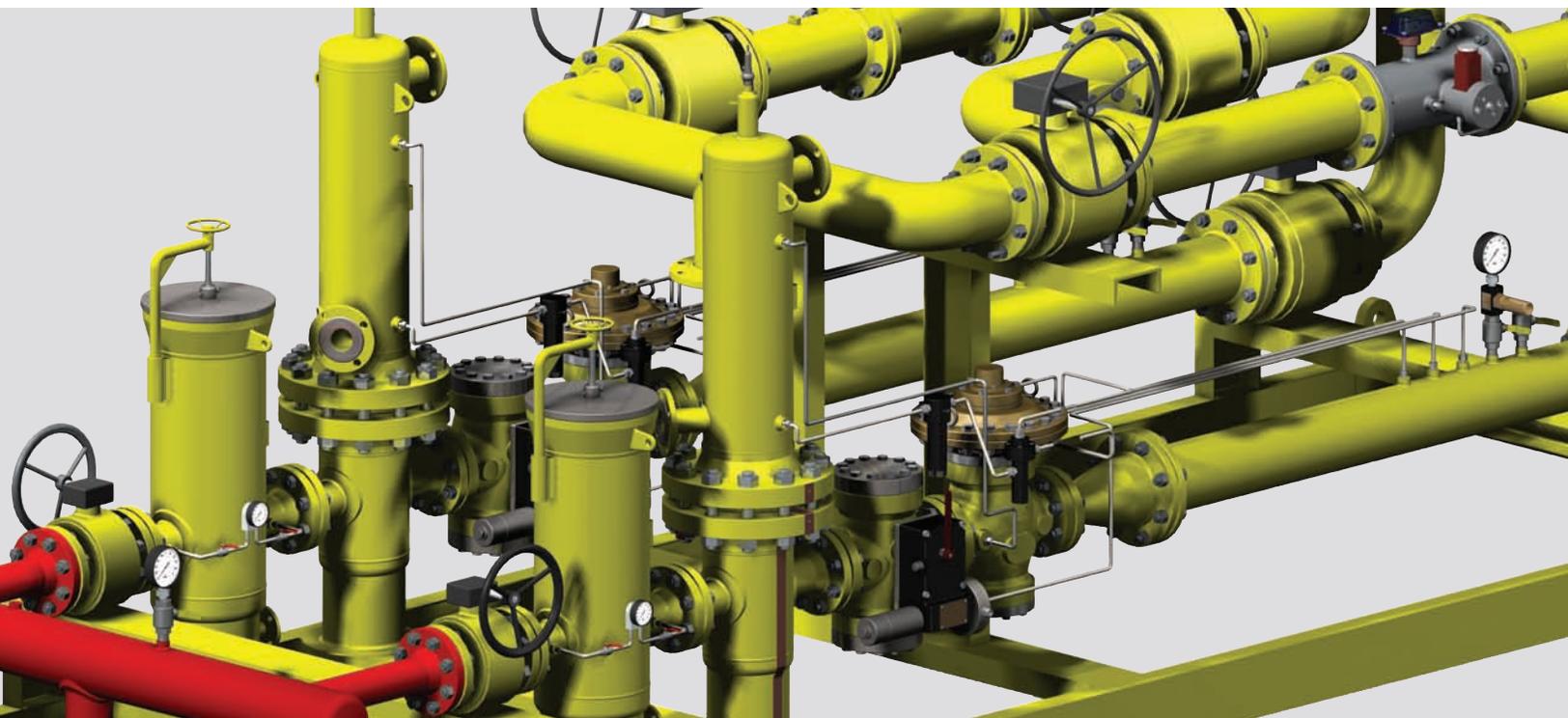# Efficient Design for the Oil and Gas Industry

