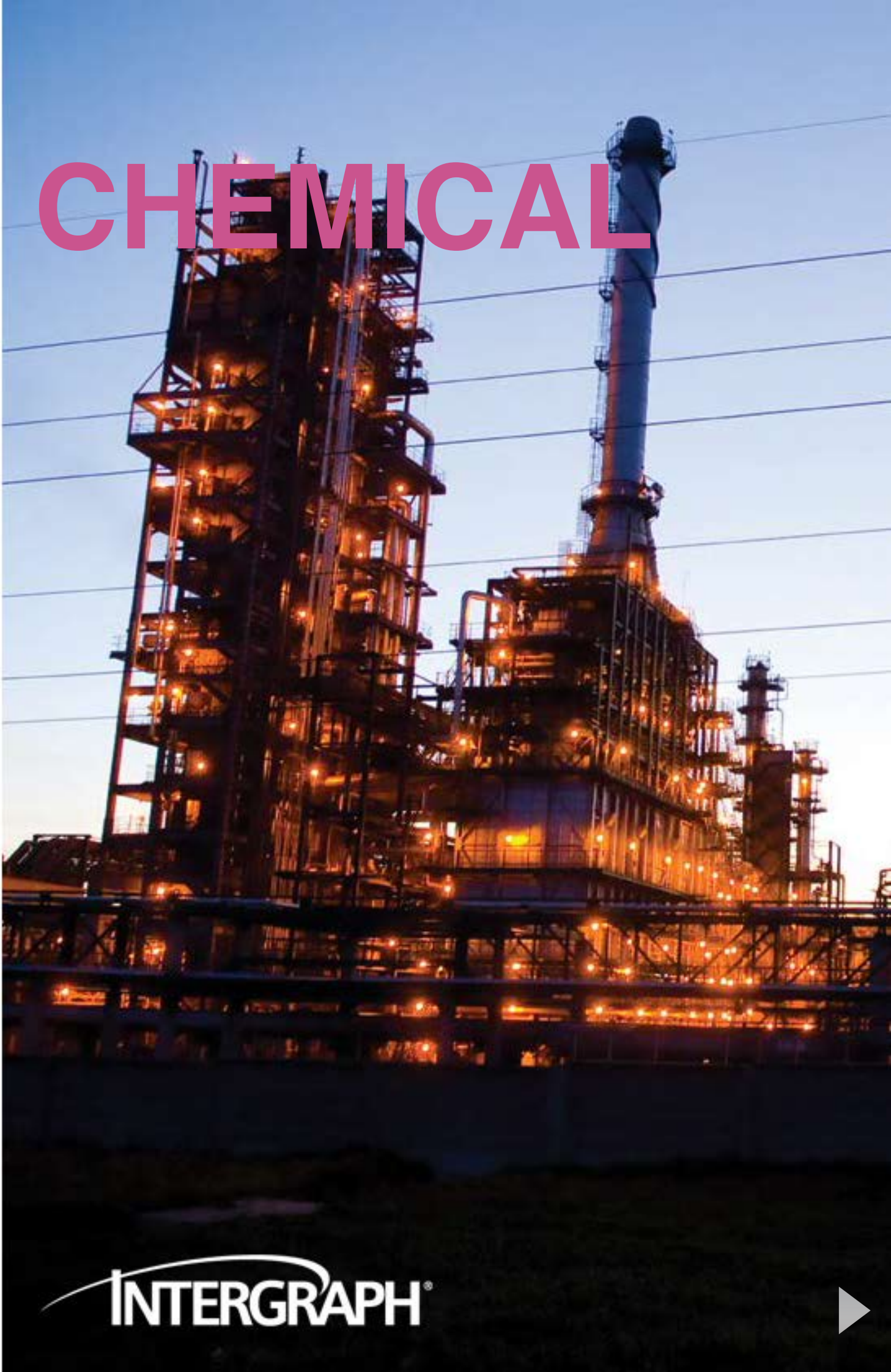
