MANAGING COMPANY RISK BY INCORPORATING THE MINE RESOURCE MODEL INTO DESIGN AND OPTIMIZATION OF MINERAL PROCESSING PLANTS

GLENN KOSICK, CHRIS BENNETT AND GLENN DOBBY — MINNOVEX TECHNOLOGIES INC.

ABSTRACT

The variability within an orebody with respect to both plant throughput and metallurgical response typically is a significant problem to address during the design phase of a mine. In addition, for existing operating plants, the variability in throughput and metallurgical response needs to be clearly understood and accounted for if plant performance is to be optimized. MinnovEX Technologies, in a collaborative program with major mining companies, is continuing to develop methodologies and tools to address the issue of variability in ore characteristics (such as ore hardness and flotation response). The comminution component of the program is referred to as CEET, for "Comminution Economic Evaluation Tool". The flotation component of the program is referred to as FLEET, for "Flotation Economic Evaluation Tool". These tools were designed for the purpose of managing company and bank risk with respect to the design and production forecasting for comminution and flotation circuits. The tools are used for design and scale-up of these process unit operations and for prediction of throughput, quality of grind, recovery and final concentrate grades throughout the mine resource model. They are used to better quantify the value of each block of ore in the resource model. This paper describes the concepts and approach of the technology, including the importance of linking the mine resource model as an input to the design tools. It also outlines how this technology can be used to refine reserve and resource estimates and how it will be applied to other unit operations in the future.

INTRODUCTION

The value of each block of ore in the resource model is a function of cost/value components such as head grade, mining costs, commodity price, undesirable elements that invoke smelter penalties and environmental costs, transportation costs, processing costs, rate of production, and recovery and grade of the commodity. Each component contributing to the block value has to be estimated and then all components combined to determine what the true value is for each ore block. The combined value of the ore blocks along with the mine plan is offset against the capital investment to determine the return on investment for the project. The value of each block is also used to classify blocks into reserve, resource or waste designations.

The approach used to estimate the cost/value components that determine the block values will generally establish the degree of success or failure for any greenfields project. If the cost/value components are well understood then design and optimization strategies can be invoked to maximize return on investment over the time frames required to match the objectives of the investor.

The approach being embraced by many major mining companies for obtaining the cost/value components for the comminution and flotation stages of a mining operation are described within this paper. It is based on application of the resource model as a dataset for the CEET and FLEET process models used for design and optimization. A similar approach can and will be applied to other unit operations in mineral processing in the near future. The medium for facilitating the access between the process models and the resource model data set is a tool called Process Access.

Once the impact of the mine resource model on the unit process operations is well understood, appropriate circuit configuration and design can be selected using CEET and FLEET to manage production expectations. This production forecasting information can then be used to improve upon advanced control strategies currently being invoked through the use of expert system technology.