

"Optimizing Grinding Circuit Performance: A Success Story at Harmony Gold's Hidden Valley Mine with Rockwell Automation's Pavilion8 MPC Process Optimization technology"

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ABSTRACT

Harmony Gold Mining Company Limited, a distinguished player in the gold mining and exploration sector, sought to enhance its operational efficiency and sustainability at the Hidden Valley Mine in Papua New Guinea. In collaboration with Rockwell Automation's industrial data science team, Harmony Gold implemented Pavilion8 Model Predictive Control (MPC) in the SAG Mill grinding process, showcasing a commitment to safe, profitable output through operational excellence.

The goal was clear: optimize the grinding circuit to achieve increased efficiency, throughput, and stability in SAG mill operations while ensuring consistent cyclone feed pressure. Facing challenges of raw material variability and rising sustainability expectations, even a modest 1% increase in throughput could lead to substantial cost reductions and profit boosts.

Engaging Rockwell Automation, Harmony Gold embarked on a comprehensive approach to maximize mill throughput and reduce process condition variability. The Rockwell Automation MPC team analysed 13 months' worth of historical data, identifying critical process parameters amenable to control and modification. Leveraging multivariable control, constraint handling, feedforward, decoupling, and dead-time compensation, Pavilion8 MPC Controller employed process models for optimized control actions.

The dynamic correlations within the grinding circuit were effectively managed by MPC. By skilfully adjusting mill speed and fine-tuning cyclone feed pump speed, the system achieved maximum achievable throughput while adhering to operational constraints such as power consumption and ore availability. Pavilion8 also maintained stable cyclone feed pressure, reducing variability and ensuring consistent cyclone operation.

Results exceeded expectations, with the MPC Grinding Circuit Application designed, implemented, and validated in less than six months, demonstrating a swift return on investment. Harmony Gold surpassed the initial target of a 1% increase in throughput, achieving a remarkable 1.2% rise after a 30-day run, and an impressive 2.7% over 100 days. Pavilion8 not only maximized throughput but also reduced feed rate variability by 53%.

Additional achievements included a robust 96.6% MPC uptime, indicating strong acceptance from operations, and consistent precision in maintaining mill weight closer to the target. The application sustained cyclone feed pressure within the desired range, showcasing a 27% reduction in variability compared to baseline performance. These milestones underscore the substantial impact and effectiveness of the Pavilion8 MPC Grinding Circuit Application at Hidden Valley Mine.

This success sets the stage for further collaboration, as Harmony Gold and Rockwell Automation plan to integrate FactoryTalk Analytics MPC technology into the flotation circuit, marking a continued commitment to operational excellence and sustainable mining practices.