

Optimising mill circuits for best efficiency impact

Decades of product evolution have given FLSmidth a range of solutions – including its LoadIQ smart sensor technology – to supply and optimise all the technology in grinding circuits.

According to Terence Osborn, director for the regional product line and key account manager at FLSmidth, grinding typically accounts for about a 30% of the operational cost of a concentrator plant. Energy, liners and grinding media are among the many elements that make up this substantial cost. In addition, the milling circuit as a whole consumes about 50% of the concentrator plant's power demand.

"Any improvements, however small, that a mine can make in the efficiency of milling and grinding can therefore have significant financial benefit," says Osborn. "This is why FLSmidth has compiled an enviable portfolio of technical hardware and software serving the comminution space."

This full suite of equipment allows FLSmidth to design the most efficient grinding circuits. In addition to semi-autogenous and autogenous grinding mills, the company's offering includes a wide range of slurry pumps and cyclones. For optimal performance, its SmartCyclone™ technologies automate the monitoring and control of cyclones, providing real-time data on key indicators such as spigot wear and roping. He highlights that integrating the performance of all aspects of



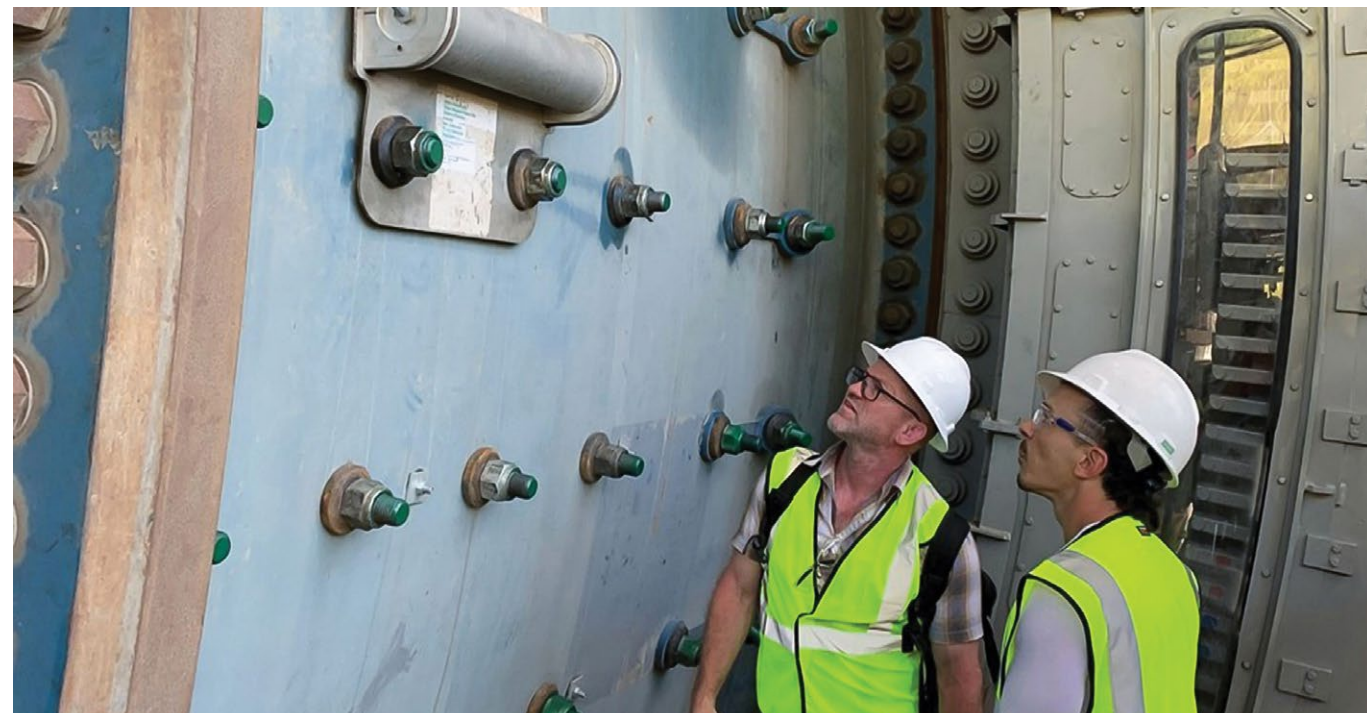
Left: Heavy duty FLSmidth MillMAX slurry pump purpose-designed for abrasive mill discharge pumping applications with grinding circuits. Right: A Field SmartCyclone user interface unit, which allows for operator intervention when poor cyclone performance is detected, allowing for optimised cyclone classification in a milling circuit.



the circuit is vital to the company's value-add proposition.

