The metals and mining industry provides basic raw materials such as iron ore, steel, copper, and aluminum to major sectors of the world economy, including automotive, consumer goods, and electronics manufacturing. The process of getting the raw materials into the hands of end-users presents formidable challenges to the industry – from mining to materials handling, mineral processing, piping, de-watering, smelting, and refining.

Metals and mining operations are some of the largest in the world and among the most remote. Construction of facilities is logistically challenging and quite expensive. Delays and mistakes in materials management send costs skyrocketing. Managing global spare parts for sites that carry redundant inventory is a challenge. And after construction, process facilities require a high degree of maintenance, so it is critical to have accurate “as built/as operated” drawings and data on all equipment in use in the facility.

Intergraph®’s products for the metals and mining industry are designed to help meet these challenges.
An Intergraph customer in Brazil was able to complete commissioning of a brownfield aluminum refinery much faster through the use of a 3D model. Full commissioning of the expanded portion of a plant – from first feed to full production capacity – was completed in 12 days. By comparison, commissioning of previous expansions took 90 days to complete. Both the owner and the engineering company attributed this cost-saving improvement to the adoption of 3D and a collaborative environment throughout the project at all levels of both companies.
INTERGRAPH SOLUTIONS FOR THE METALS AND MINING INDUSTRY

To extract and process ore from some of the largest operations in the world requires that facilities for mining, materials handling, processing, and transportation be designed and constructed faster. Engineering design speed is a key component, but it is not enough. What is needed today is a plant automation solution that provides true workflow-managed integration between the process engineering design basis and detailed engineering disciplines – including materials management and field construction.

Importance of the 3D Model

SmartPlant® 3D is reshaping the way plants are designed for the metals and mining industry. The solution provides an integrated design environment able to fully support and manage the complexities and scale of these plants. SmartPlant 3D offers close integration among disciplines – structural, civil, process plant equipment, conveying systems, and piping disciplines.

The use of a 3D model allows initial engineering designs to be reviewed earlier in the process by many levels within the owner’s operation. Plant operations and maintenance, for example, have ample time to make process improvement suggestions before completion of final design and construction. This can greatly reduce the need for the owner’s field maintenance and operation teams to spend months re-engineering portions of the plant to meet field needs. These changes can be implemented before initial construction, saving both time and money.

Early adopters of 3D models in mining report significant improvements in all phases of their projects:

- Improved accuracy of engineering deliverables, with drawing accuracy of more than 99 percent.
- Significant reductions in field rework during construction. Compared to an industrial standard of six to eight percent, field rework is reduced to less than two percent. This is a direct result of the ability to correct a problem in the model where it is faster and less expensive than correcting it in the field.
Faster project execution. With improvements in engineering time and field construction time, projects reach completion faster, turning a pre-operation cost center into a revenue generator for the company. Engineering, procurement, and construction (EPC) companies also benefit as they can move to the next project sooner, allowing for increased revenue and improved resource utilization.

**Workflow-Managed Integration**

Engineering data is a critical asset, and its value increases over time. At each stage of the workflow, more information is added, refined, and linked. Intergraph’s 3D Modeling & Visualization solution provides true workflow-managed integration. The multi-discipline environment is “intelligent” and rule-based. It “understands” the many object relationships that exist within the plant model, and can therefore maintain design intent as changes occur.

In a mining project workflow, initial process flow diagrams outline the preliminary processing method to be used. From there, the project is separated into functional boundaries; e.g., materials handling system, mill process, de-watering plant. These are further divided into functional areas. For example, the mill process would be divided into crushing/screening, SAG mill, ball mill, flotation cells/heap leaching, and so forth.

Each of these functional areas is then detail designed by engineering and approved by the owner. As the functional areas are detail engineered, the volume of information grows exponentially to include engineering details needed for design and construction of the plant, as well as operating information for each component. This information is critical for commissioning and ongoing plant operations.

Ultimately, all information used for plant design, construction, and commissioning is transferred to the plant owner who uploads it into the operating and maintenance systems to be used throughout the plant life cycle. The data now includes drawings of the entire plant, tag numbers to identify components, ISOs of piping runs, maintenance recommendations from original equipment manufacturers, operating instructions, manuals, and thousands of other pieces of information in a variety of formats.

Intergraph’s powerful SmartPlant Foundation serves as a comprehensive electronic library for the entire life cycle of the plant. It houses the facility’s design and modifications, basically managing the configuration from design to decommissioning.

**Specialized SmartPlant Enterprise Solutions: Engineering & Schematics**

The process facilities in mining and metal operations require a great deal of maintenance. SmartPlant Engineering & Schematics provides the tools you need to design the installation with the associated power and control requirements. This improves access to data in support of ongoing maintenance, thereby lowering the frequency and duration of maintenance events. SmartPlant Engineering & Schematics also enables design of plants requiring large prefabricated equipment, as well as integration of significant power distribution networks.