SUMMARY

SolidWorks® CAD software provides a complete 3D product development solution for meeting the demands of today's rapidly evolving oil and gas industry. With SolidWorks, engineers can more efficiently use 3D design data at every stage of the development process, realizing productivity gains and reduced costs across the board. From conceptual design and component selection through design validation and production, SolidWorks software provides the integrated tools that oil and gas engineers need to accelerate time-to-market, control development costs, improve product quality and innovation, and compete successfully.
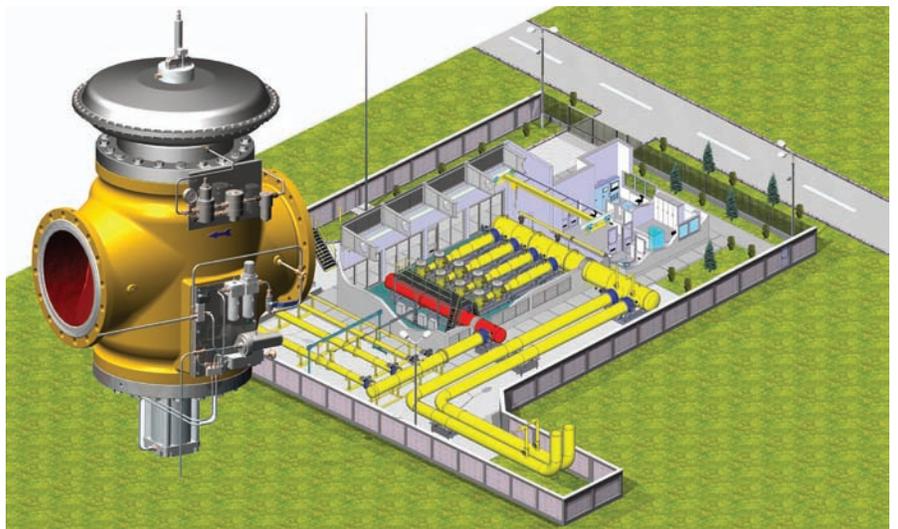
SolidWorks

Introduction

Meeting the product development, equipment design, and systems engineering needs of manufacturers serving the oil and gas industry presents distinct challenges in today's ever-evolving and increasingly multifaceted global energy marketplace. A range of factors—including the higher cost of energy, the greater focus on safety and environmental concerns, and the increasing viability of new energy sources—have combined to create a new set of competitive pressures on designers and engineers who develop oil and gas equipment and systems.

Whether a company manufactures products or systems that support exploration and drilling, distribution and transportation, refining and manufacturing processes, or alternative and biofuels technology development, competing successfully in the oil and gas industry carries new product development, engineering, and design demands. As a result, oil and gas engineers must develop more complex products and systems faster, more cost-effectively, and with greater levels of collaboration. Engineers not only have to complete more complex projects on time and on budget, but also must deliver enhancements in quality and innovation. In addition to accelerating product time-to-market, some oil and gas engineers must shorten the time it takes to develop proposals, while simultaneously expanding the completeness of proposed design concepts.

In today's increasingly competitive and continually changing oil and gas environment, 2D design tools no longer represent a viable option, given their limitations in efficiently utilizing design data to address multiple functional requirements. By using SolidWorks CAD software, however, engineers can meet emerging challenges at every stage of the development process: from conceptual and proposal development through validation, production, and implementation. With 3D design techniques, you can use the same model for concept development, design automation, simulation, and communication, as well as for prototype development and product manufacturing.

By providing more capable design data management, automated drawing generation, and documentation tools, SolidWorks software enhances efficiencies and improves productivity. Unlike 2D design tools, which are slow, laborious, and inefficient, 3D design tools provide a wealth of capabilities. So you can easily compress development cycles, reduce development costs, create more innovative products, and improve product quality—all at the same time.

SolidWorks software enables you to speed development by using modular design, systems prefabrication, as well as design reuse, automation, and configuration concepts. Because 3D design tools facilitate greater use of standard components, you can download and import accurate SolidWorks models of components and subassemblies from 3DContentCentral.com and other sources.

Specialized capabilities—such as weldment design, piping system design, and large-assembly development—provide added design efficiencies, while integrated SolidWorks Simulation and SolidWorks Motion analysis capabilities support design validation and simulation. So you can refine your design, identify potential errors, and resolve design issues before building a single prototype. With integrated SolidWorks Workgroup PDM software, you can simply and efficiently manage design data and satisfy documentation requirements. Moreover, SolidWorks communications tools, such as eDrawings® software, ensure effective, streamlined collaboration with your customers, clients, and prospects.