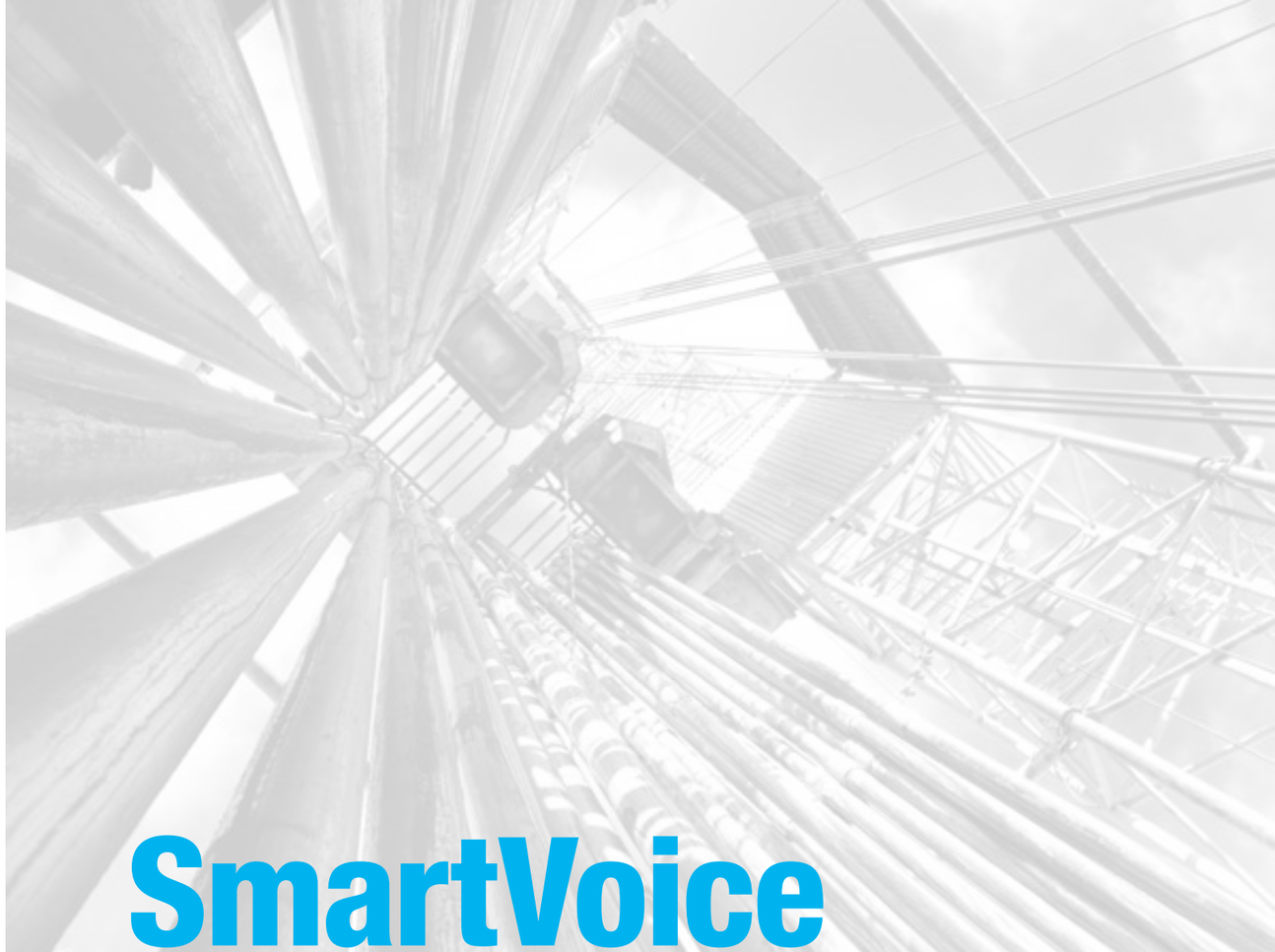
CHEMICAL



