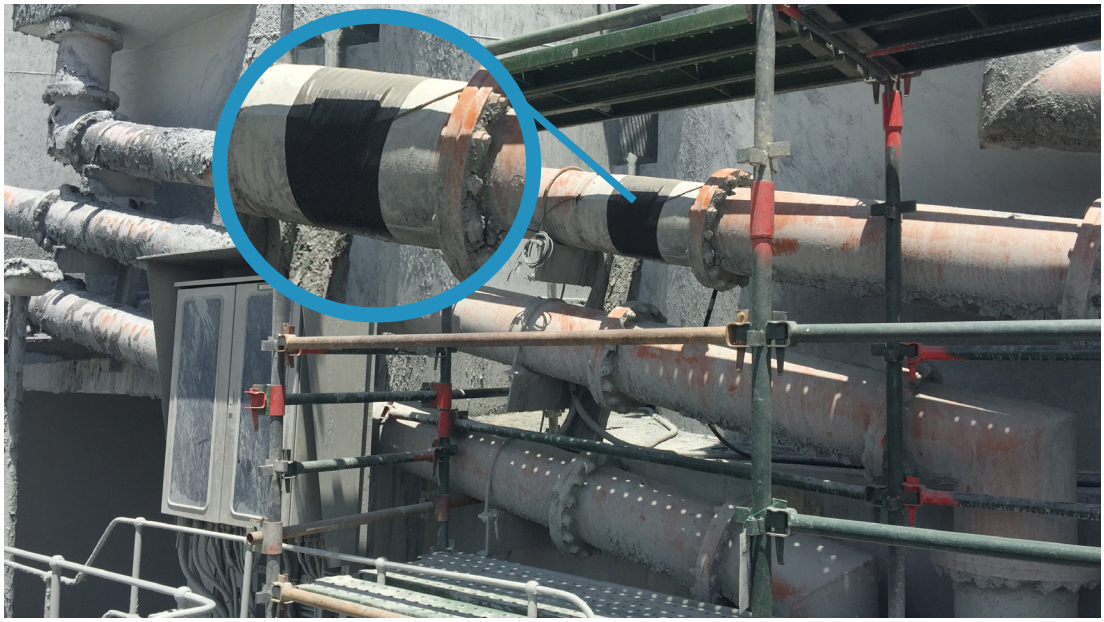
Flotation Process Metering

case study
mining



Challenge

Non-intrusive, direct measurement of water, slurry, air, and concentrate flows in a flotation circuit.

Solution

Anglo American's FutureSmart Mining™ and Anglo Platinum collaborated with Silixa to pioneer the use of non-intrusive distributed fibre optic sensing for mass pull control. In early 2017, an installation at the AMPLATS Mogalakwena North Concentrator was executed whereby a single, continuous length of optical sensing fibre was used to meter a variety of flotation flows including water, slurry, air, and concentrate flows. The results indicate that this new technology can meter many process flows simultaneously throughout flotation plants using nonintrusive instrumentation, and is therefore a powerful tool for closed loop flotation plant control.

Results

It was demonstrated that the system has the ability to measure gas, liquid, slurry, and, critically, concentrate flows; and that data could be delivered on a real-time basis to the site SCADA system. Since the sensing system is straightforward to retrofit in brownfield environments, and requires only low-cost, non-intrusive optical fibre to enable sensing, metering solutions can be envisaged whereby this technology will measure the concentrate and tailings flow from all flotation cells even within a large plant. Further, it was demonstrated that the same optical sensing circuit used for measurement of slurry flows can also be used for metering air addition flows. As a result, the implementation of this technology could have positive implications for both mass pull and peak air control strategies in flotation metallurgy.

Silixa Ltd
230 Centennial Park, Elstree
Hertfordshire, WD6 3SN, UK
T: +44 (0) 20 8327 4210 F: +44 (0) 20 8953 4362

LONDON | HOUSTON
www.silixa.com

Silixa LLC
16203 Park Row, Suite 185
Houston, TX 77084, USA
T: +1 832 772 3333 F: +1 832 772 3530

Introduction

Flotation process control can be used to maintain production set points, achieve robustness against ore grade variability, and minimise the use of process water. Control methods such as mass pull control theoretically rely on the presence of flow sensors throughout the plant. However, practical considerations dictate that the metering of flows in flotation banks is often limited to main feeds, concentrate from sumps, final tailings, and central air measurements.

A pilot was executed to evaluate the potential to use fibre optic distributed acoustic sensing (iDAS™) for the purpose of identifying whether this technology can be used to obtain high granularity flow measurement on high numbers of flows throughout the entire flotation process. In this initial flotation pilot, a process metering fibre optic circuit was installed at Anglo American's Mogalakwena North Concentrator including a single flow measurement for each of the following: slurry feed, aeration, concentrate, and sump. All measurements were made simultaneously using a single length of optical fibre.

Results

Flow was successfully measured at each of the instrumentation zones, demonstrating that water, air, slurry and concentrate flows are all realistic measurement applications for this technology. As a result, this technology can be applied in large flotation plants to provide direct measurement of concentrate production on a cell-by-cell basis.

The pilot has highlighted several features of the sensing architecture which make the optical system well-suited to the flotation sensing application. (1) The system can be installed non-intrusively, making it possible to execute large scale installation operations without impacting plant production. (2) The metering system is multiplex-capable, so multi-zone installations incorporating as many as 20 independent metering zones can be incorporated along a single optical path. (3) The layout can be adapted to changes in the plant layout over time, for instance in cases where pipe sizes are changed by plant management (4) Data integration and advanced modelling can be accelerated as a result of the fact that multiple fluids, such as water, slurry, concentrate foam and air, can all be measured using a single optical network.

Installation on the air feed line.

Conclusions and impact

The integration of this new method for flow sensing in plants presents the opportunity for real-time insights on flotation processes, and the straightforward implementation of Advanced Process Control (APC), even in brownfield operations. Use of this solution at flotation plants, even in parallel with camera systems that may already be in place, is anticipated to facilitate a 0.5%-1% recovery improvement. Efficiency improvements of this order equate to an ROI of less than 3 months for high capacity metals concentrators.