Mining companies face increasingly complex management challenges in today’s global marketplace. One of the most difficult ones is to produce intelligent, actionable information on operational performance, resources, and reserves when the supporting data is scattered across geographically dispersed properties. Traditional approaches to using data systems in the mining industry are not capable of delivering the right information to the right people at the right time and in the form they need.

Information associated with individual data systems is often trapped in “silos,” accessible only to a limited group of users, making it nearly impossible to obtain a clear view of overall operational performance. Global access is also a growing need with users across broad geographic boundaries requiring consistent data measures in their native languages.

A number of external forces, however, are exerting pressure on mining companies today to leverage this information more effectively.

A major driving force is the desire to capitalize on strong commodity prices by increasing production in the face of rapidly escalating costs. To do so, they must not only improve individual and interdependent mining processes but also glean greater insights from these processes to make better tactical and strategic decisions that affect both daily production and long-term profitability.

Another strong motivating factor comes in the form of increased legislative requirements to meet audit criteria and reporting standards. As the industry consolidates and creates bigger global companies, the different regulations and reporting requirements that they must conform to across the globe make the transparency of information and data critical.

In addition to regulatory pressure, the worldwide shortage of qualified geoscientists is also forcing mining companies to standardize processes and create best practices that simplify training for new staff, ease mobility of staff between projects, and take greater advantage of information technology (IT) to manage projects remotely.

Therefore, with the mining industry facing strong demand, rising costs, increased reporting and compliance requirements, and a shortage of skilled mining professionals, it is increasingly important for companies to manage and utilize mining operations data effectively to be able to drive key business decisions. But how?

Making Sense of All the Data
There is plenty of data available. The issue is turning it into a form that effectively guides operational and enterprise-wide decision-making. In fact, part of the challenge is the over-abundance of data. Most mining companies run a multitude of systems, which can vary across multiple sites depending on commodity, type of mine, scale and other factors.

At one of the world’s largest mining operations, numerous data collection systems and other legacy sub-systems were used to process and generate production surveys, various mine plans, geological and resource models, and ultimately a variety of production reports. There were stand-alone data sources for drilling and blasting, a separate tire management system, and the crushing portion of the mine treatment plant’s supervisory control and data acquisition (SCADA) system, plus other technical systems for mineral resource planning, management, and reconciliation. Manipulating and reporting on data from all these disparate systems required laborious manual effort, which often resulted in redundant or incomplete information. What’s more, the time required to hand-produce this information rendered it virtually useless for any short-term decision making, and suspect for determining accurate long-term trends.

One of the underlying problems was the high number of unreconciled independent, proprietary systems, which frustrated users because more than one version of the “truth” often existed.
Experts throughout the mining industry have observed this issue, noting that data systems, such as those used for operations planning and control, are largely isolated, both physically and logically. Sharing information from these systems is stymied because the data is structured in non-standard formats to serve only localized requirements. Without standards, however, data measures can be inconsistent from one point in time to another, making them unreliable. This is particularly problematic as mining managers demand more accurate and timely information on costs and the impact of decisions on mining outcomes.

Standards are the key, and when it comes to data, the starting point is a standards-based relational database. Using a standards-based relational database to create a central repository of information for the systems across a mining operation provides three primary and critical benefits to mining companies:

First, a centralized database establishes one version of the “truth,” eliminating incongruence among systems.

Second, relational databases provide inherent data integrity and security thanks to workspace permissions that control access to the data based on individual user privileges. A central database also ensures protection of vital mine data because centralized backup practices can be established, enforced, and demonstrated to auditors.

Third, a centralized database is universally accessible, eliminating unnecessary delays in access to information, which are typical when people have to request and share information manually. This adds further protection by limiting exposure of information to only those entitled to use it.

Beyond these advantages, a standards-based relational database makes it much easier to retrieve and manipulate data regardless of its origin.

Creating More Accurate Forecasts

When data from all corners of the mining operation is shared, it can be highly valuable to many aspects of the business—from planning and operations to costing and safety.

For example, if a truck breaks down, what impact does this have on the source and quality of ore delivered at that moment, later in the day, and in three months? What impact does this have on the planned maintenance activities for other equipment? What impact will this breakdown have on the blast schedule? What impact will it have on the mine’s ability to make grade in 12 months?

The fact is, with centralized, standards-based data as well as the proper business analysis, modeling, and forecasting tools, mining professionals can accurately predict the impact of monitored data on future operations. Furthermore, with more accurate forecasts, executives can deliver more consistently on their promises, which board members and stockholders demand—and regulators enforce.