INTERGRAPH®



SmartVoice

Intergraph® Process, Power & Marine Customer Success Stories

VOLUME 2

INTERGRAPH®

INTRODUCTION

Advances and innovations in engineering technology during the last three decades have changed the way people approach their work, the methods and tools they use, the collaborative partnerships they develop, and the solutions they employ to ensure the success of their businesses.

With more than 40 years' history, Intergraph has been helping customers around the world to improve safety, quality, and productivity in their process, power, marine, and offshore facilities. Today, our advanced technology is helping customers change the way they do business by offering solutions that enable them to capture and reuse their intellectual capital across the entire enterprise, enhancing their global competitiveness.

In SmartVoice, you will learn how our customers of all sizes and in all industries are transforming their businesses with Intergraph solutions. Intergraph empowers you to make better, faster operational decisions, leverage best practices from around the world, and explore how other customers are generating more value with Intergraph products and services.

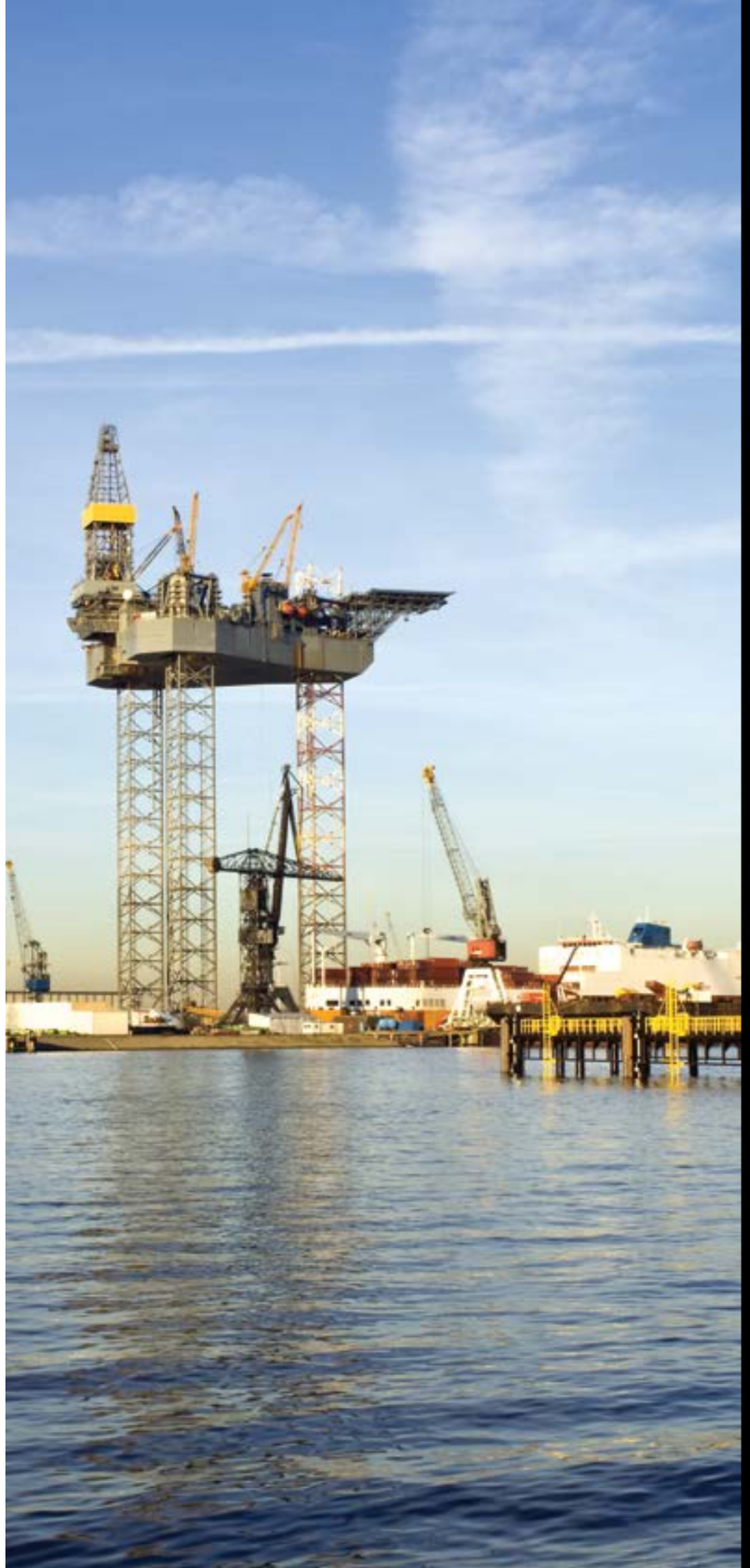
GLOBAL LEADER

Intergraph's Process, Power & Marine division creates solutions that enable the design, construction, and operation of process and power plants, offshore platforms, and ships, and provide the information management capabilities to build and operate those facilities.

Intergraph has been ranked the No. 1 overall worldwide provider of engineering design solutions for industry, according to the ARC Advisory Group. Our leadership position is backed by a proven track record of high-quality product development, a global customer base of industry leaders, and a worldwide sales and support network. Intergraph Process, Power & Marine's business is based on a strong financial foundation and steady growth.

Our customers use Intergraph software and services to design, build, and operate many of the world's largest and most elaborate industrial facilities.

"More than two-thirds of the plants built worldwide are designed using Intergraph software."



HISTORY OF EXCELLENCE

Since offering its first solution for plant design in 1978, Intergraph has focused on developing industry-leading plant and marine design solutions, enabling our customers to use integrated applications to execute projects for increased efficiency and effectiveness. Today, Intergraph is the leading global provider of enterprise engineering software to the process, power, and marine industries. We offer a full suite of solutions that enable proven productivity gains for engineering, procurement, and construction (EPC) firms and owner operators, improving engineering efficiency by up to 30 percent.

