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MSC RESEARCH REPORT- ABSTRACT

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THE OPTIMAL MILLING AND MAINSTREAM FLOTATION CIRCUIT CONFIGURATION FOR MOGALAKWENA PLATREEF ORE

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ABSTRACT

Mogalakwena Complex is located approximately 35 km to the north of the town of Mokopane in the northern limb of the Bushveld complex. The ore mined is of Platreef type mineralization. The material of value at the concentrator plant is recovered using the froth flotation process. The current circuit configuration at Mogalakwena North Concentrator is a mill-float-mill-mill-float (MF2) configuration. This circuit configuration results in overgrinding of the secondary milling circuit product resulting in generation of ultrafines which ultimately results in poor recovery of valuable material. Overgrinding reduces the probability of collision between the mineral particle and the bubble which has a negative effect on the efficiency of the flotation process**.** Fine particles also exhibit a high surface area which increases the rate of oxidation. Oxidation results in formation of a hydrophilic layer on the metal sulphide surface thereby negatively impacting recovery**.** In addition overgrinding increases the rate of entrainment of non-value particles thus negatively impact the product quality. The testwork conducted explored the feasibility of using an alternative circuit configuration in a bid to improve metallurgical performance.

Two circuit configurations were tested, the base case scenario which is the mill-float-mill-mill-float (MF2) and the mill-float-mill-float-mill float (MF3) circuit configuration in which the tertiary milling circuit was decoupled from the secondary milling circuit. Three back-to-back campaigns were conducted of the flexi-float pilot plant for the two circuit configurations.

The MF3 circuit yielded a superior metallurgical performance compared to the MF2 circuit for all the runs that were conducted. An average improvement in recovery of 3.20% for nickel and 1.78% for copper was observed when running the MF3 circuit configuration. The MF3 circuit configuration also yielded a better product quality due to the circuit configuration not exposing ultrafines to extended residence time conditions which promotes entrainment. A feasibility study on converting the current circuit configuration at Mogalakwena North Concentrator to MF3 was conducted looking at the production profile for the next 5 years. The conversion process has a payback period of 2 years 3 months and internal rate of return of 80%. The infrastructure assessment conducted indicated that the conversion process is feasible as the proposed changes to the circuit are of relatively low complexity and risk. Mogalakwena North Concentrator will be converting its MF2 circuit to MF3 configuration in the year 2020 and the initial benefit will be achieved in the year 2021. New knowledge on the processing of Platreef was generated and Mogalakwena Concentrator has embraced it. The knowledge generated will be considered for future plant design.