**Integration Across Engineering Disciplines**

SmartPlant Engineering & Schematics also enables process engineers to lay out the plant configuration in SmartPlant P&ID, the application for creating intelligent piping and instrumentation diagrams that serve as a roadmap to the plant. This forms the basis for the detailed design by the instrument engineers.
and designers in SmartPlant Instrumentation – an application for instrumentation and control systems engineering, design, and maintenance. The SmartPlant P&ID “roadmap” is also used by the electrical engineers for the power distribution system, and the P&ID will drive the physical 3D plant design by the piping department.

**SmartPlant Foundation: Globally Managing Information and Change**

Metals and mining is a global industry. Operations cover a considerable area and are frequently located in very remote locations. Today, global workshare is increasingly typical in mining projects. Partners from around the world collaborate in exchanging information and making decisions. To ensure the success of such complex, multi-party projects, decisions must be based on the best available information. And to make decisions that reduce exposure to error, risk, and cost, it is essential to employ a single set of tools and a unified approach across the global engineering enterprise.

SmartPlant Foundation is Intergraph’s engineering data and document management system, application integration hub, and information portal – all in one. With SmartPlant Foundation, you can replicate project data anywhere in the world. As changes are made in one location, they are propagated to other locations, with all project team members working in a single, concurrent environment. Also, SmartPlant Foundation Web Portal gives project partners access to information without the need for source application tools on the desktop.

Modifications are inevitable during a plant’s life cycle. What is critical is maintaining control over these changes to valuable plant data. With SmartPlant Foundation, the impact of changes in one system –
To measure the impact of the fully integrated design concept, Intergraph has conducted research among users in peer industries. These users have:

- Reduced engineering costs by 30 to 40 percent.
- Shortened total project schedules by 8 to 10 percent.
- Reduced commissioning times by up to 80 percent.
- Improved field construction productivity by 20 to 30 percent.
- Reduced total project costs by 8 to 12 percent.

Early adopters in the mining industry have begun to embrace the concept, and similar returns on investment are expected in this industry as well.
piping, for example – can easily been seen in other systems – structural, for example – without the need for lengthy design reviews. The use of clash detection technology makes these issues automatically visible and highlights areas that must be addressed prior to approvals.

**Bulk Materials Handling**

As global markets expand, the need to produce and transport raw materials around the world continues to increase. As a result, the bulk materials handling industry is becoming more visible and integral than ever before. SmartPlant 3D Materials Handling Edition – the newest addition to Intergraph’s SmartPlant Enterprise engineering software suite – addresses the challenge of designing and modeling bulk materials handling systems, such as conveyors and transfer chutes in mining and other conveyor-intensive industries.

SmartPlant 3D Materials Handling Edition provides the capabilities needed to design a bulk handling system and keep it as-built throughout its life cycle. It offers piping, HVAC, electrical raceway, structural, platework, and mechanical equipment modeling tasks, as well as a specification and catalog manager and a project administration environment. A key feature is the ability to generate fabrication-level drawings in a single environment. It also enables you to design and model sections of the system once, save them to a catalog, and reuse the design in future projects.

**Global Outlook for the Future of the Industry**

A number of analysts are projecting that by 2025, the need for metals globally will double. Driving this future growth is the expectation that developing economies in Asia-Pacific, Latin America, and India will demand raw materials for products that accompany a higher standard of living – automobiles, durable goods, and computers. Mines and process plants will be needed to meet this demand. The ability to complete a project accurately and on time will put owners in a position to capitalize on these market demands as they arise.

Intergraph’s plant automation solutions and global network of offices in more than 60 countries are providing the industry with the tools and support needed to achieve higher production goals and operational excellence.
ABOUT INTERGRAPH

Intergraph is the leading global provider of engineering and geospatial software that enables customers to visualize complex data. Businesses and governments in more than 60 countries rely on Intergraph's industry-specific software to organize vast amounts of data into understandable visual representations and actionable intelligence. Intergraph’s software and services empower customers to build and operate more efficient plants and ships, create intelligent maps, and protect critical infrastructure and millions of people around the world.

Intergraph operates through two divisions: Process, Power & Marine (PP&M) and Security, Government & Infrastructure (SG&I). Intergraph PP&M provides enterprise engineering software for the design, construction, and operation of plants, ships, and offshore facilities. Intergraph SG&I provides geospatially powered solutions to the defense and intelligence, public safety and security, government, transportation, photogrammetry, utilities, and communications industries.

For more information, visit www.intergraph.com.