1987	Offered our first piping application for plant design.
1984	Launched the leading 3D plant design system.
Late 1990s	Created first data and document management system specifically for the plant design industry.
2000s	Presented suite of integrated, intelligent 2D solutions. Offered leading material management and procurement system specifically for the plant design industry.
Today	Providing the only next-generation 3D solutions for process, power, and marine industries.

INTERGRAPH ENTERPRISE ENGINEERING COMPONENTS

3D MODELING & VISUALIZATION

Save project time and increase production efficiency

For manufacturing and power industries, meeting higher production goals and stricter regulatory requirements begins with building a better plant. Intergraph provides an integrated design environment for plant construction that defines and manages the 3D plant model. The intelligent, rule-based 3D environment enables faster, silo-free plant design and engineering, better collaboration, and reduced time to market. Innovative plant modeling software from Intergraph provides consistent 2D/3D integration between process engineering and detailed engineering disciplines, and true workflow-managed integration across the project enterprise.

INFORMATION MANAGEMENT

Ensure consistency and accuracy of your engineering data

Plant designers and plant owners need plant management software with enhanced decision support capabilities to facilitate global design, production, and life cycle optimization of the plant. Intergraph's information management software maximizes efficiency for industrial and manufacturing plant maintenance and provides plant operation solutions. From concept and design through plant maintenance, operations, and decommissioning, Intergraph enables electronic management of all of the plant's engineering information, integrating information on the physical asset, processes, and regulatory and safety imperatives.

ENGINEERING & SCHEMATICS

Increase data quality and consistency across tasks

To keep a plant operating smoothly over its 30- to 40-year life requires efficient and intelligent plant engineering from the beginning. Intergraph's comprehensive plant engineering solution has been developed for today's 24/7 global engineering workshare environment. All engineering disciplines are intelligent and fully integrated — an engineering change in one area automatically triggers change in all associated objects, no matter where the change occurs. Designed to drive plant optimization, the rule-driven environment prevents engineering errors, thus avoiding shutdowns and lost production.

PROCUREMENT, FABRICATION & CONSTRUCTION

Reduce material surpluses and shortages

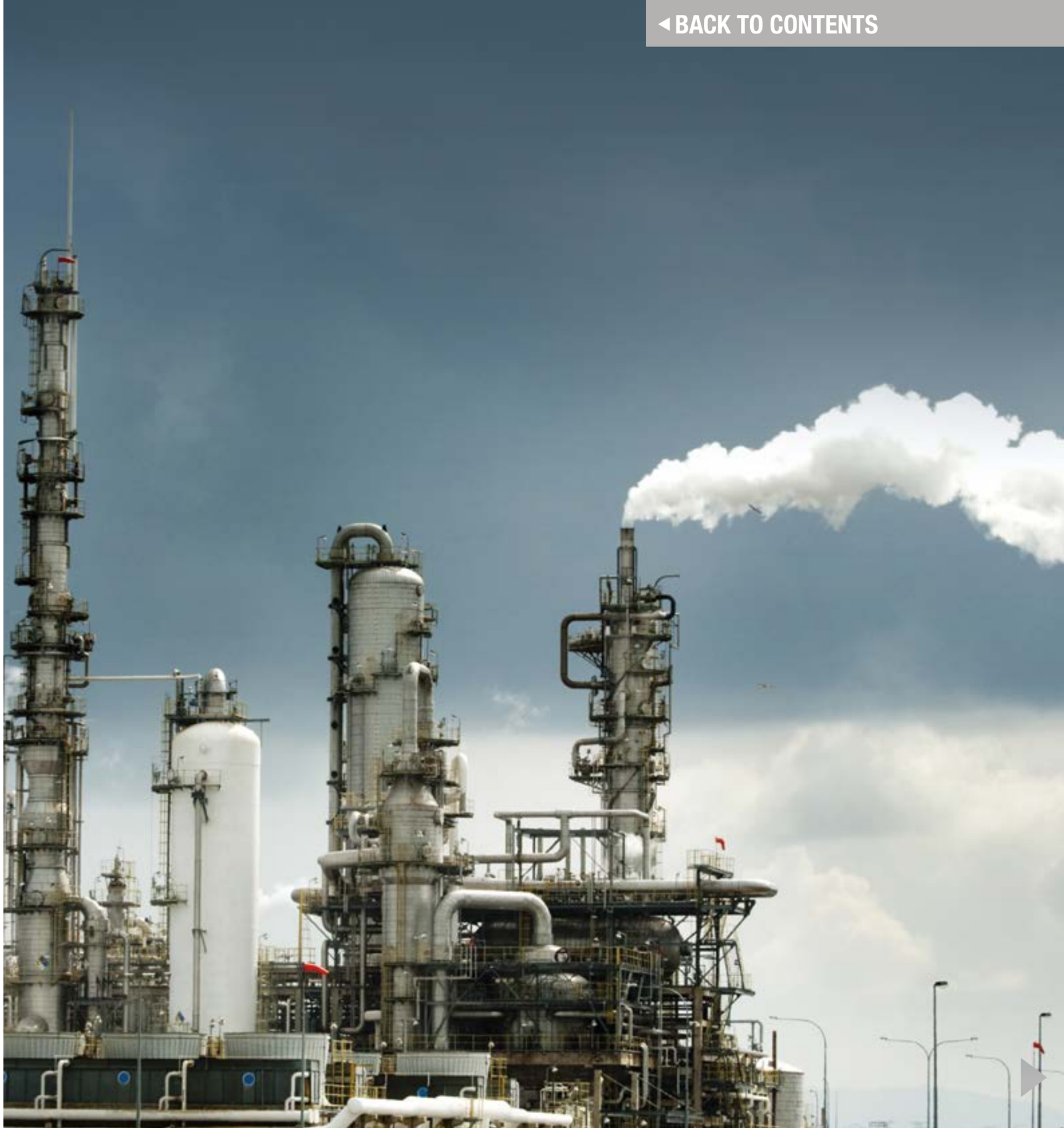
With Intergraph's efficient and accurate plant control system for procurement, fabrication, and construction, plant designers and owners save valuable production time during plant construction. The solution spans the complete project management life cycle — from materials specification and change management through procurement and tracking to inventories, forecast, and material issuing. Intergraph lowers labor costs throughout engineering, procurement, and plant construction. Designed to drive efficiency, our solutions for plant project management can help avoid costly material surpluses and shortages, and reduce overall project risk.