Accelerating conceptual design, proposal development

To compete successfully in today's global oil and gas industry, companies must incorporate agility, flexibility, and automation into conceptual design. Whether your company is putting together a proposal for a particular opportunity, such as an offshore drilling platform, a refinery refit, or an ethanol-processing plant—or is developing more generalized products, such as down-hole drill tools, valves, compressors, pumps, or skid systems—the ability to accelerate conceptual design and proposal development is vital to your success.

To overcome competitive time pressures, engineers must be able to automate concept development by finding, reusing, and reconfiguring existing designs, as well as by working, collaborating, and communicating more effectively with strategic partners. SolidWorks CAD software provides product data management (PDM), 2D editing, sketching, modeling, and design configuration capabilities that you need to access, reconfigure, model, and produce quality designs within a dramatically compressed time frame.

Using SolidWorks Workgroup PDM and SolidWorks design configuration tools, you can quickly find and often modify previous designs to meet your changing needs. For example, you can easily vary capacities, lengths, or threaded connections to produce new design concepts automatically from existing designs.

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SolidWorks 3D software also includes a powerful new feature that can help companies develop more detailed design concepts faster. Sketch Blocks enable engineers to produce initial layouts and test dynamic relationships of the design. SolidWorks Intelligent Feature Technology (SWIFT™) allows beginners to achieve expert-level 3D designs early in the process. You can download models of commonly used components and assemblies from 3DContentCentral.com and insert them directly into your design. You can then automatically generate production-quality drawings.
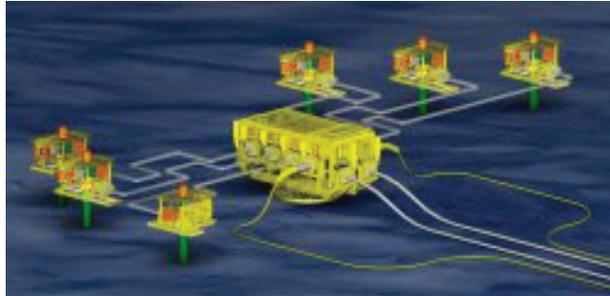
KVAERNER OILFIELD PRODUCTS DEVELOPS SUBSURFACE PRODUCTS FOR THE OFFSHORE INDUSTRY. BY MOVING TO SOLIDWORKS SOFTWARE, THE COMPANY INCREASED PRODUCTIVITY AS WELL AS OPTIONS FOR ITS EXISTING DESIGNS.

Designing weldments, piping, and large assemblies

Engineers designing products and systems for oil and gas exploration, distribution, transportation, refining, and production rely heavily on certain specialized design capabilities. While oil and gas equipment designers employ a wide range of 3D CAD capabilities, they especially benefit from robust tools to develop large assemblies, welded structures, and piping systems. The process of locating, extracting, transporting, refining, and distributing oil and gas typically requires the development of components and systems that can benefit from utilizing specialized weldment, piping, and large-assembly design tools.

SolidWorks CAD software enables you to model, visualize, and evaluate the design of large assemblies, which often contain thousands of individual components and subassemblies. In addition to viewing components as a single part or in the context of an assembly, you can adjust component transparency and use sectioning tools to reveal the inner workings of designs that you previously could not visualize. With SolidWorks large-assembly collision detection tools, you can check for interference during the early stages of design development when problems are easier to fix, rather than discovering errors late in the design cycle when they are more costly and time-consuming to resolve.

Using SolidWorks CAD software to create weldments saves time and eliminates much of the guesswork involved in designing structural frames and plate assemblies. Having the ability to sweep a weldment profile along a sketch line

and then generate cut lists of the necessary segments enables you to improve the quality of your designs, the completeness of bills of materials (BOMs), and the accuracy of cost estimates.