The mining professionals at Debswana Jwaneng mine have realized these benefits first hand. By eliminating the standalone data sources that once frustrated users and implementing an integrated software system from Gemcom built on a standard relational database, Jwaneng decision makers now have the information they need at their fingertips to ensure that mine design, mine planning, and production ‘actuals’ are more reliable, accurate, and accessible to users. Because all technical data is in the same open database, users can easily convert a number of previously disconnected manual work processes into a seamless computerized process. By consolidating these work functions into a single process, users gain greater insight into the core business of mining and can address issues more effectively.

“Jwaneng mine depends on Gemcom’s mining execution solution to manage data across disciplines including geology, engineering and mine production. This has enabled us to increase mine productivity by improving our ability to monitor, analyze and optimize the operation,” Says Kabelo Lethloma, mining manager at Debswana Jwaneng mine.
Software

Improving performance and decision-making

Increasingly, there is a trend in the mining industry to seek more information on which to base both tactical and strategic decisions. For example, the information is needed to make decisions about allocation of resources in short tactical timeframes, such as whether or not to change the number and routing of trucks or whether to change the mine plan itself. Aggregated information from across multiple mining properties is also crucial to observe productivity and profitability trends, which will drive strategic investments affecting longer-term business results.

Making better decisions and improving mine performance requires gathering, validating, and summarizing many kinds of information into meaningful, timely and actionable intelligence. This will likely mean combining data from many sources, such as geological modelling data with data from truck dispatch, to pinpoint what material is currently being moved and where. By stringing together data such as this with other information, including truck capacity, average grade of the ore in each load and the number of loads moved each day, mining professionals can begin to get a more accurate picture of yield. And if this information is available in near real time and compared to plan, very quick decisions can be made on scheduling, resource allocation, or investments. For example, this kind of insight can improve dilution rates by preventing ore going to the waste dump and waste to the crusher.

To improve management of mining operations data, companies should select solutions that leverage standards-based relational databases, such as Microsoft SQL Server, and use integrated tools to collect and act on information in real time. This approach has proven to deliver value, as in the Jwaneng mine, and it enables seamless integrations with other vendors’ systems to extend the value of mine operating data even further.

The De Beers Finsch diamond mine in South Africa is an example of a case in point. Here, Gemcom collaborated with Sandvik to integrate Sandvik’s automated ore-transport system with Gemcom’s SQL Server-based software. Working as a unit, the Sandvik system directs how mining takes place and the equipment operations, while Gemcom’s PCBC software calculates mineral reserves and draw point valuations based on the geological model. These capabilities make it easier for De Beers personnel to manage the amount of tonnage from each draw point and preserve the stability of the entire excavation. It also allows De Beers managers to analyze mining sequences and rates from draw points over the short and long term.

“PCBC provides a detailed series of reports on the resource itself. Based on an operating rate, it can provide the exact amounts of each ore type we can uncover and the grade level within the ore body. I can tell PCBC to produce 10 or 20 tonnes, and the software will display how many diamonds we can expect. Using that information, we can constantly compare actuals with what we are getting to assess the quality of our resource estimation. We can also use the information to improve upstream efficiency,” says Jaison Rajan, Section Leader – Mining Technical, Finsch Mine, De Beers Consolidated Mines.

The key in this example is the openness of the underlying database architecture, which allows outside data to be plugged in and eliminates the need for manual data entry. Yet, because the software has built-in controls and security, that data is protected and can only be accessed or manipulated by users with proper authority. Since the data is centralized and not stored on individual desktops, it is also much more secure. And with web access, decision makers can obtain the information they need regardless of physical location. An integral audit trail provides a record of all activity, including who accessed what data and when.

Lonmin Plc, the world’s third-largest and lowest-cost platinum producer, is putting these capabilities to the test by using Gemcom software to capture, manage and distribute mining operations data from its Marikana operation in South Africa to various teams, including mine survey, geology, material resource management, mine performance management, planning, and production.

Lonmin’s Vice President, Strategic and Production Planning, Anton Mauve, said, “By working with Gemcom, we will gain the capabilities needed to establish ongoing business process improvements through continuous measuring, monitoring, reconciling and reporting of mine production. This will allow us in turn to realize our objective of increasing the accuracy of short- and long-term production forecasting.”

