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The Mount Isa Mines Copper Concentrator is adding value by experimenting with the ball charge in their mills.

The role of the Copper Concentrator is to extract valuable minerals from the mined ore which is brought to the surface from underground.

Grinding is the first stage in the concentrating process and large rocks (ore) hoisted from our underground copper mines must be broken into smaller particles, to 'liberate' the valuable minerals. To do this, it is necessary to grind the rocks finely, prior to the flotation process.



To separate the copper from the other minerals and waste, the ore is finely grinded within the SAC and Ball Mills, then a flotation process is used to 'concentrate' copper into a product that can be fed to the Copper Smelter.

Grinding in the concentrator is carried out in two stages and the first stage, Semi-Autogenous (SAG) Milling, reduces the rocks from 150 millimetres to 1.5 millimetres.

These SAG mills are large rotating cylinders, about 9.75 metres in diameter, with lifting bars on the inside. The SAG mills are loaded with 105 millimetre forged steel balls, known as media, to facilitate the grinding, with the addition of media programmed on a wear rate profile.

The lifting bars pick up the rocks and steel balls and throw them across the mill. As they impact, the ore at the bottom of the mill is progressively reduced down in size. This process continues until the rocks are small enough to go through a screen on the back of the mill.

The second stage is Ball Milling which further breaks the rocks down to about 0.15 millimetres. The ball mills are large rotating cylinders five (5) metres in diameter and six (6) metres long. The ball mill is loaded with smaller 80 millimetre chrome steel balls and works by rolling balls over each other.



Forged steel balls, known as media, are used within the mills to break down the ore. The steel balls are designed to break down while progressively reducing the size of the rock.

Water is used in both the SAG and Ball Milling process to reduce dust and to make a slurry, a mixture of rocks and water, for downstream processing.

Mount Isa Mines Metallurgy Superintendent, Lucian Cloete, identified an opportunity to reduce overall ball consumption by 25-30 per cent by adjusting the ball load in the SAG Mill from eight (8) per cent to six (6) per cent and in the Ball Mills from 40 per cent to 30-32 per cent, with the additional benefit of reducing the power draw on the mills.

"The trial was planned and implemented to maintain a constant output, while targeting an overall lower ball charge, an approach which ensures results can be measured accurately and without bias," Lucian says.

"So far, the trial has yielded promising results, with noted cost reductions and importantly no adverse impacts on production."

The wear profile is being monitored periodically to ensure the actual media set points align with the online measurements.

The Metallurgy team at the Mount Isa Mines Copper Concentrator.

Additionally, the Metallurgy team is in the process of conducting a trial to quantify the wear profile on 105 millimetre forged steel media when treating slag which is a by-product from the Copper Smelter.

Queensland Metals General Manager Isa Processing, Richard Harvey, commended the initiative of the Metallurgy team and encouraged others to share their continuous improvement ideas.

"I am really pleased to see the Metallurgy team are seeing positive results from their trials, and look forward to seeing the long-term impact," Richard says.

"Looking for opportunities to reduce operational costs, improve efficiency and simplify workflows all contribute to the sustainability of our assets."

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