ANALYSIS

Streamline your plant design validation processes

For plant owners and designers, the need to integrate plant design and engineering analysis is vital. One without the other could result in delays and unexpected costs. But with the two working together, you have the ability to validate your plant's design as you go, saving you costly time and resources.

With Intergraph's acquisition of COADE, we now provide plant analysis solutions that set the standard for the industry. Leading plant engineering companies and owner operators worldwide count on our software to deliver accurate, reliable results. Intergraph has transformed primarily manual, time-consuming, and error-prone tasks into seamless and accurate processes. From pipe stress analysis to automated full vessel and oil tank analysis, our software helps you improve safety and reliability while tightening the entire design process to save time and money.



CHEMICAL

Design, construction, operation, and data management of chemical plants

For the chemical industry, today's challenge is sustainability in the market, which means operational efficiency is a must. Through Integraph's chemical plant design, construction, and maintenance solutions, leading firms can better design and build plants. This contributes to reduced time to market and an optimized supply chain. Chemical plant owners will gain control over their valuable information asset in order to generate or process chemical products faster. Owners can build and make their plants operational in record time.

L&T Chiyoda Addresses Mega-project Challenges with PV Elite

L&T Chiyoda Limited (L&T Chiyoda) is an engineering consultancy company formed by Larsen & Toubro Limited of India and Chiyoda Corporation of Japan, world leaders in engineering, construction, and related fields. L&T Chiyoda specializes in design and detailed engineering for projects such as petroleum refining, petrochemicals, chemicals, fertilizers, oil and gas, and LNG and LPG facilities.

To meet project requirements, LTC uses various software packages for the automation of engineering and design processes, ranging from drafting software to high-end intelligent software that makes engineering easier, faster, and more accurate. These programs include Intergraph PV Elite, CODECALC and other engineering and design programs.

ADDRESSING CHALLENGES OF PETROCHEMICALS COMPLEX MEGA-PROJECT

For an ongoing petrochemicals complex mega project, L&T Chiyoda has provided engineering and design for static equipment such as pressure vessels, shell and tube heat exchangers, columns, reactors, and filters. The scope of work includes the design and detailed engineering, including process, piping, civil, equipment, electrical and instrumentation engineering through 3D Modeling.

DEVELOPING ACCURATE, ON TIME DELIVERABLES WITH INTERGRAPH PV ELITE

For the mega-project, L&T Chiyoda developed very complex ASME code calculations such as minimum design metal temperature, maximum allowable working temperature, maximum allowable pressure, external pressure, center-of-gravity, and wind and seismic design for a wide variety of design codes using PV Elite. The CodeCalc module provides fast component analysis when not designing a complete vessel or heat exchanger.

