energy to perform the same task with vertical roller mills over SAG/AG mills.

"Yet, more than that, the ability to better control the grinding element, and the addition of an integrated classifier that operates via an air swept function, ensures you do not overgrind material."

Overgrinding has been pinpointed as a major target area for mining companies to address, realising that the production of excess fines and the use of excess energy for a task that does not always generate value represents obvious 'low hanging fruit'.

And, like some other vertical roller mills, Gebr. Pfeiffer's technology can offer higher recoveries at coarser grinds thanks to the ability to generate "micro cracks" through a grinding process made up of compression and shearing. Having been proven in test work, this is a particularly useful benefit given the coarse particle recovery trend sweeping through the mineral processing world, Dülfer acknowledged.

The MVR technology, which has a feed size of up to 175 mm, also operates in various operating modes – including a de-sliming mode for separating unwanted fines and impurities – and can make PSD adjustments on the fly to facilitate improved downstream recoveries.

And, speaking of downstream benefits, the ability to offer higher recoveries even at a coarser grind and the reduction in fines production leads to reduced water demand, reduced dewatering requirements in the tailings management process and, ultimately, reduced tailings generation.

In an environment where it is increasingly difficult to obtain new or extended tailings facility permits, this is an important advantage.

Dülfer says there are other ways of improving the downstream process in mineral processing applications, referencing the company's recent investment in **NextOre**.

Back in November, the two companies announced they were looking to integrate NextOre's magnetic resonance sensors and real-time bulk ore sorting with Pfeiffer's vertical roller mill technology for dry grinding as part of a strategic partnership.

Upstream of Pfeiffer's VRMs, NextOre's magnetic resonance sorters, in a greenfield project scenario, could reduce the concentrator size with the same amount of planned metal output, while eliminating reject material early in the process after primary crushing.

After the VRM has carried out its work in the flowsheet, potentially dry magnetic or density sorting could further reduce the follow-on water requirements in flotation or leaching.

Dülfer says the industry is waking up to these potential benefits, with the biggest impact likely to be seen in bulk commodities, naming copper and iron ore as examples.

He concluded: "We see an obvious place where our technology – and NextOre's – can help and assist with addressing the industry's megatrends."

FLS talks up energy efficiencies for all

FLSmidth also boasts an offering including vertical roller mills, with the OEM seeing the potential of this technology in a future dry grinding mining setup.

This potential is currently being firmed up at the company's dry grinding VRM pilot test facility at its Materials Testing and Research Centre in Salt Lake City in the US, among other options.

More broadly, FLS is developing several products and solutions relevant for a future where energy-efficiency and dry processing is a must at mine sites. Fundamentally, it is also evaluating wear part, equipment and process optimisation wherever possible, as well as looking to fit more efficient motors, drives and mill liners. Remote real-time monitoring, data-driven proactive maintenance and performance optimisation – much of which is tied to FLS' digital developments – are also available for all customers.

GMDs: built for variability

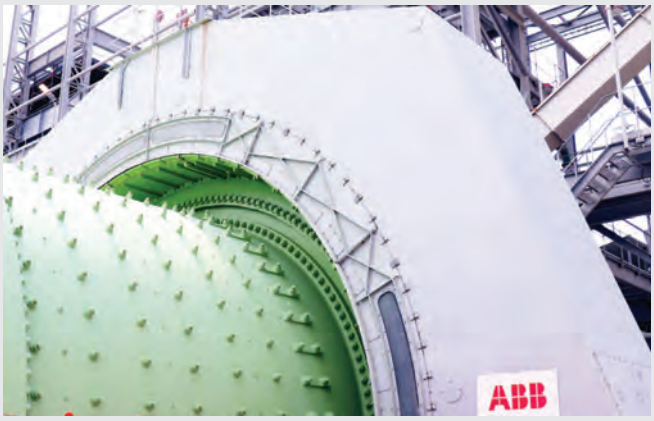
Could gearless mill drives offer a potential solution to the expected need to ramp up and ramp down grinding equipment in line with fluctuating renewable energy generation at mine sites in the future? ***IM*** found out from Nandhakumar Vijayakumar, Head of R&D at **ABB**'s High Power Rectifiers business unit.

IM: How do you see operators of large grinding mills coping with the fluctuating energy supply that comes with renewable energy-dominated grids?

NV: Gearless mill drives (GMDs) are a variable speed drive system. Hence, the fluctuation in energy supply can be handled by adjusting the mill operational speed. Thereby, its power consumption can be adapted to the renewable energy grid power availability. Typically, a grinding circuit has a SAG and two ball mills. When both SAG and ball mills have variable speed characteristics, the speed adjustment can be performed to match the energy availability.

As a possible mitigation solution to minimise issues in case of sustained lower energy availability from the grid, energy storage solutions like batteries can be installed. However, it needs to be pointed out that the main loss of time and revenue occurs when the grinding system is completely stopped. This has a consequence on the whole process, but most importantly, process restart time is linked to down time. The flexibility of the GMDs minimises this situation and is an asset for absorbing power supply disruptions with as few consequences as possible.

IM: How are you equipping your own drive systems to be able to cope with these fluctuations? Are they easily able to phase up and down in line with requirements and energy supply?



When both SAG and ball mills have variable speed characteristics, the speed adjustment can be performed to match the energy availability

NV: GMDs are equipped with a dedicated fast control system. This allows the GMD to alter its speed in a quick manner, thereby its power consumption. This adaptation enables its operation to cope with varying energy supply. Hence, it is straightforward to phase up and down.

One more point to be discussed is that renewable energy dominated grids are characterised by low short circuit power and low inertia. In such grids, voltage and frequency stability issues can occur. In this regard, GMDs can also contribute to grid stability by providing frequency support by its power reduction and voltage support through its ride-through function. As an example, one of the copper mines in Europe has an ABB GMD operating in a renewable energy dominated grid. This GMD currently provides frequency containment reserve service. Such services also provide additional revenue streams for the mine operators, especially in the reserve market.