

# Mineral processing rises on the emissions radar

New and more efficient processing technologies need to be developed as mining companies seek to reduce their Scope 1 greenhouse gas emissions, according to a report commissioned by Weir Group

By Paul Harris, Mining Journal

**W**ith miners having taken significant strides to reduce their Scope 2 emissions through implementing changes to their energy matrix, such as purchasing renewable energy, companies are now focused on the harder task of reducing the direct emissions from their operations, including from their mobile mining fleet and processing plants.

Reducing Scope 1 emissions is more of a challenge due to the sunk investment that miners have in their existing equipment and infrastructure, a reluctance to switch equipment out before the end of its working life due to the costs involved and because implementing

new technologies also carries a level of operational risk.

The independent report Weir commissioned analyzed mine energy use from over 40 published studies, centred on copper, gold, iron ore, nickel and lithium as it sought to highlight opportunities to improve energy and emissions through more efficient site practices, technology and renewables, with crushing and grinding a key target.

The study found that comminution – the crushing and grinding of rocks – accounts for 25% of final energy consumption at mine sites, confirming comminution as a key target for energy and emissions reduction efforts.

The findings align with the mission of the Coalition for Energy Efficient Comminution (CEEC), a global initiative to accelerate eco-efficient minerals, with a focus on energy-efficient comminution.

The report identified opportunities to reduce energy consumption such as the redesign of grinding circuits, improved drill and blast approaches, preconcentration and the use of artificial intelligence and machine learning to improve decision making.

It said small improvements at existing mines can lead to large savings in energy consumption and greenhouse gas emissions. "A relatively modest 5% improvement in comminution, ►

*Weir Minerals' Enduron HPGR equipment*



► across the industry, may result in emissions reductions close to the total emissions for New Zealand (35 Mt CO<sub>2</sub>-e)," said report author Marc Allen. "A more robust energy audit process and implementation of low-cost opportunities across a mine and process plant may result in total energy savings of up to 10-15% and overall emissions reductions of over 200 million tonnes of CO<sub>2</sub>-e depending on the source of electricity."

*Mining Journal* spoke with Weir CEO Jon Stanton and Ricardo Garib, president of the Weir Minerals division, about the report the company commissioned into minesite energy usage, about how they are helping miners achieve their carbon emission reduction goals.

**Q MJ: What were the aims of Weir when commissioning the report?**

**JS:** In recent years, Weir has transitioned to increase our focus on mining technology. We know that our customers, from a licence to operate and sustainability perspective, have many challenges to overcome, especially around energy and water consumption. We wanted to help and that starts by getting a really good understanding of the scale of the challenge. When we looked a lot of the available publicly data is out of date and unreliable. Through the report we are trying to scale the issue and the size of the opportunity by looking at what our customers need to do to reduce their CO<sub>2</sub> emissions, water and energy consumption. The aim was to really understand where energy is used across the mine site and what miners need to do about their energy consumption in order to prioritise where we need to invest more and the challenges we need to help them address. So, we now have an authoritative source of data, a stake in the ground of where the industry is today. We know where we want to get to by 2050, which is net zero emissions and help our customers to get there. So, we have a starting point and finishing point which allows us to figure out what we need to do to get from A to B.

**Q MJ: What was your response to the report? Did it surprise you?**

**JS:** We knew the biggest energy consumer in mining was the diesel for the trucks and other mobile

equipment, but we wanted to learn more about the areas where we can contribute more as an organisation, which is mostly downstream of the diesel-using equipment. The slight surprise was the extent of energy used in the comminution process, in crushing and grinding, which is about one quarter of the energy used on a mine site and even more for copper. This helped us determine the opportunity for us as a business and where our equipment helps customers reduce energy and water consumption.

**Q MJ: Mining's answer to processing challenges over the past twenty years has been to supersize equipment, but it seems that is no longer enough, that other solutions are needed. How do you see equipment evolving?**

**JS:** We know the industry needs to change to become more sustainable and there are already some good examples of what can be done. For Weir, our Enduron HPGRs [high pressure grinding rolls] are the lead products in our portfolio for energy reduction, for example. They are a replacement for the traditional SAG [semi-autogenous grinding] and ball mills, as they use up to 40% less energy and move the need for water to later in the process, reducing the volume and therefore helping solve two of miners' biggest operational challenges. In addition, as miners look at their scope 3 emissions, the CO<sub>2</sub> embedded in the products and consumables they use at their mine sites, HGPRs can help too. They do not require grinding media, the steel balls made in foundries, which generate lots of emissions.

Another longer-term trend will be the move to green steel and what that will mean for the iron ore mining industry. Steel production is much more energy intensive than mining and there are lots of competing technologies being developed to reduce steel emissions and they require higher grade iron ore. Higher grades require more beneficiation which means more processing and therefore efficient comminution will become even more important. We have recently won large contracts in Ukraine and Western Australia where customers wanted processing plants that cost efficiently produced higher grade ore while also reducing emissions and we were able to help them achieve both these goals.

**RG:** A second area where we can provide solutions is replacing truck journeys with our large GEHO pumps. Normally a large mine can use about 100 trucks a day to transport copper concentrate to the port or smelter. Traditionally, trucking is a simple solution as it is easy to supply fuel to trucks whereas a pipeline requires towers for the electric pylons, pipes and generators. But when the trucks drive through several communities and national parks they are not so attractive. With three GEHO pumps and electricity you can get the concentrate to port without bothering anyone and you don't have diesel emissions. As Jon said it is about seeing things differently.

**Q MJ: Mines are often reluctant to swap out tried and tested equipment they know how to operate for new solutions. How much of a challenge is this?**

**JS:** Miners often have a huge amount of invested capital in an operation, so the slate is not going to be entirely wiped clean to put new equipment in. Operators will work with what they have and it's unlikely we will see a wholesale replacement of legacy equipment. However, many mines are at capacity and with customers trying to get more production they may add HGPRs to an existing circuit to add another 10-20% capacity while benefiting from newer, greener technologies.

**RG:** We also see that miners are starting to view one huge unique machine as being too complicated to operate and maintain and too risky and so they prefer to have several units of smaller equipment that gives them greater operational flexibility. So, smarter, more efficient and sustainable technology will be the future.

**Q MJ: How do you see the future of processing equipment evolving?**

**JS:** Digital and big data will play a bigger role and we are embedding this in our products so that they can talk to the rest of the circuit. This will become critically important as the use of big data and AI [artificial intelligence] will be key to optimise process circuits and efficiency. This will be another big theme over the next decade and again we intend to help lead that change. ♥

**"Comminution accounts for 25% of final energy consumption at mine sites"**