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Informed and in-depth editorial on the world mining industry

PRECIOUS WATER:
needs best management practice

FLOTATION:
new ideas and technologies

KIRUNA:
a world greatest underground mine

WORKHORSES:
underground

Top flotation

IM looks at some of the latest innovations aimed at getting more from the flotation process

At Prominent Hill a B5400/18 model Jameson Cell is used in a cleaner scalper duty treating the discharge from the IsaMill™ regrind mill to produce a final grade copper concentrate

Optimisation of flotation cells is a constant need for profitability in the flotation section of the concentrator. Most, older flotation cells use a displacement float below the froth layer to measure the pulp height. Pulp height is an extremely important process measurement, used to ensure that liquid pulp is not allowed to overflow to the launders. If pulp overflows, the flotation cell ceases to function effectively, which is very costly to the process. The displacement float technique is limited in performance in a variety of ways: the float may at times stick, slurry builds up on the float mechanism changing the effective specific gravity tracked, they are affected by high agitation, etc.

Hawk has developed a very low frequency "Acoustic Wave Transmitter" that is non intrusive and will penetrate through the froth to measure the pulp height. The Hawk sensor is mounted above the froth and pulp height, so it has no maintenance or mechanical problems. Typically the transmitter can be mounted at walkway height for easy serviceability. The low frequency level transmitter can be supplied ready for connection to the typical two-wire loop power supply used for the displacement float transmitter which it is replacing. Remote mounted transmitters are also an option.

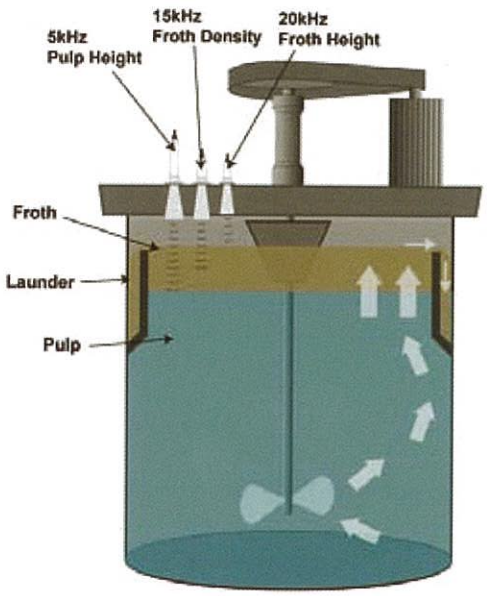
Hawk also provides as an option, a non-intrusive transmitter to measure the froth height. Continuous measurement of the froth height, provided as feedback to the control loop for the inlet 'Dart Valve', allows a flotation cell to maintain constant overflowing of froth to the launder, even when the orebody type may produce variations to frothing consistency. Small changes in the pulp height to keep the froth overflowing at all times will increase the efficiency of the cell and consequently increase profitability. Hawk says its transmitters will reliably measure froth height, even when froth density changes.

Hawk also provides a third type of transmitter to measure relative froth density. Higher density froth will have greater entrainment of mineral going over the launder. Currently, Hawk says, density measurement is not widely used due to the degree of difficulty in making an effective online density measurement in each flotation cell. Bubbler type pressure transmitters have been commonly used, though they have high maintenance costs due to their intrusive installation. A non intrusive transmitter that penetrates partly through the froth gives an output proportional to density. Data from the froth height transmitter is used with the froth penetration (density) information. Monitoring of the deviation between froth height and froth penetration allows the control system to track relative froth density - all non intrusively. Relative density data can be used to actively control density through a feedback loop, regulating forced air flow into the flotation cell. Air input is currently largely controlled manually by onsite operators.

Hawk's low frequency transmitters require no maintenance due to their self cleaning nature. The high powered acoustic wave being transmitted will automatically clean the sensor face with every measurement pulse. Self cleaning minimises buildup on the sensor facing which would otherwise prevent it from measuring accurately. Buildup is a significant problem in the mining industry due to the dirty nature of materials being handled, and also the presence of moisture and dust in the environment.

20+ years of success

The Jameson Cell is an efficient high intensity flotation technology marketed world wide by Xstrata Technology. With nearly 300 cells installed globally, the technology has been continuously developed and improved over



Hawk's low frequency, non contact transmitter penetrates froth and measures pulp height, froth density and froth height

two decades. The current Mark IV model is the easiest to operate and maintain yet, Xstrata Technology says.

In metals applications, Jameson Cells are specifically designed for duties which best use its attributes. Due to its fine bubble generation and high intensity it is able to float liberated fast floating mineral particles very rapidly, with its froth washing capability producing high grade concentrates in a single stage of flotation. Jameson Cells are usually integrated into circuits in combination with conventional cells, with the faster floating minerals recovered by the Jameson Cells, while the slower floating minerals are recovered in the conventional cells. For this reason Jameson Cells are best used for:

- Prefloat duties to remove naturally hydrophobic gangue minerals upfront prior to valuable mineral flotation
- Pre-roughing duties where it can produce a final grade concentrate in a single step if liberated fast floating minerals are present. This reduces downstream flotation capacity
- Roughing duties where it can produce high grade concentrate and high recovery using a single cell
- Precleaning (also called cleaning scalping) where again, liberated fast floating minerals can be recovered to the final concentrate. This reduces downstream cleaning capacity. If rougher concentrate regrinding is required, removing already liberated material means less over grinding and a saving in energy.

Le Huynh, Senior Processing Engineer for Xstrata Technology says the high throughput and small footprint of the Jameson Cell means it can offer versatile solutions to increase existing plant capacity. With no moving parts and no need for blowers or air compressors it is simple to install and commission so can be brought online very quickly.

Recent Jameson Cell installations in base metals include the Prominent Hill mine in South Australia, where a B5400/18 model Jameson Cell is used in a cleaner scalper duty treating the discharge from the IsaMill™ regrind mill to produce a final grade copper concentrate. Froth washing in the cell enables excellent rejection of penalty elements such as fluorine and uranium.

In the brownfield expansion at the Cosmos Mine in Western Australia, a Jameson Cell was installed as a pre-rougher cell which treats feed from primary grinding. It is able to produce a nickel concentrate grade that is higher than that of the cleaner circuit.

Although now more common in the base metals and coal industries, Le Huynh said that the Jameson Cell technology is making significant inroads into industrial minerals such as the potash and phosphate industries. Oil sands flotation is another area with great potential, with the first full scale installation commissioned this year. She said its efficiency, ability to achieve high concentrate grades, high recoveries in a single cell of very small volume and its robust operation makes it a very attractive option in these applications.