Net Metal Production Optimization in the Digital Age

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Keywords: Crushing, grinding and flotation operational on-line models, online estimation of business metrics, mine-to-mill modeling and optimization, big data mining tools, machine learning, net metal production and recovery maximization

ABSTRACT

Ores are becoming extremely variable with mineralogy and hardness disturbing the integrated crushing, grinding, flotation, and thickening processes. The current mining, comminution and flotation sensors provide large amounts of data for process optimization. To augment the operational knowledge for proactive actions for improving the performance of the integrated rock processing complexes, we need to add the right process knowledge context and operational modes.

Without these proper operational contexts in place, the results are unmanaged downtime, process troubles, maintenance interruptions, and unmet production schedules. By measuring operational modes and managing these unproductive times (trouble times), people can find new ways of improving profitability and efficiency of the plant. The inFORMAtion (inSHAPEtion) created by the real-time analytics enables us to calculate the metal recovery in real time and to develop predictive analytic models to secure the best operating conditions based on the type of ore currently mined. Using the latest advanced analytics, machine learning, big data analytics tools and cloud computing enables the creation of new workflows and collaboration between mining, concentrator plants, and the enterprise, including services providers.

Machine learning pervades our culture in a multitude of ways, from medical diagnosis and data management to speech synthesis and search engines. The novel approach of using machine-learning techniques coupled with dynamic process models in grinding, such as Dynamill™ and Dynaflote™, a new operational integrated process model is realized and implemented. A Digital Twin Plant Model becomes available to assist in optimizing the net metal production subjected to the transport of the pulp constraints a mineral processing plant. Both Metal Flotation and Water Recoveries are enhanced having an integrated mineral processing plant model.

These days of remote operations utilizing the capability to integrate mining operations from drilling to product delivery is an industry boon. With mines in inconvenient, out-of-the-way locations, people can now work from home, remotely supporting operations and staying safe and healthy during these challenging times. Today, subject matter experts (SMEs) can increase productivity by developing predictive models to classify the operating conditions owing to large variations in ores, catching the hidden production, energy, and water losses by ore type and unmeasured disturbances. People call this a “follow the money” strategy, the ability to survive and adapt to these unforeseen forcing factors affecting the communities and support.

The application of a digital plan twin to mining, mineral processing and extractive metallurgical process using advanced analytics tools is presented here.