Addressing Skills Shortages

One of the most direct forms of competition in the mining industry involves attracting skilled employees. However, the fact is there just aren’t enough of them
to go around anymore. Studies, such as one undertaken in 2005 by the Mining Industry Human Resources Council (MIHR), project that the mining industry will need thousands of new workers in the coming years. The MIHR report identified that in Canada alone more than 81,000 new workers will need to be recruited.

The problem is that the mining industry’s current workforce is retiring, and universities are unable to turn out graduates in the numbers necessary to replace them. What’s more, as these experienced workers depart or transfer operations (which can happen frequently) their knowledge, experience, and in some cases, intellectual property, go with them since the processes and systems to capture this valuable expertise are sorely lacking. This means that the best practices and innovations they have developed leave with them.

Database technology, automation, and increased ease-of-use in mining software can help to alleviate the skills shortage problem by providing new, less-skilled staff with standardized data, consistent workflows, and best practices. These systems and resources can also be leveraged to capture the experience of workers, which can be leveraged over the life of the enterprise.

Driving more effective compliance management

Multinational mining companies are often listed on multiple exchanges, which means that they are exposed to a range of regulatory statutes, including Sarbanes-Oxley (governance and organizational control), GAAP and IASB (accounting and financial reporting standards), and a variety of standards for reserve and resource reporting, such as JORC / VALMIN and National Instrument 43-101 (NI 43-101). To comply with these requirements, mining companies must establish and monitor global management and reporting standards.

When information is scattered across a patchwork of systems and geographies, it’s not only difficult to implement the necessary controls and reporting standards, it is also problematic to prove they are effective on a global basis—a specific requirement of Sarbanes-Oxley. With Sarbanes-Oxley, mining companies making any public financial or production projections must be able to demonstrate how they arrived at the numbers.

The JORC code in Australia and New Zealand is no less demanding. JORC sets minimum standards for public reporting of exploration results, mineral resources, and ore reserves. And it mandates a system for classifying tonnage and grade estimates according to geological confidence, as well as technical and economic considerations.

Demonstrating just how important data management is becoming due to these regulatory standards, Shore Gold, a Canadian company, which trades on the Toronto Stock Exchange, sought to have a 3D modelling solution linked to a central database because the company publicly discloses scientific and technical information about its mineral projects in accordance with the NI 43-101 rule. In fact, the aim of the company’s Star Kimberlite advanced evaluation is to define a NI 43-101 compliant mineral resource followed by a mineral reserve. Therefore, Shore sought powerful software to improve data accuracy, help it portray information in the prescribed format, and establish auditable information trails.

According to Pieter Du Plessis, Vice President—Exploration, Shore Gold Inc., “The GEMS product is integral for constructing 3D models on time and giving us hard numbers that we can publish to comply with NI 43-101. Therefore, we have a great measure of comfort that we are constructing models in line with industry standards.”

Where to Go from Here

For mining companies today, the problem is not the lack of data, it is the lack of a means to make sense of it in order to drive higher performance and make better decisions. By centralizing and integrating mining operations data—from drill holes and blasts to survey and exploration, from fleet management to mine planning—companies can use this information more effectively. Starting with a standards-based relational database, such as SQL, is the first step. Implementing integrated software tools that can leverage SQL data for a broad range of analysis and reporting on a global basis is the next. From there, mining companies have the resources and controls to meet increased market demand, comply with international regulatory statutes, and ultimately maximize long-term profitability. They will also be able to overcome the shortage of skilled mining professionals by automating work flows and establishing best practices.

Rick Moignard is the President and CEO of Gemcom Software International Inc.

Links and References

- 3D modelling solution linked to a central database
- Analysis and reporting on a global basis
- Case in point
- Challenge is the over-abundance of data
- Data integrity and security
- De Beers Finsch
- Debswan Jwaneng Mine
- GAAP
- GEMcom’s PCBC software
- GEMS
- IASB
- Improving mine performance
- Integrated software system from Gemcom
- JORC
- Lonmin Plc
- Microsoft SQL Server
- Mining Industry Human Resources Council
- National Instrument 43-101
- One version of the “truth”?
- Relational database
- Sarbanes-Oxley
- Shore Gold
- Shortage of qualified geoscientists
- Standardized data, consistent workflows, and best practices
- Standards are the key
- Traditional approaches to using data systems in the mining industry
- Universally accessible
- VALMIN

Click here for full list of links: http://go.mining.com/july08-a1