APPLICATION NOTE

Minerals & Mining

Flow measurement of flotation air for roughers

- Reliable control of agitation air supply for separation of PGM and gold ores in flotation cells
- Variable area flow measurement of air consumption enables energy-efficient froth flotation
- Cost-effective replacement of calorimetric sensors provides fast return on investment

1. Background

Froth flotation is a crucial step in the concentration and liberation process used to separate valuable metals such as gold or platinum-group metals (PGMs) from mined ore. It relies on the hydrophilic or hydrophobic surface properties of minerals. In simpler terms, the process involves placing a slurry from the milling and classifying circuits into agitated cells mixed with water. By introducing specific reagents and high volumes of air, bubbles are generated and come into contact with mineral particles that attach to the oxygen molecules. While the gangue, or unwanted material, sinks as tailings, the valuable minerals attach to the bubbles, forming a mineral rich froth layer on the surface. This froth is then directed into a dedicated launder channel for further processing and concentration.

A mining business in South Africa operates a multistage circuit with several flotation cells (roughers), scavengers and cleaner cells. This allows it to recover as much valuable minerals as possible from UG2, Merensky and Gold reef ores.

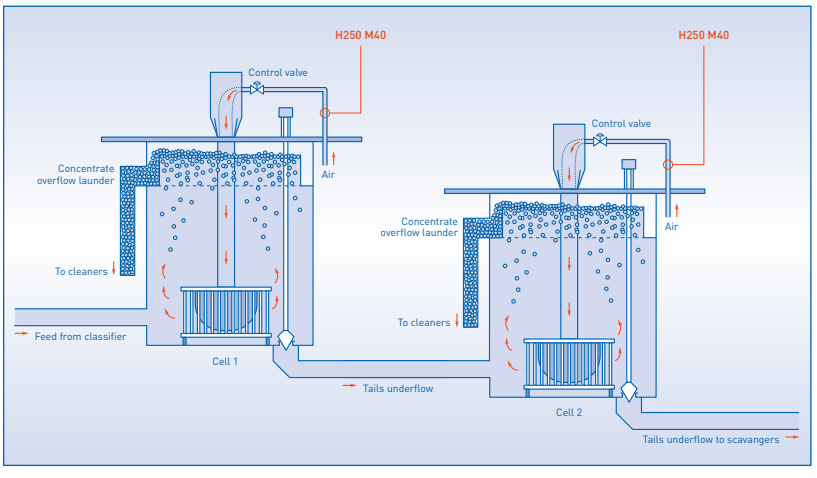
2. Measurement requirements

Stable process conditions are essential for flotation. One of the most important parameters monitored by the customer in this process is the air supplied to the flotation cells. The air is fed into the process at low pressures of 48...55 kPa and must be measured independently for each rougher. The company had previously tried to control the flotation air volume flow rate by using calorimetric sensors. However, this sensor type required regular maintenance and replacement, sometimes even every month. The regular replacement of the sensors had revealed repeatability issues, which affected the overall control performance. The sensors did not have integrated volume flow rate calculation and only provided information on the flow velocity. Once the transmission of the readings was interrupted, there was no reading available as these devices also lacked a local display. The customer was therefore searching for a more long-term stable and robust flowmeter. They demanded that OPEX and CAPEX of the new instruments be much more beneficial than of the previous sensors.

KROHNE

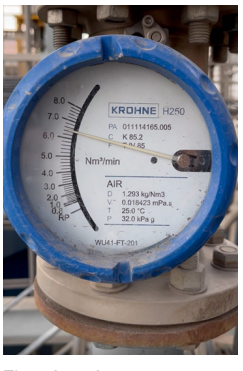
3. KROHNE solution

The mine operator replaced more than 40 calorimetric sensors with the H250 M40 variable area (VA) flowmeter. The KROHNE flowmeter was installed in DN80 and DN100 supply lines for volumetric flow measurement of agitation air. The device transmits its readings to the control room via its 4...20 mA/HART output. In addition, the mechanical indication of the variable area flowmeter allows on-site monitoring of the readings. The stainless-steel design of the sensor tube and float makes the H250 M40 very robust against corrosion for many years to come.



Simplified process scheme of flotation

Since the flowmeter is modularly extendable, its functionality can easily adapt to new requirements, e.g. if the operator considers digital integration of the flowmeters into a fieldbus system or needs additional diagnostics such as continuous float monitoring to predict float blockages. Unlike the previous calorimetric sensors, the H250 M40 electronics can be serviced at any time without process interruption if needed.



Flotation air measurement with H250 M40

4. Customer benefits

The mine operator benefits from a reliable and long-term stable flow measurement of agitation air with a good repeatability. The actual flow rates are reported to the PLC for a process control loop in accordance with the targeted frothing speed. The flotation cells can be managed more effectively as a more stable air supply is achieved. This has helped the customer increase the grade and yield of the concentrate, contributing to additional revenue gains in the end. The improved flotation performance also translated into reduced costs. The consumption of costly frothing agents can be kept to a minimum and air compressor capacity is only used as required, reducing energy consumption.

The KROHNE flowmeters have meanwhile been in operation at the site for many years without any drift. Since there has been no need for regular maintenance and replacements, the customer has long since achieved its return on investment (ROI). As compared with the previously used calorimetric sensor the ROI of the cost-effective KROHNE VA meter materialised no later than one month after installation. In addition, the customer also stands to gain from increased field operator efficiency since a local display is always at hand, which facilitates daily inspection, especially when it comes to mitigating process chokes. Should the customer need an upgrade or any kind of maintenance, the device can be easily serviced without affecting plant uptime.

5. Product used

H250 M40

- Variable area flowmeter for liquids and gases
- Modular design: from mechanical indicator to 4...20 mA/HART®7, FF, Profibus-PA and totalizer
- Any installation position: vertical, horizontal or in fall pipes
- Flange: DN15...150 / ½...6"; also NPT, G, hygienic connections, etc.

Contact

Would you like further information about these or other applications?
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