SMARTPLANT® ENTERPRISE
For the Metals and Mining Industry
Metals and mining facilities are increasingly complex and large in scope, with mega-projects becoming the norm. There is the logistical problem of transporting heavy raw materials involved in bulk materials handling. Equipment and labor shortages drive costs higher. In addition, there is a growing demand for enforced safety standards.

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.

To extract and process ore and minerals from some of the largest operations in the world requires that facilities for mining, materials handling, processing, and transportation be designed and constructed with greater efficiency and quality. Mining companies are looking for assurances that their projects will be delivered efficiently and within budget and schedule. What is needed to accomplish all of this today is a plant automation solution that provides true workflow-managed integration between the engineering design basis and detailed engineering disciplines – including materials management and field construction. Intergraph® products for the metals and mining industry are designed to help meet these challenges.
FASTER COMMISSIONING

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

IMPROVED DELIVERY OF MINING PRODUCTS
Intelligent 3D Design for the Bulk Materials Handling Industry

Intergraph Smart™ 3D enables the design of materials handling systems in a variety of global industries. Smart 3D addresses the challenge of designing and modeling bulk materials handling systems, such as belts, conveyors, and transfer chutes in mining and other conveyor-intensive industries.

Smart 3D helps users design bulk material handling systems and then keep them as-built. The solution offers comprehensive piping, HVAC, electrical raceway, structural, plate work, and mechanical equipment modeling tasks, as well as a specification and catalog manager and a project administration environment.

Smart 3D provides an innovative solution for designing bulk material handling systems through an integrated environment that removes the need for multiple design systems. Smart 3D consolidates the design of surface and underground material handling systems into a single application for a variety of purposes, including:

- Belt and conveyor layout.
- Truss and gantry layout.
- 3D modeling and visualization.
- Detailed construction and fabrication drawings.
- Reports.
- Intelligent design modifications.

Another key feature is the ability to design and model sections of the system once, save them to a catalog, and reuse the design on future projects. Intergraph developed the solution with direct feedback and engagement from some of the leading materials handling system design companies from around the world.
System Improvements
Informed decisions can be made early in regards to system design by reviewing the model with the owner at defined stages during design. The model can be quickly and easily changed, based on information coming from these reviews. As the model changes, content for bill of materials and drawings will automatically be updated. This ensures that both the engineering contractor and the owner can make the best possible decisions.

Process Changes
Improved technology enables improved business processes. Previously, the creation of drawings was the driver to create the 3D model, if a 3D model was actually ever created.

With the change in technology, the 3D model is the source for drawing creation. Drawings become an output from the model, specifically fabrication-level drawings for engineered objects, such as transfer chutes and truss sections. This is a significant improvement over traditional work processes where drawings are created first and modified prior to handing them to a detailer to create a 3D model.

Data Reuse
Intergraph’s solution gives you the ability to design and model in 3D and save portions of the design to an intelligent catalog. This catalog can then be reused on other projects – benefiting both the owner and the engineering contractor.

Not only does this positively impact future project costs, but it also greatly reduces project timelines through better engineering data management. The opportunity to “learn” from other projects and apply this knowledge in the future is a marked improvement over existing design systems.

Modular Design, Assembly, and Construction
Most of the easily accessible mining projects have long been discovered, which leaves the more difficult geographic locations for new project development. Many of the high-quality ores being discovered today are found in remote locations which are difficult to reach, difficult for workers, and difficult for transporting heavy construction equipment. Sometimes the right labor force is in a different part of the world.

The industry has developed a cost-effective method for solving these problems through modular construction, whereby modules are fabricated in various controlled locations, transported to the project site, and assembled. This provides an effective way to achieve significant cost savings. Intergraph solutions provide tools for performing design and construction of modular systems by allowing an engineering contractor to organize designs by module within Smart 3D and to create construction work planning packages by module with SmartPlant® Construction.

Standardization across Projects and Contractors
Large mining projects often involve many different engineering, procurement, and construction (EPC) companies that are contracted to work on various parts of the project. It is critical that engineering information coming from each of these contractors follows a consistent standard. This is important for quality and cost control. Standardized, intelligent electronic catalogs that contain specifications, equipment and other components, drawing standards, formats for reporting, and many other elements are essential for proper control of complex projects.
Having a standardized method for capturing, storing, and using catalogs and specifications across all projects is important. Cost, schedule, and quality improvements can be realized through a central storage and retrieval method. SmartPlant Reference Data (SPRD) allows a company to have a central repository for catalogs and specifications, and can output the specifications in a variety of formats, ready to load into 3D systems such as PDS®, PDMS, and Smart 3D. Once these standards are established within the central repository, they can be provided to subcontractors to ensure that all models, regardless of who is doing the work, adhere to the same standard. This promotes standardized deliverables (drawings and reports) and enables standardized commodity codes to be used for procurement. There is great benefit to this approach along with opportunities for cost savings (through centralized bulk material purchasing) and quality improvement (through automated enforcement of standards).