One of the larger pieces of equipment was a column with dimensions of 9,600 X 8,700 mm and a length of 82,000 mm. The fabricated weight was 1,007 tons, with an operating weight 2,575 tons and a hydro-test weight of 5,834 tons. Due to the column's size, it was fabricated in one piece, cut into two pieces, shipped to the site, and welded back together on site.

BENEFITING FROM DESIGN AUTOMATION

"We found PV Elite very user-friendly with its detailed reports and help manual compared to other similar software available in the market," explained Mitul Patel of L&T Chiyoda. PV Elite does design calculations per ASME, PD-5500, EN-13445, and WRC standards and provides a wide variety of wind and seismic design codes for international project requirements. "The software is up-to-date with the latest codes, addenda, and interpretations so we can avoid manual and spreadsheet-based calculations," Patel added. The software's Nozzle Pro finite element analysis (FEA) run directly from PV Elite makes analysis easy. "These levels of automation help us meet dates in fast track bid engineering projects, and various suppliers and client companies also use PV Elite which allows us easy comparison and approval of design calculations," Patel stated.

AVOIDING DELAYS IN ISSUING ENGINEERING DELIVERABLES

In the highly competitive engineering sector business scenario, using the latest tools and software such as PV Elite helps L&T Chiyoda maintain schedules. "We can minimize chances of errors that can occur with manual and spread sheet calculations and avoid delay in issuing engineering deliverables. In short, we cannot imagine the design of static equipment without PV Elite," concluded Patel.

L&T-CHIYODA
www.lntchiyoda.com

Larsen and Toubro Reduces Design Cycle Times with CAESAR II

A global company founded in 1938 and one of the largest private companies in India, Larsen & Toubro Limited's Heavy Engineering group (L&T HE) designs, manufactures, and supplies precision custom-engineered critical static hi-tech equipment and systems for the processing industries including oil and gas refineries, petrochemical, fertilizer, and coal gasification plants. This includes reactors, pressure vessels, high pressure, and heat exchangers for such facilities plus waste heat boiler and steam drum packages with interconnected piping for facilities in more than 40 countries. They operate fabrication facilities in Mumbai, Hazira, and Ranoli in India and also in Oman, each with ISO 9001:2000 certification.

DESIGNING AND FABRICATING COMPLEX AMMONIA AND SNG PROJECTS FOR INDIA AND CHINA

For ammonia plant feed stock changeover projects in Panipat and Bhatinda, India, L&T's task was to supply the waste heat boilers, steam super-heater, steam drum, riser, and down-comer piping. For a 4 billion m3/year coal-to-synthetic-gas project in Inner Mongolia, China, L&T had to supply the methanator boilers, steam super-heater, steam drum, riser and down-comer piping. These projects required thermal and mechanical design, procurement, manufacturing, inspection and testing, and installation of all equipment plus the interconnecting piping between steam drum and boilers. These projects required precise calculations for riser and down-comer piping between waste heat and methanator boilers and steam drum to ensure code compliance, and they had to evaluate piping systems for operating loads and wind and seismic loads.

VISUALIZING FOR QUICK ALTERATIONS WITH CAESAR II

To address these complex system design challenges, they chose Intergraph CAESAR II because of its ease of use, capabilities, and universal acceptance. "With CAESAR II we were able to access and modify the input elements element by element, allowing for quick alterations that helped us take multiple runs and optimize the design," explained Sachin Khanderajuri, assistant manager at L&T HE. "The software's animation capability helped us understand the behavior of the system for each load case and take corrective measures if necessary." L&T HE used CAESAR II to check the complex system for different load combinations and ensure an optimum design. "The user-definable CAESAR II software reports were very clear and accurate," Khanderajuri added.

REDUCING DESIGN CYCLE TIMES WITH CAESAR II

The graphical user interface of CAESAR II allows L&T HE's engineers to learn, understand, implement, and deliver the results quickly. L&T HE uses Intergraph CAESAR II stress analysis and piping flexibility calculations for new piping systems and to address code compliance and fitness for service evaluation for existing piping systems. "The ease of use and quick iterations with CAESAR II in our projects has reduced the design cycle time substantially," concluded Khanderajuri.

www.larsentoubro.com

CHEMICAL

SmartPlant 3D Enables SNEC to Increase Engineering Design Efficiency of China's Largest Methanol Project

Next-generation 3D design solution delivers enhanced safety, quality, and productivity to Chongqing natural gas-to-methanol project

PROFILE

Company: SINOPEC Ningbo Engineering Company Limited

Website: www.snec.com

Description: SNEC is an engineering company with its business scope covering areas of scientific research and development, engineering design, manufacturing, construction, and inspection and maintenance services. The main area of focus is on EPC services and project management. SNEC holds its own patents and proprietary technologies, and renders technical and management services in both domestic and international markets.

