

ABSTRACT

Simulation work was carried out to analyze how feeding a finer size distribution to a single stage SAG mill in closed circuit with hydro cyclones at Freda Rebecca Gold Mine would affect through put and specific energy consumption using an Excel based milling process simulator developed by Hinde, a comminution specialist who has worked for Mintek for many years. Other initiatives to increase through put were evaluated which included; the installation of a regrind mill (1000kW) to treat the cyclone underflow and the installation of a 100 μ m aperture fine screen to reduce the re-circulating load. ModSim software was used to study the later. It was observed that when the feed size distribution became finer there was an increase in through put, a decrease in specific energy consumption and cyclone overflow fineness. A 13.1% increase in throughput was observed when F_{80} was reduced from 240 mm (split ratio=1) to 45 mm (split ratio=0), the specific energy dropped from 20.66 kWh/t to 18.5 kWh/t and the cyclone overflow product size distribution fineness decreased from 78.33% passing 75 microns to 74%. The optimum through put was obtained at a split ratio of 0.2 which corresponds to an F_{80} of 70 mm. The throughput at this point is 88.17t/h (10.2% increment), specific energy consumption of 18.94kWh/t and the cyclone overflow product size distribution is 75 % passing 75 microns (plant process requirement). The payback period of the project at optimum through put is 1.2 years.

Installing a 1000kW regrind ball mill increased plant capacity by 56% through treating 29% of the cyclone underflow and reduced the SAG mill specific energy from 20.66 to 16 kWh/t and the investment has a payback period of 1 year and a month, in 10 years the project would have earned the company more than 15 million dollars of profit.

It was also observed from the plant survey that there was a high re circulating load of fine material to the SAG mill amounting to 51.2 t/h affecting mill capacity as this took space and limited the capacity for new feed. Using ModSim simulator, incorporation of a 100 micron screen on the cyclone underflow stream was simulated. The main purpose of the screen is to reduce the re circulating load by removal of fines that are deemed gold liberated enough and directed to the leaching circuit. The re-circulating load was reduced from a base case of 238 % to 175% and a 50% saving on energy required.

Key words: Simulation, Hinde excel simulator, ModSim, Model, SAG mill, Feed size distribution, Circulating load, Comminution.