In many areas of the oil and gas industry, companies typically have piping system design needs. SolidWorks Routing software simplifies the design of piping and tubing systems, along with electrical conduit, cable, and harness segments. With this tool, you can save a substantial amount of time when designing piping for oil and gas processing and distribution or when developing general machinery and equipment that utilize pneumatic, hydraulic, or electrical subsystems.

HALLIBURTON ENERGY SERVICES USES SOLIDWORKS SOFTWARE TO STANDARDIZE ITS PRODUCT DESIGN WORLDWIDE AND TO ACHIEVE CONSISTENCY IN PRODUCT ENGINEERING AND MANUFACTURING.

Integrated design analysis, simulation, and validation

Developing reliable oil and gas equipment has become increasingly important not only because of higher energy costs, but also due to the increased investment required to find and tap new fields. Often this entails more complex methods and greater risks. With SolidWorks, you can ensure that designs meet reliability and environmental requirements.

Companies in the oil and gas industry simply do not have the time to conduct extensive, costly, and time-consuming prototyping and testing regimens to validate design performance. Since SolidWorks Simulation and SolidWorks Motion design analysis applications are embedded in SolidWorks, engineers can accurately model and validate the loading and kinematics performance of equipment and components, minimizing prototyping and build-and-break testing.

Using SolidWorks Simulation software, oil and gas engineers can validate the performance of structures ranging from simple components to large offshore platforms. You can easily apply a wide range of loads, dramatically reducing the potential for field failures and minimizing—or even eliminating—the costs and delays associated with prototyping and testing.

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The SolidWorks Motion feature enables you to realize similar benefits by conducting kinematics and dynamic response analyses on moving assemblies and mechanisms. This capability is especially useful for assemblies such as cranes and drill pipe handling equipment, which must operate in confined spaces offshore. SolidWorks Motion can help engineers with tasks that range from sizing motors and actuators to determining power consumption, developing cams, and improving gear-drive performance.

Equipped with these powerful design analysis, simulation, and validation tools, oil and gas equipment companies can ensure the quality and reliability of their products early in the design process. Instead of discovering necessary and expensive design modifications in the field, companies can save time and money by spotting and resolving design problems before they even build a prototype.

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BUCYRUS, INC., A LEADER IN EQUIPMENT FOR EXTRACTING OIL FROM TAR SANDS, DESIGNS ITS PRODUCTS USING SOLIDWORKS ALONG WITH INTEGRATED SOLIDWORKS SIMULATION, SOLIDWORKS ROUTING, AND SOLIDWORKS PRODUCT DATA MANAGEMENT SOFTWARE.

Managing, documenting, and communicating design data

In an evolving energy market, a company's ability to respond to demands quickly and effectively is highly dependent on how well it can organize, manage, and communicate its internal design data and expertise. Oil and gas companies face competitive time pressures and require more collaborative development relationships, data reuse, modular design, and systems prefabrication. To complete their jobs effectively, engineers must have efficient data management, documentation creation, and design communication tools.

Completely integrated with SolidWorks CAD software, the SolidWorks
Workgroup PDM system enables you to safeguard, control, and manage
valuable project data. Powerful search tools help you find applicable design
data quickly and easily, so you can apply previous experience and lessons
learned to future projects.

Engineers can also use SolidWorks software to streamline the production of
design and assembly documentation for their products. Automatic drawing gen-
eration and the creation of exploded views, along with image and animation pro-
duction, enable you to quickly produce design documentation with minimal effort.

The ability to communicate design concepts and documentation to customers,
clients, and prospects quickly and easily, and then obtain their feedback, has
become increasingly important for improving an organization's responsiveness.
With eDrawings software, included with SolidWorks, you can quickly create
compact, information-rich, lightweight model and drawing files. Collaborating,
communicating, and interacting with contractors, partners, and customers is
as simple as sending an email.

