

Implementation EngineeringSM at a Tantalum Mine

Open Pit Mining and Processing

Situation

Our client, the largest producer of tantalum, had recently gone through an expansion to increase the site's concentration processing capacity. The challenge was then to understand what needed to be done in the pit to increase output going to the new concentration area. Similarly the site needed to better understand if the magnetic separation process after concentration would be able to handle the increase in volume coming out of concentration. Therefore, Implementation Engineers was asked to provide an Implementation EngineeringSM analysis and then make recommendations to determine the steps necessary for the pit and magnetic separation processes to be in balance with the increased capacity of the concentration process.

Approach

We started by detailing the project charter for the work by producing an estimate of the current performance versus the targeted performance. Then we documented in the charter, the project objectives of identifying a path forward to get from current performance to target performance. The Implementation EngineeringSM methodology began to fulfill the charter as follows:

- Document the entire process from drilling and blasting through the mine logistics to ROM pad, then into processing. This provided us with a good understanding of the operation and what data we would need to collect.
- Collect operational data recorded by the mine such as demand, production plan, process yields, quantities of equipment, nominal capacities, production outputs, inventory levels, and delays, downtimes, and causes.
- Collect our own data through observations and time studies. The data created through our analysis allowed us to validate the operational data provided to us as well as created data not otherwise available. Examples included blasting delay times; hauler waiting, spot, loading, travel distance and dumping times; loader waiting times; face preparation times; plant equipment downtimes and delays; and inventory levels.

This data gave us a baseline for analysis of the “current state” of the operation which was represented by a value stream map. That coupled with programming a simulation of the fleet logistics (see Figure 1), clearly showed us the productivity issues that hindered throughput.

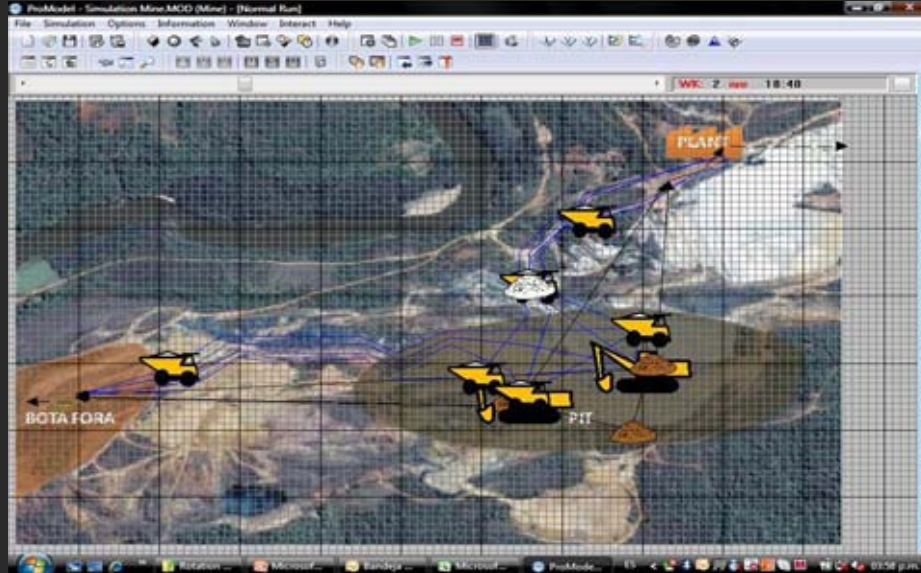


Figure 1: Simulation example

The next part of the work was to take each productivity issue and determine the gap between the current performance and needed performance. We documented, in a Value Stream Map, results outside normal operational boundaries that if improved would yield the desired productivity and throughput. Then we determined what could be done to close the gap.

Results

The work exposed a number of unexpected findings with most centered on the pit loading and hauling operations. There were a few straightforward improvements to their processes that would quickly provide the needed volume out of the pit to support the concentration operation. The three most important were:

- The long delays between when one haul truck was filled and when the next hauler was ready to start to be filled, even though there were excess haulers.
- There were delays between each bucket load by the loader filling a hauler.
- Haul trucks were leaving the pit without being filled to capacity.