ABB MEASUREMENT & ANALYTICS | APPLICATION DESCRIPTION

Optimizing industrial water use through flowmetering

Enhancing accountability through using ABB's WaterMaster electromagnetic flowmeter

Improving understanding of site-wide water usage in industrial applications through accurate flow measurement

Measurement made easy

Enhancing accountability through using ABB's WaterMaster electromagnetic flowmeter

Introduction

For companies to identify their water footprint and find ways to improve it requires a detailed understanding of their current consumption, including any areas where water may be being lost. A thorough water measurement regime on an industrial site should focus on the accurate measurement of both the clean and waste water parts of the process.

Measurement is necessary for a number of reasons, including:

- where an organization abstracts its water from a local supply, to measure the amount abstracted and determine whether the quantity is within permitted limits
- to help assess the efficiency of the production process(es)
- to help establish a water mass balance between the amount of water entering the site, the amount consumed and the amount discharged to waste
- to ascertain how much water may be being lost in transit around the site
- to help identify areas where water consumption could be reduced through greater efficiency and to assess the performance of any on-going water efficiency programs
- Where waste water is concerned, to help satisfy any legislation relating to disposal
- To help identify potential scope for savings in the water treatment process

The application

There are various ways that industrial companies can measure their water consumption. Meters can be deployed around a site to monitor individual processes or to measure and compare the difference between the incoming supply and the quantities discharged.

This information can be used in a number of ways. Where water is abstracted, for example, an accurate measurement will ensure that the company is within its prescribed limits and is being correctly charged for the amount of water it is using. Alternatively, any discrepancy in the water balance may point to leaks across the site, which can then be pinpointed and addressed.

Monitoring the amount of water consumed by a process can also help to encourage staff to find ways to use supplies more carefully. In food and beverage applications, for example, water use can be reduced by optimizing cleaning in place (CIP) processes (see Figure 1) or turning off supplies when they are not needed.

Water metering can also play a key role in improving the efficiency of steam systems. Measuring boiler feedwater and comparing it against the steam output of the boiler can help to assess overall steam raising efficiency, which can then be used as the starting point for any subsequent maintenance.

Companies may also use water meters to quantify the amount of waste water from their processes, either for legislative purposes or to help find ways to reduce wastage, which can also help to minimise subsequent treatment costs.

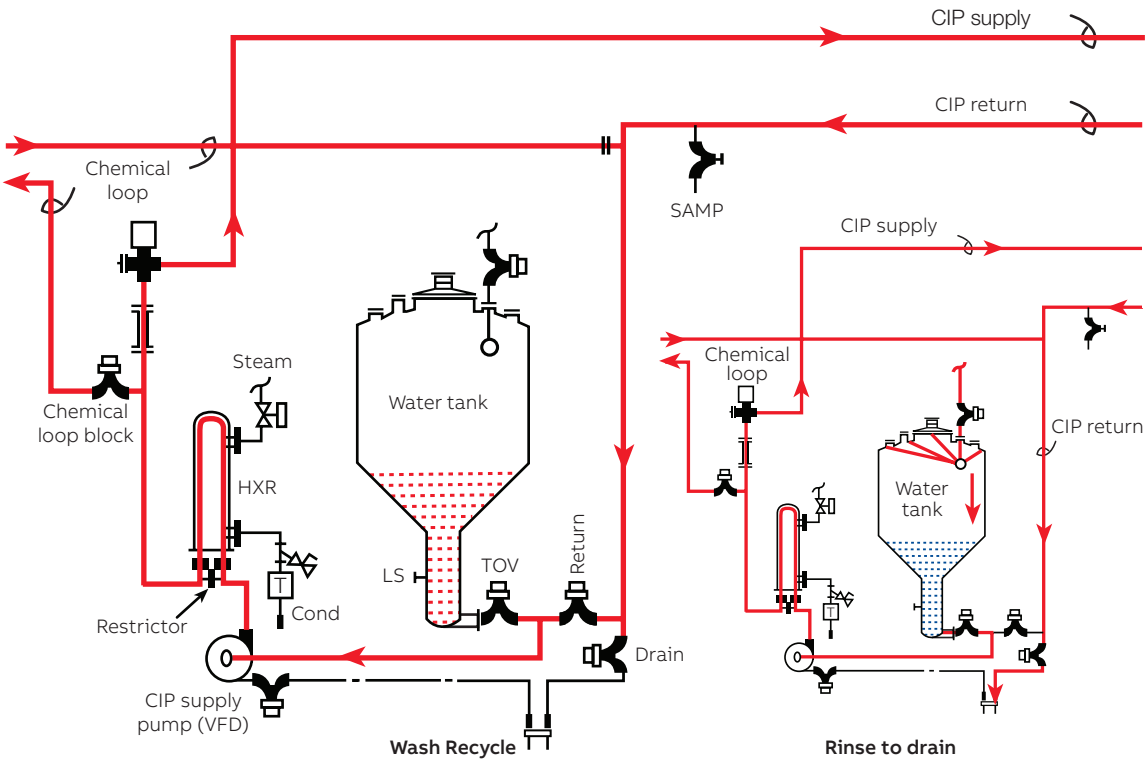

Figure 1 Flow measurement can play a major role in helping to promote greater water efficiency of cleaning in place (CIP) systems in industrial processes.

