

Resourceful thinking

Smart data is the way to boost mining productivity

September 2016



Mining companies may have become much better at collecting and storing data, but when it comes to actually utilizing this information, the end of term report would probably read: “Could do better.”

Only around 0.001 percent of an orebody is sampled, making it hard to estimate its volume and precise location. And the data flowing from this sampling is rarely, if ever, available in real-time, clouding key decisions on when and where to dig.

The large ERP systems favored by most of the industry hardly help the cause, with the software often struggling to cope with the three-dimensional aspect of mining.

In addition, some of the most important metrics are rarely reported. Haul distance, reconciliation, stripping ratio (total volume of material mined to final amount of ore produced), and tonnes per vertical meter all impact unit costs, yet are considered more difficult to track.

Investing in insights

With so much data available, mining operators may be uncertain where to focus their collection and analysis. A good starting point is to home in on the numbers that are most likely to influence costs.

In an open pit operation, for example, truck-shovel costs are the most significant, especially if stripping ratios are high. In gold and base metal mines, on the other hand, crushing and grinding is one of the largest expenses.

Looking across the entire operations value chain from development, through mine production, comminution (reduction of solid materials by crushing, grinding, etc.), processing and product transport, most of the major costs occur upstream. But, paradoxically, this is where data collection is at its most challenging, due to the presence of opaque orebodies and non-homogenous solids that can mask the material’s true properties.

Highlights



Mining companies tend to measure what’s easiest, rather than what’s most relevant



Most major costs are accrued upstream



Understanding how different mining activities impact productivity is critical

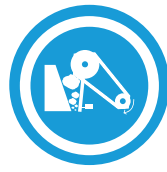


Leaders need to invest time and resources to build a ‘data culture’



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Increasing homogeneity and measurability of product flows



Mine development

Ore mining

Comminution

Processing

Product transport

Increasing cost and value leverage in decision-making

With this backdrop, we should ask, do the data collection systems focus on areas of greatest leverage, or on areas of greatest convenience?

Convenience versus value

Rather than choose the data that is most valuable (and less accessible), most mining firms elect to grab low-hanging fruit — such as consumables expenditure, maintenance costs and plant utilization — which offers far less benefit. In the absence of robust information on what really matters, they call on the intuition of experienced operators and engineers. Regardless of these individuals' maturity and skills, their judgment lacks hard facts and will inevitably be less accurate.

The only sure way to understand costs and efficiency is to take this intuition and overlay it with accurate, up-to-date information, as the following two examples demonstrate.

Processing in a moderately complex plant

In this instance, simple modeling of plant capacity was overstating the throughput capacity by up to 30 percent. Although the operations team knew that modular shutdowns and breakdowns reduced throughput, they were not able to quantify this precisely, and, therefore, could not predict the effect of performance improvement initiatives.

The answer was to create a probabilistic model combining the reliability of each section of the plant, along with the maintenance plan for the overall plant. This approach predicts how long each section of the plant will function as a temporary bottleneck, and the subsequent reduction in throughput rate of materials.

This model is extremely accurate and can forecast current throughput to within 5 percent.

Open pit truck-shovel fleet

Shovel performance is measured in terms of availability, utilization of availability and dig rate. For truck fleets, the key performance indicators are availability, utilization of availability and cycle time.

However, when taken in isolation, these metrics fail to show the full picture. What's really useful is the interaction between shovel and truck performance and, more importantly, the way this interaction causes the truck cycle time to be typically higher than expected and the average dig rate to be significantly lower than the digger is capable of.

Further analysis reveals that "process variation" and "dispatch efficiency" will ultimately determine truck-shovel productivity. Typical truck dispatch databases should provide the raw data on process and dispatch activity, which can be used to calculate these two new indicators. The results are especially useful for autonomous truck fleets.



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How can your data add value?

Data analysis is most useful when it can help reduce costs, raise productivity and enhance revenue. This means that the people making crucial decisions, such as supervisors and operators, must receive data in real-time.

Companies should also identify those indicators with the highest leverage, and ensure that they become an integral part of performance management, and are embedded into new business intelligence programs.

Using data to add value

The ultimate value of data analysis lies in how the data is leveraged to derive value, whether through cost reduction, productivity improvement or revenue enhancement.

Getting data and decision-support tools into the hands of supervisors and operators to effect better real time decisions is one means to do this.


Real-time
improvements

 Mobility

 Data

 Field observation

Laying the foundation for effective data utilization

Data quality and stewardship

Mining operators can only make sound, consistent decisions when there is a “single source of the truth” across the organization. A company-wide program is needed to achieve this goal, employing time usage models, data definitions, calibration, reconciliation, error correction and data cleansing.

Specific individuals must be accountable for data, to ensure it is well-managed and reliable, to support analysis, reporting and decision-making.

Implementing a data-valuing culture

The decision to use data in a better way is strategic, not tactical. Leadership should invest time, money and resources, in order to produce a regular flow of reliable,

accessible data, and create a culture where the big decisions are not simply the result of intuition, but are supported by data.

Mining differs from other industries in that key properties of our raw material (for example, the spatial, geological and physical properties of the ore we mine) which is highly uncertain in real time and rarely figures in our real time mining data sets. Understanding this is fundamental to how we best use the data we do have.

Having embraced big data, it is now time to move onto ‘smart data,’ by identifying which activities are most closely linked with strong cost, productivity and revenue performance, extracting the relevant data and making it accessible, and measuring staff against achieving key indicators. When these conditions are in place, data can bring real value.

Key questions:



Do you tend to make decisions based upon hard facts or intuition/experience?



Can you confidently link productivity with specific activities, in a quantifiable way?



Do you have a consistent, organization-wide approach to data measurement and reporting?

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Publication name: Resourceful thinking. Publication number: 133457-G. Publication date: September 2016