Multi-office, Global Worksharing

One of the key issues that can create problems in project execution is a lack of consistency for sharing and managing work across engineering disciplines, across multiple offices within a company, and across multiple subcontractors. One of the best ways to improve project quality and increase execution efficiency is to improve communication across the organization. SmartPlant Enterprise solutions provide better worksharing and collaboration through their data-centric architecture. Smart 3D supports the sharing of work globally, which delivers large projects with more flexibility, faster, and with better productivity. Engineering disciplines work together – from a single shared database. True global worksharing is now a reality.
It is important that plant asset information be up-to-date so that correct decisions can be made regarding performance improvements for Operations and Maintenance. When intelligent tools are used to create the engineering design and the data from these systems are made available to Operations and Maintenance through electronic handover, this data can be used to update other mine systems, such as the control system, engineering health management, and SAP PM with any design changes coming from ongoing sustaining engineering. It is important that this engineering data be controlled under MOC. The process for keeping asset information current and relevant throughout the enterprise is a key component of maintaining operational excellence. SmartPlant Enterprise offers:

- Asset integrity.
- Better decision support.
- Support for reliability, inspections, and maintenance.
- Interface to ERP.

With Smart 3D, new satellite offices can be brought online in hours. The solution offers flexibility by enabling companies to use project resources from anywhere in the world. More engineers can be added quickly when needed by the project. Engineers can work productively from around the globe on a given project, which shortens project schedules and saves on labor costs.

MANAGING INFORMATION WITHIN COMPLEX METALS AND MINING FACILITIES

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. Smart 3D 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 the 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.

**SUPPLY CHAIN MANAGEMENT AND PROCUREMENT**

An effective materials management system can integrate the entire material and supply chain work processes. Project teams will have online access to information during all project phases – from engineering through the complete supply chain to onsite management. The business benefits of effective materials management include significant cost savings and increased procurement efficiency.

SmartPlant Materials is the Intergraph integrated life-cycle material, supply chain, and subcontracting management solution. It provides a common collaboration platform and project workbench for all partners in any EPC project supply chain.

**CONSTRUCTION PLANNING**  
Improved CAPEX Efficiency

A major mining construction project involves thousands of workers, millions of details, and numerous complex variables, such as labor, materials, weather, and schedules. How can you manage millions of bits of data every day to complete the project on-time and within budget? How can you turn improved information management into increased field productivity?

The challenge for the construction industry is determining how to make informed decisions based on the most accurate information available and how to manage people and materials in a dynamic construction environment to advance the project in the safest and most efficient manner.

SmartPlant Construction, used in conjunction with Smart 3D and other SmartPlant Enterprise engineering tools, provides construction planners with early access to engineering data. Early visibility of design information and drawings provides construction planners with a valuable tool to build construction work packages earlier, which accelerates construction schedules.

**Scheduling**

SmartPlant Construction offers a direct link with Primavera and imports a Level 3 schedule for
work package planning. A “scheduler” feature also enables users to select durations, crew size, work week schedules, non-working day, and set dependencies. Users can view, sequence, calculate, and animate schedules. They can now even export detailed schedules back into Primavera. Users can animate work packages in the 3D model that links to the scheduler, then record and save schedules.

3D VISUALIZATION OF MINING FACILITIES
Complete 3D Design and Modeling
Traditionally, materials handling system designs are 2D document-centric, and the industry has typically been conservative in adopting new technologies of intelligent 3D design systems. Smart 3D offers comprehensive 3D design and modeling tools for a true 3D solution. Smart 3D provides a unique solution that enables modeling of the materials handling components in the same 3D design system as the rest of the plant design. This eliminates the requirement of a CAD translation interface, and the model can be taken from feasibility straight through to detail design.

Importance of the 3D Model
Smart 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. Smart 3D offers close integration among disciplines – structural, civil, process plant equipment, conveying systems, and piping disciplines.

BUSINESS BENEFITS
Cost and Schedule Reduction

There are many ways to gain enterprise benefits, including the deployment of standardized catalogs, reuse of modular systems, deployment of data-centric 3D technology, consolidation of procurement systems, and electronic handover of information from engineering. It has been shown that cost savings can be realized by using these systems, in addition to significant schedule reductions. Having a system with a “single source of truth” means reduced time and reduction in errors due to elimination of data re-entry. Cost savings can be achieved through centralized procurement and reduction of design errors through intelligent, integrated design.

MEASURING THE RETURN
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 40 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.
ABOUT INTERGRAPH

Intergraph helps the world work smarter. The company’s software and solutions improve the lives of millions of people through better facilities, safer communities, and more reliable operations.

Intergraph Process, Power & Marine (PP&M) is the world’s leading provider of enterprise engineering software enabling smarter design and operation of plants, ships, and offshore facilities. Intergraph Security, Government & Infrastructure (SG&I) is the leader in smart solutions for emergency response, utilities, transportation, and other global challenges. For more information, visit www.intergraph.com.

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