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Investigation of the factors that influence the mine call factor with particular reference to illegal mining at Driefontein ya Rona shaft

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ABSTRACT

The Mine Call Factor (MCF) will be 100% in a perfect mining environment. This is when no gold loss occurs throughout the mining process from the in situ gold blasted on the stope face through to the processing plant and the estimation of the gold produced (called for) is perfect. Ya Rona shaft, part of the Driefontein Operation, showed a downward trend in the MCF from 75% to 70% over the last five years. This study was conducted to determine the possible causes behind the regression in the MCF over this period.

The loss of gold at Ya Rona shaft currently amounts to a 30% loss, assuming an MCF of 100% is achievable. Over the monitored period, Ya Rona shaft has lost approximately 109 kg per month, which amounts to R86,9 million losses in revenue at an assumed gold price of R800,000/kg. Detailed investigations were done on the MCF to determine the possible causes and quantify the losses and gains. Data were analysed on the ore flow, and the variances were investigated. The increase in illegal activities from “Zama Zama” was also of special interest. The investigation has shown that the illegal miners contribute to a 1% loss on the MCF (in the current working areas.) The gold loss in the old mined-out areas and those not in the mine plan is unknown. The mine survey accuracy, sampling and assay methods were also investigated for any anomalies.

Quantitative and qualitative methods were used to determine the possible cause of the low MCF at Ya Rona shaft. The Ore flow data and the Technical Statement were obtained for 2021. The data received includes tonne broken on the face, sweeping percentage, hoisted, face grade, belt grade and yield. The data was analysed to identify variances, and these variances were subsequently investigated. Planned task observations were done on the underground mine surveyor and underground sampler. The accuracy of the mine survey measuring results and sampling methods was checked and analysed (quantitative data).

It was found that the real gold loss can be attributed to poor drilling and blasting practices that lead to poor fragmentation and gold loss through water use.

The underestimation of the widths and height in the gully and the underestimation of accumulations led to apparent gains in tonnes. Accumulation of broken ore and mud is left behind when the mining personnel do not clean out properly or timeously.

The MCF can improve significantly once all these factors have been addressed. Explosives have been changed to an emulsion product to improve fragmentation and water control measures have been implemented (deeper sumps and better pumps). Steps are taken to keep illegal miners out of the underground environment and improvements have been made to the quality of sweepings. The use of blasting barricades on the face is monitored and mud and accumulations are cleaned out regularly.