Process metering at Anglo American's eMalahleni Water Reclamation Plant (EWRP)

case study
metering

Challenge

To demonstrate metering of water and slurry flows at several measurement zones along a single fibre within an operating minewater treatment plant.

Solution

Silixa used a single optical fibre circuit to install a multizone metering system on several processes at eMalahleni Water Reclamation Plant (EWRP, Witbank) on pipes ranging in size from 165 mm to 300mm. Metered flows including reverse osmosis manifold water, clarifier underflow slurry, and minewater slurry feed. Flow data was updated once per minute, and compiled data was transmitted automatically via email from South Africa to the London office every 24 hr. Data compilations were provided to the site over the duration of the 6 week pilot.

Results

Flow rates were monitored successfully in each zone. Flow measurement output from the reverse osmosis process provided process insight along a manifold which would have been burdensome to instrument with conventional means. Over the course of a month period when both iDAS and reference sensors were functioning, the accumulated flow rates for the calibrated minewater and slurry flow rate zones were accurate to 1.5% and 0.5% respectively.

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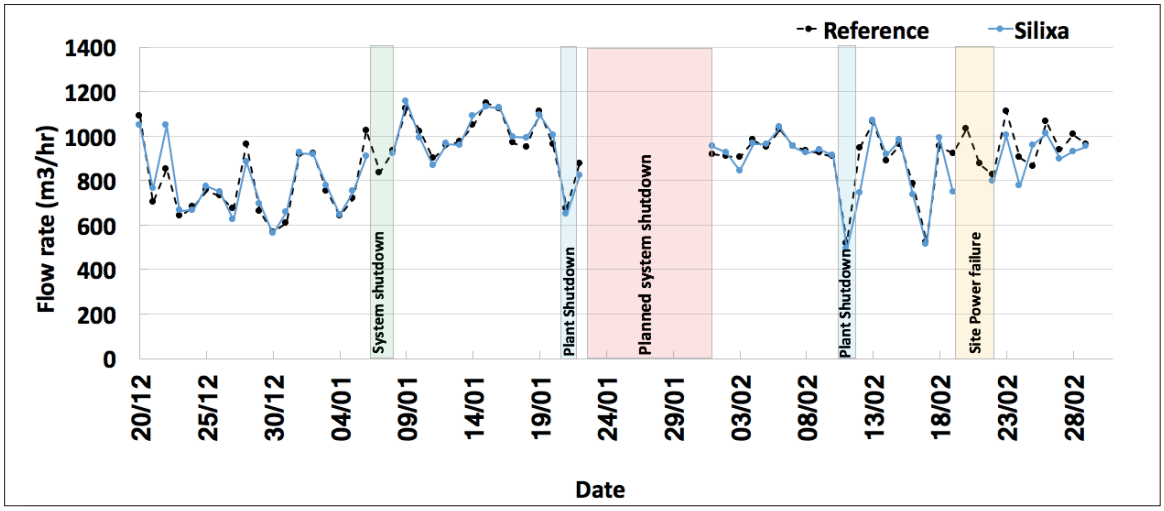
Introduction

Silixa was commissioned by Anglo American to execute the worlds' first pilot installation for a nonintrusive, multizone process flow metering system based on distributed acoustic sensing (DAS). The pilot was executed at eMalaheni Water Reclamation Plant (EWRP), where 30 ML per day of acid mine drainage (AMD) water is reclaimed from local coal mines for use as both drinking water and within mining operations. This metering installation featured liquid and slurry handling lines (made from both steel and HDPE) ranging from about 165mm to 400mm in diameter. Similar to many plants of this scale, the desire for flow systems control is challenged by the need for low-capex, reliable sensors that can be retrofit unobtrusively without disrupting normal operation.

During this pilot, 6 separate liquid flow zones in 3 different regions of the plant were instrumented using a single optical fiber. Zone 1 of the installation featured a large scale HDPE water supply line feeding water from the surrounding mines into the plant. This pipe is metered continuously using a conventional magnetic flow meter, making it straightforward to obtain reference flow rates. The HDPE flow line in Zone 2 handles water processing slurry, the solids fraction of which varies over time from approximately 10% to 35%. Zones 3-6 were installed on a multibranch stainless manifold handling reverse osmosis (RO) process flows. Reference data in this last region of the plant was obtained via a clamp-on ultrasonic meter. During the course of the 6-week pilot, flow rates were monitored continuously using the distributed optical system, and automatically uploaded from the plant in rural South Africa to the Silixa Headquarters in London. Flow rates obtained using this technique were compared with the rates obtained by Anglo American using conventional sensors. It was seen that the sensing layout was straightforward to install, and that the flow rate measurements were in good agreement with conventional sensors as shown in the figure below.



Mine Water Flow Rates (400mm diameter, HDPE)

Conclusions

Silixa's metering makes it possible to use distributed acoustic sensing technology for the purpose of nonintrusive process metering throughout a plant without the need for communications hardware or system power. Sensing fibre is easy to deploy, and output can be customised according to the needs of the user.

Reference: Finfer, D., P. Newman, N. Rein, M. Amir. Pervasive metering of minewater flows and process water using distributed acoustic sensor technology, SAIMM "Water 2017", Johannesburg, 10-11 July 2017.