Employees: 3,200

Industry: Chemical

Country: China

PRODUCTS USED

- SmartPlant 3D
- SmartPlant Review

KEY BENEFITS

- Automation of engineering deliverables for increased work efficiency
- Ability to identify design conflicts easily to minimize design errors and improve design quality
- Optimized engineering design processes for improved design efficiency and productivity

IDENTIFYING GOALS

SINOPEC Ningbo Engineering Company Limited (SNEC) was established in 2003 with the merger of the former SINOPEC Lanzhou Design Institute and the former The Third Construction Company of SINOPEC, which was approved by SNEC's parent company, SINOPEC Group. Today, SNEC is an all-round engineering company, providing EPC solutions, as well as project management services. It has rich project management experience, completing the engineering design and/or construction of over 1,000 plants.

SNEC is one of the EPCs involved in the Chongqing natural gas-to-methanol plant, China's largest methanol project. It is responsible for the engineering design of this large-scale and complex chemical plant, including multiple process units. SNEC required a comprehensive engineering design solution with advanced technology to tackle such a challenging project.

OVERCOMING CHALLENGES

- Improve engineering design efficiency and productivity
- Enhance quality and accuracy of engineering design
- Automate generation of large volume of project deliverables
- Accelerate project schedules and reduce operating costs

REALIZING RESULTS

SNEC selected Intergraph SmartPlant Enterprise solutions, including the world's most advanced 3D plant design solution, SmartPlant 3D, for this high-profile project. Intergraph's SmartPlant 3D is recognized as the leading 3D engineering design solution in the market, used by global industry leaders. It is proven technology and can handle even the most complex tasks quickly and easily. This was a critical factor for SNEC's selection of SmartPlant 3D as there are about 350,000 objects to be included in the 3D model for this major project, including 138 sets of equipment and a 40-kilometer pipeline.

SmartPlant 3D is the world's first and only next-generation 3D plant design, employing a breakthrough engineering approach that is focused on rules, relationships, and automation. It provides all the capabilities SNEC needs to design a plant, and then keep it as-built throughout its life cycle. This innovative Intergraph solution captures new and existing engineering knowledge so that it can be saved and reused in the future, which is the key to success in today's competitive global economy. SmartPlant 3D is the most advanced and productive 3D plant design solution that effectively enables optimized design for increased safety, quality, and productivity, while shortening project schedules. Companies using SmartPlant 3D, including SNEC, typically report a 30 percent improvement in overall engineering design productivity.

SmartPlant 3D has a user-friendly interface with simple operation commands, so it was easy to train SNEC's engineers to use the software, halving the usual amount of time required for such training. SmartPlant 3D's automation capabilities also help to greatly improve design efficiency by optimizing engineering design processes and shortening the design cycle. Engineers could automatically generate engineering deliverables, such as pipeline isometric maps and material tables, delivering both cost and time savings.

SmartPlant 3D features unique, rule-driven technology, enabling SNEC to deliver high-quality engineering design for this major methanol project. Using rules and relationships established in SmartPlant 3D, engineers could easily perform collision checks of components within the 3D model, such as piping, equipment, cable tray, and others, and make any modifications or improvements as required. Accuracy and design quality is greatly enhanced, which improves the safety and productivity of the plant.

MOVING FORWARD

The implementation of SmartPlant 3D for the Chongqing methanol project has been a great success for SNEC. The Chinese engineering company plans to further extend the use of SmartPlant 3D for other projects.

In addition, SNEC will expand its use of Intergraph technology and adopt other solutions from the SmartPlant Enterprise suite, including SmartPlant Foundation, SmartPlant Instrumentation, SmartPlant P&ID, and others. This is aligned with SNEC's vision to implement an integrated engineering environment for the whole plant life cycle to drive its EPC business.

www.snec.com

CHEMICAL

The Master Switch of Raffinerie Heide's Electrical Engineering Systems

SmartPlant Electrical Detailed provides an efficient and integrated way to support electrical workflows, increasing safety and reliability

PROFILE

Company: Raffinerie Heide

Website: www.heiderefinery.com

Description: Raffinerie Heide produces classic mineral oil products such as all grades of petrol, diesel fuel and aviation fuel. Furthermore, it produces light heating oil as well as important basic substances for the chemical industry. Raffinerie Heide has a capacity of 4.5 million tons of crude into end products and into semi-finished substances for the chemical industry, among others.

