Application of process data to identify process improvement opportunities-Case Study: Antofagasta Mineral S. A. 's Los Pelambres

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ABSTRACT

Advances in sensors and digital technologies enable operations collecting a vast amount of data from the operation. The real-time Plant Information (PI) data which are continuously being collected and stored, is a valuable source of information for assessing the performance of the process control and identifying opportunities for improvement. In recent years with Artificial Intelligent (AI) becoming popular and easy to utilise, there is a strong push for applying AI to analyse the PI data. Although this approach is proven to be powerful and beneficial, it has a major shortcoming which is incorporating the domain knowledge. Nevertheless, the powerful statistical analysis, which inherently incorporates the domain knowledge must not be neglected. This paper presents the statistical data analysis which was implemented to benchmark performance of the advanced process control (APC) in Antofagasta Minerals - Los Pelambres Mine Site operations.

Los Pelambres concentrator is a copper-molybdenum processing plant treating 175,000 tons ore daily. Los Pelambres is one of the most advanced operations in Chile, which has implemented APC through the development of Model Predictive Control (MPC) for their processing units (i.e. SAG mills, ball mills, cyclones, flotation and regrind) of its three parallel lines. An overall analysis of data indicates the application of MPC resulted in process stability and 14% more throughput on average. Although SAG mills MPC is utilised above 90% of time, the ball mills and flotation MPC utilisation can be enhanced further by improving maintenance of mechanical parts and calibration and maintenance of sensors. There are opportunities to boost the performance of MPC for each unit through the implementation of semi-empirical models for SAG mills, cyclones and gravity-induced stirred media mills developed in Julius Kruttschnitt Mineral Research Centre (JKMRC).