supports maintenance planning. As such, it tends to focus on the relatively small leakage flows occurring in the background rather than larger pipe bursts that can be identified and located relatively quickly. It is estimated that only 10 percent of the water losses in well-monitored and controlled networks are caused by larger pipe bursts, with the remaining 90 percent accounting for smaller, less easily identifiable leaks.

Reducing real water losses to an economically acceptable level, the so-called economic level of leakage (ELL), requires targeted and coordinated measures to address leakage detection and location, pressure management, improved system maintenance and prioritization and implementation of repair measures.

The challenge

It is neither practical nor economically feasible to totally eliminate leakage from a water distribution network. Instead, network operators should strive to reduce losses to an economically acceptable level.

For water network operators, the challenge is to have the right equipment installed that will provide the most accurate picture of pipeline conditions. Ideally, this equipment should be able to be integrated into a centralized supervisory system providing an overview of the network, enabling effective planning and management of maintenance activities.



An effective leakage management strategy should combine both an active and a passive approach to ensure that as many leaks as possible are identified using a combination of flow measurement and pressure management.

A solution

Many leakage management schemes use a distribution network approach. This approach consists of creating leakage or pressure-management zones to help operators to gain an understanding of the flow or pressure variations occurring within specific parts of the network.

These zones are created by closing all boundary and circulation valves, with water being supplied through a single meter. Closure of a valve isolates a specific section of the zone. If there is a large drop in flow, then this will indicate a leak within that section.

One way of speeding up the process and gathering accurate data on flow and pressure within the zone is to use an integrated flow and pressure measurement device. This device can accurately measure pipeline conditions and relay the resulting data back to the network operator.



Coupling unrivalled accuracy with GSM communications and a choice of power options, ABB's AquaMaster 3 electromagnetic flowmeter offers the ideal solution for operators seeking to reduce leakage through accurate measurement in even the remotest of locations.

Integrated pressure sensing is just one of the extensive functions available in ABB's new AquaMaster 3 electromagnetic flowmeter.

These functions include GSM-SMS radio technology, enabling up-to-date information to be remotely collected from anywhere around the world. Providing immediate access to a host of flow data, GSM-enabled AquaMasters eliminate the time, cost and potential errors traditionally associated with the manual collection of flowmeter information.

Using the same technology as a mobile telephone, the AquaMaster can be contacted via a PC or laptop or through a mobile telephone via SMS messaging. Users can gain full access to the AquaMaster's three integral data loggers, two of which collect data on flow and pressure, with the third providing daily flow totalization. Data can be downloaded from the flow and pressure loggers, based on both a 15 minute and a high resolution one minute sample rate, to provide a range of information which can be used to pinpoint supply fluctuations and identify potential problems vital to water company leakage teams.

The integration of both the datalogger and GSM-SMS equipment into the AquaMaster has an additional benefit to leakage teams seeking accurate night line information as it eliminates quantization errors caused by counting from traditional pulses on discrete electronic or mechanical type meters. The AquaMaster's integral logger takes the flow rate data directly from the precise true flow rate measurement section of the flow meter and feeds this to the GSM-SMS section for wireless transmission.

Available in sizes from 10 to 600 mm ($\frac{3}{8}$ to 24 in), the AquaMaster 3 offers a choice of power options. As well as the existing mains and battery versions, an all-new renewable power version now also makes it possible to draw power from either solar or wind-powered energy sources.

A simple DC (6 to 21 V) connection can be hooked up to sources as small as a 5 W solar panel or 60 W equivalent wind supply. When coupled with its use of super capacitor energy storage technology, this feature totally eliminates the need for either mains or battery power, ideal for highly remote locations.

With a turndown ratio of 1000:1, the AquaMaster offers unrivalled accuracy across an extremely wide range, enabling even the smallest and most difficult leaks to be quickly pinpointed and rectified.

As a further assurance of a robust metering regime and lifelong accuracy, ABB also offers users its CalMaster2 in situ verification service for the AquaMaster 3. Performed by an ABB service engineer, this service verifies a meter's current operational status and also predicts any potential future faults. Users are issued with traditional calibration verification certificate complete with an uncertainty statement.

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