INDUSTRY CHALLENGES

ENGINEERING, PROCUREMENT, AND CONSTRUCTION COMPANIES (EPCs)

During engineering, there is increasing pressure on margins and intense global pressure and competition to deliver projects not only faster, but also with a more efficient design to reduce operational cost. Change management and resourcing/outsourcing/insourcing issues must be addressed due to a growing number of retiring experts. There are many new technologies becoming available for process and control systems, as well as engineering tools that challenge project execution. Engineering groups must also meet tight schedules and comply with government regulations. Global engineering is now required between far-flung domain expert offices or joint ventures. There are also the challenges of design reuse, fast-track projects, and providing additional value to win projects.
OWNER OPERATORS (O/Os)

During the operations phase, there are also several business drivers, such as supporting plant strategy, including production, quality, safety, and resource utilization. Increased plant safety reduces operational risks and production interruptions. Operations groups need to minimize turnaround planning and scheduled shutdowns, and conduct preventative maintenance planning. They desire to reduce the costs of inspection and overhead. The team is also driven to optimize production output and reduce energy costs. Production flexibility is needed to meet market demands.

BUSINESS = RISK MANAGEMENT

Saving time is an excellent, but not always key, business driver. Other issues to be considered include:

- Quality
- Innovation
- Differentiation
- Added value

It is important to be able to make the right decision as early as possible in the workflow to avoid costly rework, or worse, re-ordering of plant components. To achieve business drivers, integration is imperative. Individual applications can offer many benefits, but integration of disciplines holds even more value. Engineering & Schematics applications significantly contribute toward the bottom line in terms of saving costs, reducing execution risks, increasing design quality, and offering tools and data to support the operational phase of the plant.

A CHANGING INDUSTRY

Technology is the enabler to address business needs. Creating an efficient design and plant that will operate with the lowest possible risks is important. In addition to the traditional design, you can add value not only in the execution, but also in the deliverables used in operations. Engineering is the process of progressing from assumptions to a consistent and sound design.

Intergraph® recognizes that making the right decision early in the engineering design process eliminates re-work, saving time and money. It has been shown that poor design can increase the cost of a project by 15 percent or more, with errors rippling through from the critical P&ID design phase into the piping, instrumentation, equipment, and electrical phases. The key is to focus on the engineering goal – the plant.

Engineering is the way to create the plant, and technology is the enabler for the engineering and operational phases. Each phase in the plant life cycle has its own focus and associated value propositions. For example, engineering wants to execute as fast as possible; construction wants to ensure all materials are just-in-time; commissioning wants to see all systems verified and documented to start plant operations; and finally, operations wants to reduce production risks. You need to select a solution to address all parties’ needs, from engineering to safe and reliable plant operations. Each group has its own drivers, but in the end, the operational plant is the common goal.

SOLUTION

Intergraph®’s Engineering & Schematics applications encompass many engineering disciplines, and have been developed for today’s 24/7, global engineering workshare environment. All engineering disciplines are intelligent and fully integrated – so an engineering change in one area automatically triggers change in all associated objects, no matter where they are located, while the rule-driven environment prevents engineering errors.
Intergraph enables the rule-driven P&ID design of an intelligent plant asset configuration, the instrumentation engineering of the control system life cycle, and safe and reliable electrical engineering systems. The logical design and engineering of the plant are described in terms of process, control system, and power distribution.

Engineering & Schematics applications include a variety of powerful Intergraph software solutions:

- SmartPlant® Electrical
- SmartPlant Explorer
- SmartPlant Instrumentation
- SmartPlant P&ID
- SmartPlant P&ID Design Validation
- SmartPlant Layout (link with SmartPlant P&ID)
- SmartPlant Isometrics (link with SmartPlant P&ID)
- SmartPlant Process Safety
- SmartPlant Import Assistant
- SmartSketch®
- SIGRAPH.CAE®

**DIFFERENTIATORS**

Engineering & Schematics applications offer a variety of functionalities and benefits simply unmatched in the industry, including the following:

- **Intelligent Plant Assets** – Create and maintain connectivity for all plant items, such as valves, vessels, and lines, which hold knowledge based on their engineering data
- **Automation** – Compress schedules with fewer iterations because you can automate some design tasks and take advantage of best practices with customizations
- **Deliverables** – Automatic create deliverables consistent with the true representation of the design data
- **Validation** – Check and flag the engineering content consistency and compliance to

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**“Much value has been lost in not bridging the gap between design, construction, operations, and maintenance. We expect value measured in multiple millions of dollars annually from the capture and broad use of the plant information asset.”**

Bob Donaho  
Director Design Engineering/Design Technology  
The Dow Chemical Company
The company chose SmartPlant Instrumentation because it has a complete database and update for instrumentation projects. All deliverables link with a report and an intelligent database to have better control of all information. 

Elisa Guinea Corres
Project Manager of Operations
Krupp Uhde Jacobs Engineering de Mexico, S.A. de C.V.

• Integration – Share relevant data once across all tasks
• Data Management – Manage the revision, notification, and distribution of engineering and workflows
• Market-leading Solutions – Rely on the worldwide market-leading solutions currently in use in both small and large projects, delivered by a company with more than 40 years of experience
• Partner in Project Execution and Plant Operations – Take advantage of Intergraph’s approach to work closely with customers, offering services and support in 60 countries, supplied by engineering professionals with thousands of hours of experience

THE SOLUTION: ENGINEERING & SCHEMATICS

Intergraph’s Engineering & Schematics solution enables you to efficiently configure your plant process, controls, and power distribution. All of these capabilities are driven by rules and specifications to ensure data consistency, quality, and compliance with engineering and customer standards. The solution is focused on the plant asset and its data, and relationships between the plant assets. This unique engineering approach enables you to make the right decisions early in project execution.

