measure the tonnage being processed,” Elias explained. “The processed ore is then dumped onto a 14-m-high stockpile.”

This plant is looking to solve a challenge that most – if not all – large copper mines face globally: an increase in pebble production relative to an operation’s ability to process said pebbles.

“What we’re seeing is that many of the existing pebble crushing circuits aren’t able to handle the extra capacity and, thus, are no longer fit-for-purpose,” Elias said. “As a result, a lot of miners are stockpiling vast quantities of pebbles.

“A decade ago, these were seen as less valuable, but, with declining ore grades, the value proposition has changed, and these unprocessed pebbles may hold the key to ensuring mining companies meet their production targets.”

ABB’s drive for efficiency
ABB, through its drive systems portfolio, straddles both camps in the aforementioned comminution space – operations using SAG/AG & ball mills, and those using HPGRs and vertical milling technology.

On the former, ABB has successfully supplied gearless mill drives (GMDs) to operations since 1969 – with its first copper installation coming in 1985. On the latter, it has supplied HPGR drive systems to high profile mines across the globe, like Southern Peru Copper’s Toquepala mine.

Like other companies and experts consulted for this article, ABB sees the relevant use of these technologies depending on the application at hand.

Wilson Monteiro, Business Line Manager, GMD, ABB, explained: “HPGR and vertical mills (such as Vertimills and stirred mills) have shown promise in some applications, especially for certain types of ores. However, when we compare the efficiency between the drive powertrain of GMDs, RMDs (ring-gear mill drives), HPGRs and Vertimills, the GMD is always more efficient due to its intrinsic construction characteristic.”

GMDs do not have an intermediate power transmission system, enabling an efficiency gain on HPGRs/vertical mills of around 2-4% depending on the model, according to Monteiro.

A wider awareness of this fact has led to ABB’s GMD sales surging over recent decades:

“It took us 32 years to reach a production of 40 GMDs, then we doubled the quantity in eight years, and then it took another 15 years to double it again, reaching, today, around 160 units sold,” Monteiro said.

With ore grades continuing to fall, Monteiro envisages the need for even larger GMDs than the 28 MW ones the company has supplied the sector to date. These GMDs will, he says, prove to be even more efficient in operation than using two or more HPGR/vertical mill units.

This efficiency is key when it comes to mining companies achieving their climate change goals, as Monteiro explained:

“The use of more efficient solutions will play a key role in future decision-making processes,” he said. “Any gain in efficiency, no matter how small, will have a huge impact on reducing carbon emissions. As mentioned before, the gearless motor technology offers the highest availability,
highest energy efficiency and the highest achievable power.

“We estimate that our GMD installed base is avoiding between 106,000-195,000 t/y of CO₂ emissions when compared with other grinding technologies. That is equivalent of taking 49,000-89,000 cars off the road every year.”

To achieve these emission reductions, companies need to not only purchase the equipment but more readily move from condition-based maintenance practices to predictive processes, according to Monteiro.

At the upcoming SAG 2023 conference in Vancouver, Canada, Monteiro and his colleagues will be presenting the latest features of its digital platform, ABB Ability™ Predictive Maintenance for Grinding, which aims to extend the lifetime of grinding assets through better use of resources and to support non-stop operation and avoid unforeseen downtime.

“We do believe that the mining industry still has some room for improvement in terms of more efficient operations,” Monteiro said. “Having a predictive maintenance culture and making use of the available state-of-the-art digital solutions is key to achieving this.”

Alongside this, ABB will also be at the event discussing the challenges associated with operating large grinding mill drives in renewable energy-dominated grids: a topic it believes will represent more of an ongoing challenge as more mines move towards zero carbon emission operations.

Derrick dealing with the fine print

This ongoing upstream evolution has a big impact on those further down the process flowsheet, as Baojie Zhang, Director of Application Engineering at Derrick Corporation, explained.

“Comminution and classification are advancing in different directions for different minerals,” he told IM.

“For example, many iron ore operators are grinding finer to achieve better liberation and higher-grade concentrate, driven by green steel transitions. Fine screens down to 38 microns are sometimes required to produce high grade (>67% Fe, DRI-grade) concentrate.”

Derrick, a supplier of screening equipment, is engaged with this transition, as evidenced by a recent case study with ArcelorMittal Nippon Steel India (AM/NS India).

ArcelorMittal Nippon Steel India manages a 253-km-long continuous iron ore slurry pipeline, one of Asia’s longest, connecting the Dabuna beneficiation plant to the Paradeep pellet plant.

As part of a plan to increase the Dabuna beneficiation plant capacity from 8 Mt/y to 12 Mt/y, the steel maker sought to address one of the bottlenecks in its process: the hydrocyclone-based classification system. This system was deemed inefficient in producing the desired product, producing excess ultrafine and coarse particles.

“The ultrafines negatively affect the final iron ore pellet quality and limit the grinding capacity, while the coarse particles may cause excessive wear and tear in later processors.”

Ten Derrick SuperStacks closing the grinding circuit at AM/NS India