An important recent step in this process was the acquisition of technology company KnowledgeScape, which places FLSmidth in a leading position to offer a plant-wide digital optimisation solution. This capability enables

customers to reduce operational costs and environmental impact across the entire minerals processing flowsheet. "Among the new solutions acquired is LoadIQ, for monitoring and optimising the performance of semi-autogenous (SAG) mills," he says. "The SAG mill is a key element of many milling circuits



An FLSmidth wireless LoadIQ system installed on a mill shell, from which it gathers mechanical and operational data for enhanced decision making on the mill performance.

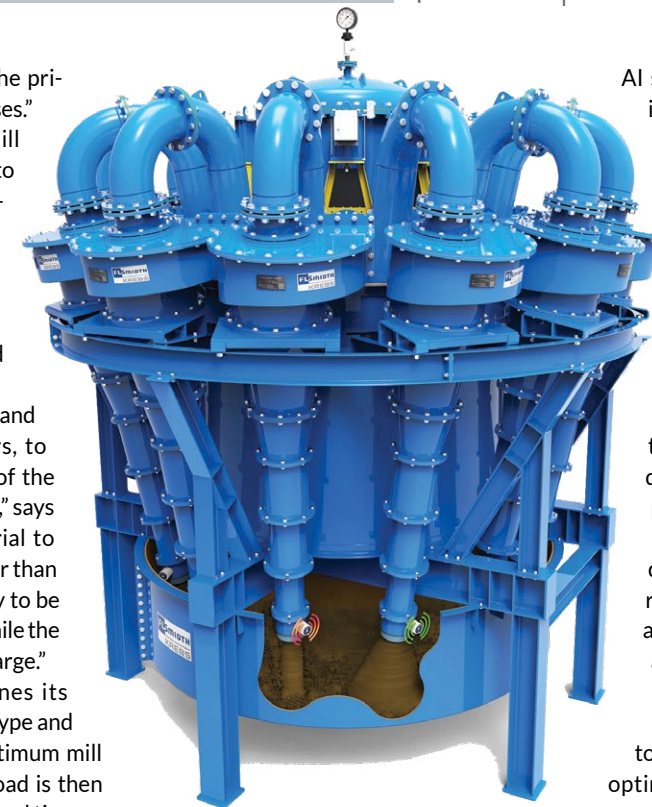
today, usually located between the primary crushing and ball milling phases."

LoadIQ utilises FLSmidth's mill scanner smart sensor technology to accurately measure volumetric filling and ore trajectory in real-time, according to Lineshan Naidoo, FLSmidth's regional product line manager for digitalisation for sub-Saharan Africa, Middle East and South Africa.

"The unit measures vibration and impact among other parameters, to ensure the optimal 'cateracting' of the media and particles inside the mill," says Naidoo. "It is vital for the material to cataract onto the charge toe rather than onto the liners. This allows energy to be optimised to promote breakage while the liners remain protected by the charge."

The technology then combines its readings with data about the ore type and liner profile to determine the optimum mill load and mill speed. The target load is then set automatically and adjusted in real time as grinding conditions change.

He highlights that LoadIQ has seen global success with about 60 units installed to date, mainly in the Americas. Customers using this solution have typically experienced mill throughput increases of 3% to 6%, with some customers benefiting from over 10% increases in tonnage. These values vary based



A FLSmidth classification cyclone cluster used in grinding mill circuits showing the implementation of the SmartCyclone system to detect cyclone roping and wear online.