By moving to SolidWorks CAD software, you can realize dramatic improvements
in the ability to manage, document, and communicate internal design data.
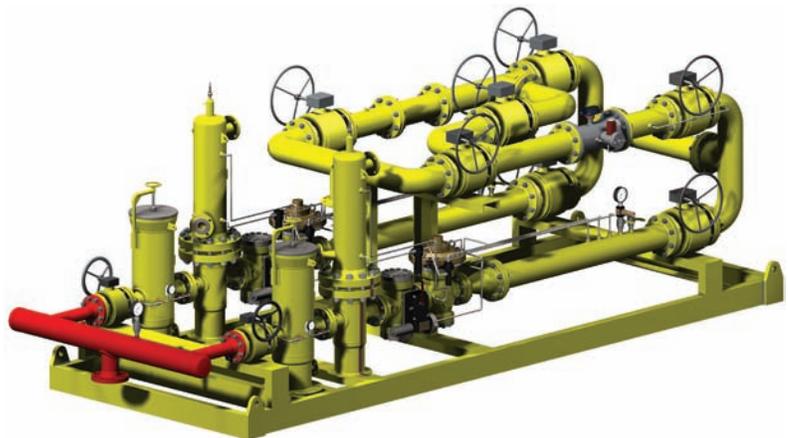
AFTER ENABLING ITS DEPARTMENTS TO SHARE DATA USING SOLIDWORKS
WORKGROUP PDM SOFTWARE, TOTALGAZ, S.A., REDUCED ITS DESIGN TIME
BY 50 PERCENT AND IMPROVED THE QUALITY OF ITS GAS CONTROL SYSTEMS.

Automating manufacturing and production

After using 3D design tools to develop and validate designs, oil and gas companies can leverage 3D CAD data to automate manufacturing and production. Because 3D design data is highly visual, engineers can communicate and collaborate more effectively with assembly and production personnel to balance cost, quality, and delivery. With SolidWorks software, companies can generate BOMs automatically as they develop their assemblies, thereby accelerating the ordering and purchasing of standardized parts.

Through the use of integrated CAM (computer-aided machining) software, SolidWorks CAD data can also help engineers automate machining and manufacturing. With SolidWorks Gold Solution Partner CAMWorks™ and SolidCAM software, you can automate the generation of NC programming for producing custom parts, shaving additional time from the development process. Since this is all done without leaving SolidWorks, you can quickly make any changes to the parts that are needed to support machining inside SolidWorks.

In addition to cutting time from the production process, SolidWorks software can help oil and gas companies to reduce the volume of scrap produced and rework required. Because the design has been validated and manufacturing relates directly to 3D CAD data, fewer questions and surprises will arise in manufacturing than when using 2D development methods.

> With SolidWorks CAD software, companies can generate BOMs automatically as they develop their assemblies, thereby accelerating the ordering and purchasing of standardized parts.

THE ABILITY TO INTEGRATE DESIGN AND MANUFACTURING PROCESSES WITH SOLIDWORKS ENABLES TOTALGAZ, S.A., TO DESIGN COMPLEX GAS REGULATOR GEOMETRY EASILY, RESOLVE DESIGN PROBLEMS EARLY, AND BRING NEW PRODUCTS TO MARKET QUICKLY.

Conclusion

As the oil and gas industry continues to confront new challenges, companies are feeling the impact of higher energy costs, a greater focus on safety and environmental concerns, and the increasing viability of new sources of energy. Whether they manufacture products that support exploration and drilling, distribution and transportation, refining and manufacturing processes, or alternative and biofuels technology development, all companies face competitive pressures. They must continually develop more complex products, equipment, and systems—faster, better, and more cost-effectively.

By implementing SolidWorks CAD software as your product development platform, your company can enhance its competitiveness—improving time-to-market, controlling development costs, and designing better products. With SolidWorks, you can realize improved efficiencies and productivity gains at every stage of the development process: from conceptual and proposal development through design validation, production, and implementation. Moreover, the same model can be used for concept development, design automation, simulation, and communication, as well as for prototype development and product manufacturing.

Many oil and gas companies have quickly realized a return on their investment in SolidWorks by decreasing development time, cutting material costs, reducing design errors, and shortening time-to-market by as much as 50 percent in the first year. With SolidWorks CAD software, you have the powerful tools needed to improve product quality and innovation and to compete successfully in a rapidly changing industry—now and in the future.