Engineering & Schematics applications break down the discipline silos in your organization. Each task, such as SmartPlant P&ID, offers a step change in engineering and design, and dramatic benefits. When used in the SmartPlant Enterprise environment, the equation 1+1 = 3 becomes a reality. You yield a much greater value when information flows between the tasks, changes are managed,
and engineers are notified if changes are made in associated tasks.

To execute projects more quickly, ensure design consistency, and implement best practices for constructability and operability, you rely on your best, most experienced engineers who have performed many of these types of projects in the past. With a younger workforce, some of this experience is leaving the industry.

Our Engineering & Schematics applications can capture this experience in the rules to ensure you complete design and safety analysis in the most efficient way, providing the highest design quality based on your company’s years of experience. At the same time, the tools enable fast and easy modification to allow for innovation and adjustments based on new technologies.

Plant safety is a key element, and strictly enforced by regulations. SmartPlant Process Safety enables you to automate design analysis to ensure the design is sound, and in case process conditions change or equipment fails, the plant returns to a safe state thanks to protective devices, for example.

SmartPlant Explorer is your solution for viewing, querying, and reporting on data generated by PDS® and Engineering & Schematics applications via the Web. SmartPlant Explorer turns design data into usable information that fits your needs. The software provides a “common user experience” for all supported applications, enabling you to navigate through and report on PDS P&ID data, SmartPlant P&IDs, SmartPlant Instrumentation data, and PDS 3D model information. This enables easy, live data access, and the solution is rules-based. Benefit from a role-based process.

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<th>BEST PRACTICES AND VALUE PROPOSITIONS</th>
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| Workshare Project Consolidation | • Subcontractors release their designs to the main contractor  
• No data inconsistency due to single design basis and seamless merge of the individual project scopes in a single project | Consistent design using single design basis, and no need for data consolidation verifications | 2 hours per P&ID x 700 P&IDs x $60/hour labor costs = $84,000 saved |
| Electrical Design | • Layout the plant distribution and distributing loads from the mechanical group  
• Optimize safety and eliminate redundancy  
• Enforce rules to comply with engineering and company standards | Efficient way to design optimal distribution with shorter cables and reliability | .5 hours per load x 400 electrical designs x 5 designers x $60/hour labor costs = $12,000 saved |
BEST-IN-CLASS WORK PROCESS

Engineering & Schematics applications offer the opportunity to implement your best-in-class work process for project execution and plant operations. Intergraph goes beyond the CAD world of mere graphic depictions with limited data on symbols. Streamline your workflow with access to plant items and their relationships to understand change impacts, create scenarios for engineering updates, and more.

SmartPlant P&ID represents a completely different approach from any CAD system because the graphics represent the data. Data are primary, followed by graphics. It also supports engineering standards like KKS and PIP.

Take advantage of unique capabilities, such as multiple projects for what-if scenarios. You can compare the what-if scenario with your original design, and consolidate them if the change is approved. Copy your existing design, and during the copy, a transmission routine can modify the original design on-the-fly. For example, change the symbology tag numbers and process data, and then the P&IDs with the newly modified design are recreated from the database. This gives you a valuable jumpstart on your new projects, boosting productivity, data consistency, and innovation. Plus, take advantage of typicals.

Engineering & Schematics applications streamline your plant process and configuration design with data validation, your link from safety analysis to design safety and operability in the plant. As part of the work process, SmartPlant Instrumentation will expand your functional control system design from the P&ID into the physical design, offering support for new technology, such as fieldbus and links to vendors like DCS catalogs.

SmartPlant Electrical will help create safe and reliable power distribution, taking the input from the mechanical drawings and P&IDs to interface with other vendors’ analysis products, such as ETAP, to verify design. SIGRAPH.CAE creates all of the design and deliverables required for an electrical system, from concept to detailed design. SmartSketch is the engineering companion to assist with conceptual designs and deliverables throughout the plant life cycle.

MEASURING THE RETURN

- Industry research reveals that an environment using Engineering & Schematics technology delivers engineering efficiency increases of up to 28 percent, and handover savings of up to 60 percent. For a $2 billion, six-million-tons-per-year capacity LNG plant project involving 700 P&IDs, 900 equipment items, 1,200 control loops, and 2 product trains, with engineering communications spread across three countries, total estimated savings of 19 percent using Engineering & Schematics on the project were quantified at $683,000, or 11,384 labor hours.
- Dow Chemical’s project savings estimate for the SmartPlant environment is 0.3 percent of total installed costs.
THE INTEGRATED SMARTPLANT FAMILY

Beyond standalone use, Engineering & Schematics is also part of the SmartPlant Enterprise. SmartPlant Enterprise offers best-in-class applications and a low-risk, step-wise implementation approach to realizing a truly integrated engineering enterprise. SmartPlant Enterprise includes:

- 3D Modeling & Visualization
- Analysis
- Information Management
- Engineering & Schematics
- Procurement, Fabrication & Construction
- SmartPlant Alliance Program

NEXT STEPS

Engineering & Schematics applications are fully supported by Intergraph’s global service network and can be tailored to meet your specific requirements. The solution can be up and running within weeks, including user training. In addition, we offer SmartPlant Import Assistant and data conversion services to move legacy data such as P&IDs or instrumentation data into the SmartPlant world. To discover how this solution could help your business, contact us today.

SmartPlant P&ID provides data that is more accessible and consistent. This saves us time in both engineering tasks and material procurement. SmartPlant P&ID was selected because it gives data intelligence to pipe and instrumentation diagrams, and uses that intelligence to leverage the accessibility of the data to other specialties. It also enables our process engineers to work directly in final designs.

Miguel Villalobos
Information Technology Manager
Tecnoconsult
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.