The challenge

As the data collected on water consumption will be the starting point for any efficiency improvements, it is important to ensure that the flowmeters selected offer the best longterm accuracy, repeatability and reliability for the task.

With space at a premium across many industrial sites, it is also necessary to consider not only the size of the meter itself but also any associated requirements relating to pipe lengths and mounting arrangements. Taken together, these may greatly increase the overall size of a flowmeter installation.

With moving parts subject to wear and tear, mechanical meters can quickly suffer reduced accuracy, leading to either under or over-registration of flows. Furthermore, the need for mechanical meters to be periodically tested, recalibrated and repaired means that they have to be removed, requiring users either to replace the meter with a temporary device or cease measurement until the meter is refitted back into the line.

Ultrasonic flowmeters also suffer various drawbacks which can make them unsuitable. Transit time meters in particular can struggle to handle flows with high levels of particulate matter, requiring a strainer to be fitted. Both transit time and Doppler meters can also be affected by velocity profile distortions, requiring from 10 to 40 upstream diameters, depending on the severity of the disturbance. The turndown of ultrasonic meters is also limited within an ideal range of 20:1 to 40:1. Ultrasonic meters can also be difficult to install and set up, especially where high accuracy is required.

As a further consideration, there may also be the need for data from the meter to be accessed from a central location, particularly on large, dispersed sites or where the meter is situated in a hard to reach location.

A solution

Electromagnetic flowmeters offer a good alternative for water distribution applications. Compared to other flowmeter types, electromagnetic flowmeters offer greatly enhanced accuracy and repeatability throughout their operational life, with uncertainty of ±1 % reading or better. With no moving parts, they do not suffer from problems with wear and tear, minimizing maintenance and require no upstream strainers to filter sediment. A choice of flow primary linings affords further protection against coating and high sediment flows, with users able to choose from a variety of materials, including ceramic linings for particularly abrasive flows.

The ability of electromagnetic flowmeters to better handle distorted velocity profiles also reduces the amount of piping upstream and downstream of the meter.

Modern electromagnetic flowmeters are also capable of being buried, eliminating the need for the construction of costly installation chambers.

ABB's WaterMaster electromagnetic flowmeters are highly suited for use in water distribution applications. Available in sizes from 10 to 2400 mm (3/8 to 96 in), the WaterMaster flowmeter range brings a host of advanced features and functionality for water measurement.

A key feature is the WaterMaster's revolutionary octagonal sensor design. By improving the flow profile, the octagonal design minimizes the upstream and downstream pipe lengths required from the point of installation, greatly reducing the cost of fitting the meters into new or existing pipelines.

The WaterMaster also features onboard verification capability. Called VeriMaster, it assures operators of the performance of the meter through constant self-checking. When coupled with ABB's VeriMaster software tool, it enables operators to produce a printed verification certificate for regulatory compliance.

The effects of signal noise are also reduced by the WaterMaster's use of advanced Digital Signal Processing (DSP) technology. This enables the WaterMaster's transmitter to separate the real signal from the noise, providing high quality outputs especially in harsh environments involving vibration, hydraulic noise and temperature fluctuation.

All WaterMaster sensors have a rugged, robust construction to ensure a long, maintenance-free life even under the most difficult conditions experienced in water and waste water applications. The sensors are inherently submersible (IP68, NEMA 6P) as standard, ensuring suitability for installation in chambers and metering pits which are liable to flooding.

All sizes of the WaterMaster are buriable and are straightforward to install, with installation merely involving excavating to the underground pipe, installing the sensor and wiring the factory pre-potted cabling to the transmitter and then backfilling the hole.

Operation has been simplified by the use of ABB's universal Human Machine Interface (HMI), which has now been extended across its range of instrumentation products. Based on Windows™ technology, the HMI simplifies operation, maintenance and training, reducing cost of ownership and providing a consistent user experience. Data can also be accessed remotely via HART™, Profibus DP™ and Modbus™ communications.

Installation is further simplified by the WaterMaster's 'Fit and Flow' data storage feature. On initial installation, the self-configuration sequence automatically replicates into the transmitter all calibration factors, meter size and serial numbers as well as customer site-specific settings. This eliminates the opportunity for errors and leads to increased speed of start-up.

Measurement integrity is ensured by redundant storage of data in both the sensor and transmitter memory, which is continually updated during all operations. The on-board sensor memory eliminates the possible problems associated with pluggable data memory modules.

The WaterMaster is proven to be robust and reliable, with unmatched diagnostic capabilities providing the right information to keep the process up and running. Alarms and warnings are classified in accordance with NAMUR NE107.

The meter is also verified to OIML R49 type 'P' requirements to ensure the highest accuracy and long term performance of the system by continuously self-checking the sensor and transmitter in the field.

All ABB flow meters are designed and manufactured in accordance with international quality procedures (ISO 9001) and are calibrated on nationally-traceable calibration rigs to provide the end-user with complete assurance of both quality and performance.

Deploying ABB's WaterMaster electromagnetic flowmeters across industrial sites can enable plant operators to gain a greater understanding of their water use.

Acknowledgments

- HART is a registered trademark of the FieldComm Group
- Modbus is a registered trademark of Schneider Electric USA Inc.
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