Employees: 570

Industry: Petrochemical

Country: Germany

PRODUCTS USED

- SmartPlant Electrical Detailed

KEY BENEFITS

- 20 percent reduction of archives and documents
- Highly efficient support of electrical engineering workflows
- Quality increase in the documentation itself to fulfill 100% authority requirements and safety needs
- Transparency of projects design can be checked and verified any time

IDENTIFYING GOALS

Raffinerie Heide is located 60 miles north of Hamburg, Germany. It has the capacity to process nearly 4.5 million tons of crude per year. The refinery produces conventional petroleum products such as gasoline, diesel or aviation fuel. It also produces heating oil and important raw materials for the chemical industry.

The refinery suffered the effects of its aged installations and methods. The refinery employed a non-homogenous information handling and document archiving structure, which included eight different systems and more than three archives. In addition, non-transparent handing over of project documentation posed increasing difficulties in daily operations.

The refinery needed to modernize its document and data handling systems in order to increase efficiency and profitability and to ensure consistent change management in the daily maintenance and business operations of the plant. Accurate information needed to be made available faster. In 1996, Raffinerie Heide found a solution to its needs in SIGRAPH CAE, now called Intergraph SmartPlant Electrical Detailed (SPEL D). During the last 15 years, continuous improvements in the asset infrastructure were performed and the tool was upgraded to handle new developments and the increasing capacity of the plant in an efficient manner.

OVERCOMING CHALLENGES

During the implementation of SPEL D, multiple information and documentation storages and archives had to be removed and transferred. The transfer of large amounts of data was very time consuming, as it was training the refinery staff on the new tool. All of this was done while the plant continued its daily operations, while trying to cause as little disruption as possible.

The refinery has now changed the workflow in electrical engineering. This was particularly important to be able to refer to consistent data for major maintenance, for day-to-day maintenance and for the entire project. The integrated and centralized way to deal with all the electrical and automation system environments, the Web-based data handling and a more efficient data management, helps Raffinerie Heide to increase data quality and to achieve greater efficiency in decision making.

As an early adopter and a development partner, Raffinerie Heide began early on with SPEL D to improve reliability and to ease maintenance of electrical systems. Today the refinery is one of the oldest, though most modern, refineries in Europe.

REALIZING RESULTS

"The main benefit of introducing SPEL D in the refinery electrical engineering system is the central data storage, which makes all data centrally available for third party systems – as for example SAP. Due to the high consistency and quality of the data decision processes are optimized and the facility efficiency has improved drastically", said Joachim Kaeding, who has been responsible for modernizing the electrical engineering infrastructure over the last 14 years. The refinery could reduce by 20 percent the number of documents and archives.

Coordination with contractors has also improved. The major EPC and contractor is the local company ISS. The flexibility of the system provides the possibility to support the different engineering steps, as well as the need of different projects. First the reuse of design on different levels is very effective, e.g., copying projects or documents. Furthermore, the levels of building up templates, assemblies like macros and symbols as part of standardized workflow steps makes life easier.

Other noticeable and celebrated benefits include:

- Up-to-date archive and data deliverables through the whole electrical environment with reliable information at any time
- SPEL D database that can be handed over in DVD / CD, as well as paper copies, reflecting current-state plant environment and ready to use
- Less paper and high quality based on data in SPEL D, reduce handing-over time to a minimum

The refinery enjoys consistent change management in daily maintenance. Projects need to have reliable basis for studies and calculations during all project phases, including handing over from contractors to maintenance teams.

MOVING FORWARD

This major step to a data-centric solution has made a difference in the refinery performance, providing essential improvements that would not be achieved otherwise.

The focus has now shift to maintaining and viewing the data and deliverables more efficiently, as well as providing more appropriate user interfaces to different user groups, such as maintenance, workshop, basic engineering, among others. That translates now into the refinery having the capability to get a more hands-on and user specific plant environment available.

Further customized integration is being developed, with most resources addressing increased automated information exchanged with SAP systems and others, and optimized data -centric approaches expanding across a wider range of plant operation, not only in the electrical & instrumentation environment.

RAFFINERIEHEIDE
www.heiderefinery.com

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 to make processes and infrastructure better, safer and smarter. The company'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, operation and data management of plants, ships and offshore facilities. Intergraph SG&I provides geospatially powered solutions, including ERDAS technologies, to the public safety and security, defense and intelligence, government, transportation, photogrammetry, and utilities and communications industries. Intergraph Government Solutions (IGS) is a wholly owned subsidiary of Intergraph Corporation responsible for the SG&I U.S. federal business.

Intergraph is part of Hexagon (Nordic exchange: HEXA B; www.hexagon.com), a leading global provider of design, measurement, and visualization technologies that enable customers to design, measure and position objects, and process and present data.

For more information, visit www.intergraph.com.

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