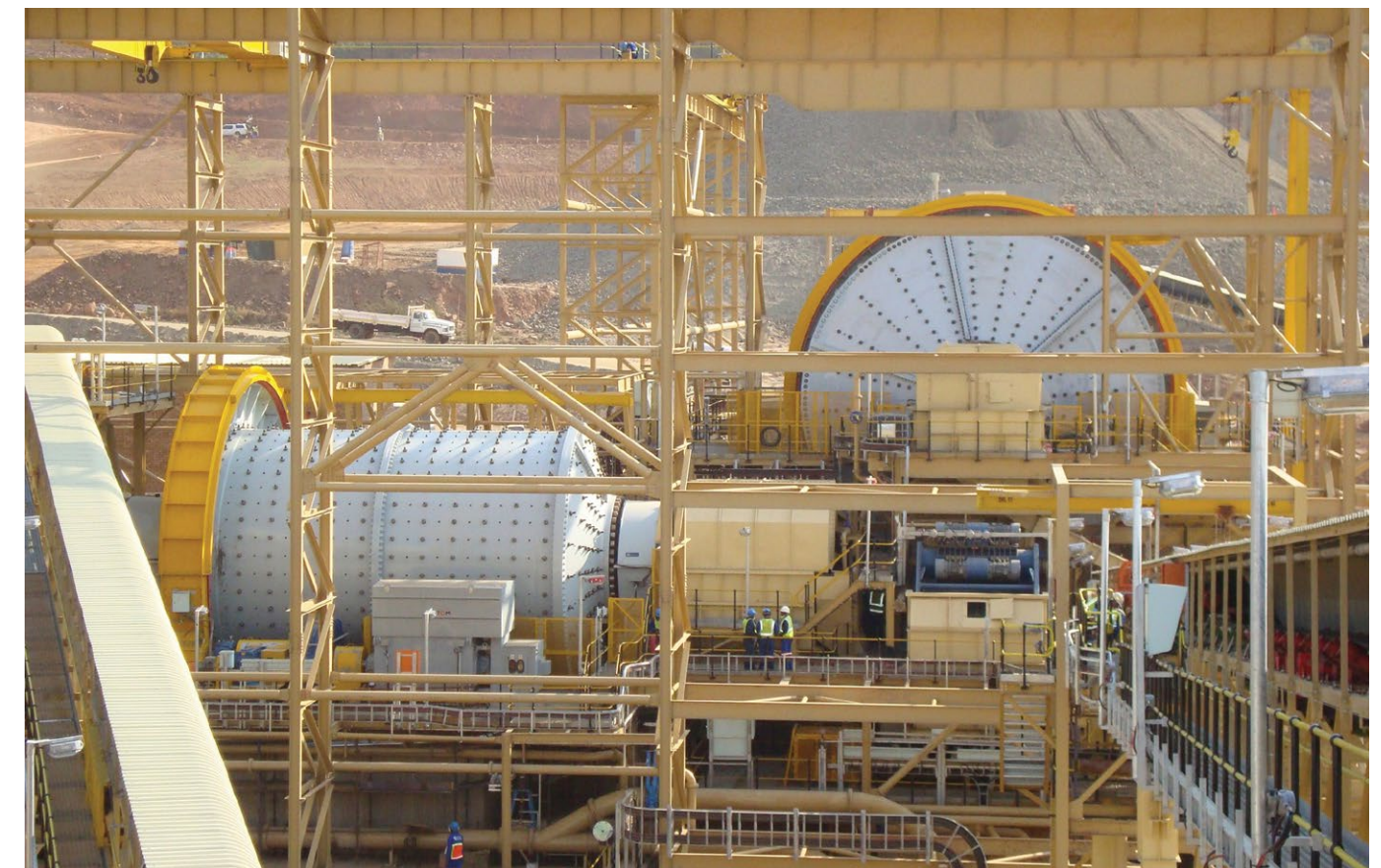
on a number of parameters such as ore characteristics and grinding circuit configuration.

Mines can also optimise mill load using a system of smart sensor technology and

AI software. In South Africa, FLSmidth is installing LoadIQ in a leading platinum producer's plant, where the strategic focus is on generating and analysing data for better decision making and prompt action. Osborn notes that the delay between data generation and the required decisions remains a real challenge in most process plants and technologies such as the LoadIQ are targeted at making more critical decision-making data available to the plant operation team enabling quicker adaption to changing operational parameters in as agile a way as possible.

"Process samples can take up to days to be analysed, while the material's residence time in the plant may only be a matter of hours," he says. "By the time any adjustment can be made to the process based on the data, considerable volumes of value mineral has been lost to tailings." FLSmidth's solutions therefore optimise key parameters such as bearing pressure, material density and power consumption in a continuous manner. He says the ECS/ProcessExpert software is able to make plant adjustment decisions consistently and accurately, and without fatigue. A South African nickel mine has been among the customers gaining high levels of success with this solution.

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FLSmidth designed and supplied the AG/SAG and ball mill operating in a nickel and PGM comminution circuit.