David Canady, Intergraph PP&M, USA, details the importance of keeping information and data organised, visible and readily accessible at mining facilities.
For centuries, the mining industry has extracted significant quantities of raw material and processed them into copper, gold, steel, clean coal, fertilizers and other commodities that are vital for our economies. Certain techniques for mining have been tried and proven over generations. But as quality deposits became more difficult to find, technology was applied to help locate additional mineral sources and also for new extraction and processing techniques; this has changed the commercial landscape of the industry. Today, minerals, such as copper and iron ore, are being extracted and processed in quantities and in locations — such as remote deserts, high mountains and deep jungles — that were not considered possible before. Technologies are producing efficiencies that previously could not have been imagined: autonomous mining, faster tunnelling technology and increased efficiency in sorting out waste before it gets to the plants. As mining operations are being centralised, monitored and improved from anywhere in the globe, the entire supply chain and logistics of a mine can be integrated; new construction techniques are adding efficiencies; and mine safety has improved immensely.

And today, there are similarities with information and data. In the digital economy, data is more valuable than ever. For those who see data’s fundamental value and learn to extract it and use it correctly, there will be huge financial rewards. A modern mining operation produces mountains of data, coming from thousands of sensors, as well as from planning, engineering, communications systems and more. And by applying technology to that data and harnessing its value, the metrics of a mining operation can be truly changed. Some examples are the ability to predict and extend component life, improve maintenance schedules, reduce production downtime and better manage water and power.

Mining companies today are looking to provide this data and centralise it so that it is always up-to-date, organised in a way that everyone can find it efficiently and is accessible to the right people at the right time.

In an era where resources for CAPEX investments are limited, better use of data allows operators to get more out of existing assets. Having a centralised data and document repository is a requirement to collect, organise and manage information about the massive numbers of assets at a mining facility. Proper management of these assets is critical to the success of any major mining facility.

Assets and data
Conceptually, an asset begins its life during facility design to fulfill a specific function within the mind of an engineer. It eventually gets a unique tag on a drawing, gets purchased and delivered to a warehouse and eventually to a construction site where it is installed and later commissioned. The asset begins its life as a functioning piece of equipment, control mechanism, gauge, valve, pipeline or other component within the mine facility. Somewhere along the line, it receives a nameplate so that maintenance technicians and plant operators can identify it.

An asset retains all of these various forms concurrently throughout its life: a tag on a drawing (or multiple drawings), a line item on a purchase order (or multiple line items, including spares), a name-plated physical component in a facility and even as a spare part in a warehouse. And all of these need to be managed appropriately and kept synchronised throughout the life cycle of the facility. Change to these assets is continual, as maintenance, plant re-vamps, expansions, optimisations and other modifications are made, as vendor and supplier information is updated — and on and on. Data coming in from thousands of sensors and other sources gets added to each asset and represents vital information about the performance of the asset, historical information about the asset and other critical information. All of this needs to be organised, visible and readily accessible to the right people at the right time.

So how is this accomplished?

Managing changes to assets
From preliminary design through to construction, commissioning and start-up, the capital project generates large amounts of information and documents pertaining to the large number of assets. Change is constant. By using a system that intelligently manages asset data, owners and EPC contractors stay synchronised and that mountain of information is kept organised, visible and readily accessible. Changes are managed so that nothing slips through the cracks. Managing all of that is a monumental task with great risk. But if handled correctly, it translates into significant cost savings; the outcome is the most efficiently constructed processing facility possible. This makes for optimised production at the mine itself. As that information is re-purposed for plant operations, all of the information for effective operational decision support is consolidated and is readily accessible, which translates into operational excellence.

Managing change to assets is one of the most important issues; improper management of change has been the cause of serious and sometimes deadly accidents at mining facilities. For example, there are numerous cases of severe accidents occurring at processing plants where changes were made to the plant without approval by qualified personnel and where safety standards or proper engineering practices were ignored, resulting in injury or even death.

Change also represents cost, which needs to be completely understood before allowing any modifications to occur. The financial and safety impact to any change needs to be assessed before it is implemented. Instituting a formal process where all changes are properly approved is critical to maintaining cost control and assuring safe operation. All changes should be fully traceable and visible to all affected parties. If there are problems later, they need to be traceable back to the source. All data and information about the asset needs to be visible and accessible so that the impact of that change can be assessed quickly and completely.

Visibility and traceability of assets
Knowing exactly where an asset is in the facility, what has changed and the impact of change is critical to success. When
problems occur, when there are construction delays or delays in the supply chain, it is vital to get quick answers so that solutions can be assessed.

It is no longer necessary for mining owners to be completely dependent upon contractors for information. Traditionally, owners rely upon their EPC contractors for information, but in an era of greater cost control, they need the ability to ‘trust, but verify’ information coming from contractors. Sometimes, EPC contractors give owners only what they want them to see or what is stipulated by contract – and many times the information is out of date by the time the owner receives it. Cost control with both OPEX and CAPEX is the responsibility of the owner, so Hexagon’s Intergraph® PP&M data-centric solutions provide them with a tool for capturing, storing and organising all of the data and documents coming at them from their contractors, vendors, suppliers and many other sources. Mine owners can have tools and systems to give them up-to-date visibility into all aspects of the project and can trace problems back to the source for greater control.

Another important aspect of managing assets is to have systems in place for proper decision support so that enough information is available to the right people to make the best possible decision when an asset goes down, needs replacing or when other production or maintenance problems arise at the plant or mine facility. Large amounts of information are coming in from contractors, vendors, sensors, the supply chain, etc. Having effective systems and processes in place so that all of this information can be accumulated, organised, filtered and reported in a timely manner is critical. One key to the success of such a system is to have all of this information centrally managed in an electronic data-centric repository where data, documents and asset records are linked together. A data-centric system is important, since all of these asset management concepts hinge on efficient access to data.

**Operating and maintaining assets in the plant facility**

Effective management of assets is vital during operations and maintenance of a mining facility. Through application of the principles described here, plant operators can reduce production downtime, get more out of existing assets, have information at their fingertips for better decision support, and therefore achieve increased operational excellence. How does this happen? Through quick and easy access to information.

Maintenance personnel can more accurately predict asset failures and extend the life of an asset through ready access to performance and historical information – including repair and inspection records – and through quick access to other relevant documentation, such as repair manuals, vendor manuals, specifications and design documents. Proactive, scheduled maintenance and optimised planning for shutdowns and turnarounds are achievable with an effective asset management programme. Employing systems and processes that provide a centralised electronic repository for control of all of this information and documentation is a requirement to manage assets at this level.

**Putting asset management into practice: Minera Lumina Copper, Chile**

Minera Lumina Copper Chile (MLCC) operates in the resource-rich country of Chile. MLCC has put these principles into practice at their Caserones copper mine high in the Andes Mountains. Its main goal in managing assets at the mine is to identify, capture and reuse information developed during the capital project to achieve operation and maintenance excellence. This will optimise the return on investment and ensure a safe environment with demonstrable regulatory compliance. To achieve this goal, they deployed an electronic asset management system by Hexagon’s division, Intergraph Process, Power & Marine (PP&M) with full management of change.

Initially, more than 14 000 engineering documents and 36 000 pieces of vendor information related to 20 000 equipment assets were consolidated from various systems. The Intergraph solution rigorously controls the quality of the data loaded into the data repository. Intergraph’s SmartPlant® Enterprise for Owner Operators (SPO) provides MLCC with rapid access to all key information and ensures the capture and maintenance of asset information.

Currently, the system manages more than 120 000 documents and also acts as the central data-centric repository for capturing engineering data. MLCC implemented SPO as the information management platform linking all necessary information. This means that the operations and maintenance teams have all of their information available from a single source that is constantly updated according to changes in operations.

Now all MLCC engineering, operations and maintenance staff members can quickly access asset information and documents for:

- Impact assessment of engineering modifications.
- Emergency response support.
- Rapid decision support in the field.

MLCC enjoys significant business benefits, including:

- Up to 90% cost savings for engineering design changes thanks to the use of intelligent tools.
- As much as 250% time savings for onsite engineering design changes, also due to the use of intelligent tools.
- Minimised plant shutdown activities because up-to-date, as-built information is readily available.

**Conclusion**

Having the capability to consolidate, organise, visualise and control the extensive amount of information that is involved in a mining facility is critical to success. The traditional method of paper and file cabinets is quickly being replaced by centralised electronic repositories where just about every aspect of every mining asset is captured with near instant access to information by relevant personnel. This is leading to the next revolution in the mining industry, where information is the currency that drives economic success.