STREAMLINE PROCESS AND PLANT DESIGN WITH 3D

Overview

Building plants and processing systems—or even an entire factory—in a global economy has become more challenging than ever. Competition is stiff and capital is tight, so the need to control costs, ensure quality, and speed delivery is critical to your success. Whether you develop individual components, equipment, processing systems, or complete plants, integrated 3D solutions can help you develop, coordinate, and deliver on-time and within budget.

SOLIDWORKS

Putting everyone on the same page

The world of process and plant design is changing rapidly. Innovative products, new technologies, greater energy demands, and increasing competition usher in a host of new challenges to building the processing systems and factories of the 21st century. To succeed, you need access to integrated 3D development tools that enable you to efficiently create, validate, coordinate, communicate, and document the increasing amounts of design data associated with these projects.

Today's factories differ greatly from the monolithic plants of the past and require a more streamlined, modular approach. No matter what industry or application you support—whether it involves oil and gas production, alternative fuels development, power generation, pharmaceuticals, food processing, mining, wastewater treatment, or manufacturing—your primary challenge consists of bringing it altogether in an efficient, reliable, and cost-effective fashion. You no longer have the luxury of using time-consuming and costly 2D-based approaches for process and plant development.

Integrated 3D solutions can give you the agility and flexibility that you need to successfully tackle today's demanding projects.

Integrated 3D solutions can give you the agility and flexibility that you need to successfully tackle today's demanding projects. By establishing a common, highly visual development environment, 3D tools can help you to spur coordination, eliminate duplicated effort, minimize waste, compress design cycles, and control costs. Everyone from component manufacturers, equipment suppliers, and skid system developers to project managers, subcontractors, and plant owner/operators will benefit from using 3D at each stage of the process.

3D improves every phase of process and plant design

Planning

Whether you're planning to design, build, or renovate a plant—or develop subsystems or pieces of equipment within a plant—you can benefit from using 3D tools. That's because they support a more cost-effective, organized, and visual approach to layout and design. Most of these projects involve multiple vendors, each with a specified footprint and responsibility. 3D facilitates subsystem development and equipment integration from all vendors in a way that's not possible with 2D design techniques. Finding problems early in the design phase helps companies avoid the costly delays and expenses associated with making changes later in the development process.

When 3D is integrated with a product data management (PDM) system, you can streamline vendor interaction, automate workflows, and better manage individual vendor design data. Tracking changes so the proper revisions are always used, enabling sign-offs as the design progresses, and managing diverse CAD and Microsoft® Office data are all part of a PDM system. This will enable you to locate and reuse past design data and ensure proper design control to save time and improve quality.

Regardless of your role in the planning process, working in 3D can help you more clearly define your work plan, more effectively collaborate with other parties, and more easily put together bids that win contracts.

Equipment Design

Most process and plant design projects require many different pieces of equipment, which are usually sourced from a variety of manufacturers. Working in 3D allows you to take advantage of design libraries, online equipment models, and configuration capabilities—such as those available at 3D ContentCentral® —so you can size each piece of equipment for the task and space required.

You can also use 3D to visualize how a piece of equipment will appear and operate on the factory floor. Are there any clearance or interference issues? Where will you run piping, cabling, conduit, and other utilities? Have you left ample room for operators to run and maintain the equipment? Can you see how the equipment will function in its intended setting? Are there other equipment options that offer a better solution?

Whether you are an equipment manufacturer or a plant layout engineer, 3D tools give you the ability to determine how a particular piece of equipment will perform in a specified footprint and configure the equipment to match your specific needs.

...a case in point

Pflow Industries, Inc., the manufacturer of the most complete line of vertical reciprocating conveyors (VRCs) in the industry, improved its performance by moving to 3D. Using SolidWorks® design software, the company cut the time required to make design changes by 50 percent and substantially reduced the number of errors released to manufacturing.

3D design

Bringing the various pieces of equipment and subsystems together to develop a processing system or a plant demands 3D design tools. How else can you avoid problems related to fitting different subsystems together and delays when modifications need to be made? 3D tools allow you to automate the design of certain subsystems such as piping runs, configure and reuse proven designs, and process design changes quickly and easily.

Using 3D tools with an integrated PDM system, you can quickly combine and tightly manage all subsystems design data, eliminating the potential for data loss or using the wrong revision. With 3D, you can visualize the entire system or plant—and even take a virtual fly-through of the facility—without building a model, gaining the confidence that all systems will work well together.

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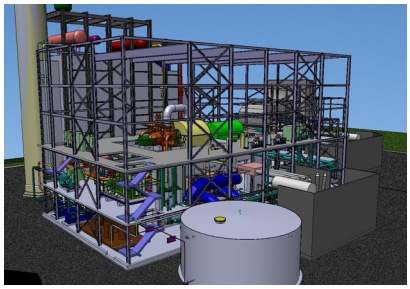
Managing different design elements—usually from several vendors—and bringing it together into one final design will save you time, money, and costly surprises. 3D design tools will help you to streamline the design process.



...a case in point

Eastern Power Limited leveraged integrated SolidWorks 3D design software to develop a 280 megawatt, natural gas-fired, combined cycle power generation plant. By moving to 3D, the company completed the facility in 50 percent less time and at 60 percent less cost.

Simulation

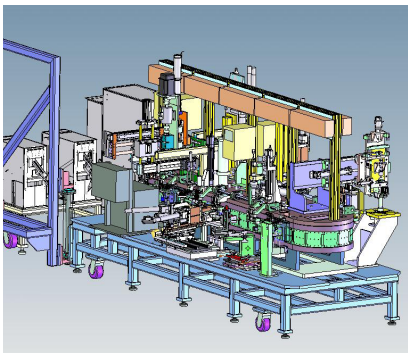
Design errors—including systems and components that do not function as intended—are the primary reason for costly and time-consuming engineering rework and delays. You can streamline your process but still fall short of on-time delivery, if portions of the final design fail and have to be redone.

By employing integrated 3D simulation software, you can avoid surprises during construction. These tools enable you to validate design performance during the design phase by simulating the effects of structural loads, temperatures, and fluid flows, as well as gauge energy requirements. Simulation allows you to pinpoint potential failures, so you can modify designs to prevent them. It can also help you to improve design performance, cut material costs, and reduce energy requirements.

Eliminating unanticipated failures during construction is critical to delivering projects on-time and within budget. Integrated 3D simulation software, operating inside your CAD design system, can help you achieve this important goal.

"SolidWorks software was the only solution with integrated design, piping, structural, simulation, and documentation capabilities. We can see, analyze, and document every design detail right in the 3D model, and easily coordinate design activities for a complex project without translating data to other tools."

Orlando Linero
Plant Designer
Eastern Power Limited



...a case in point

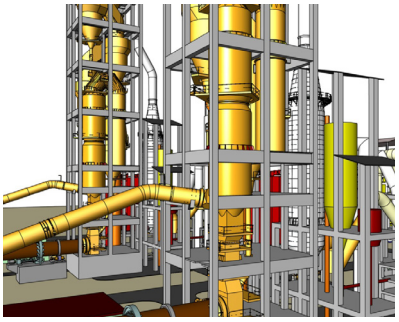
Assembly & Test Worldwide's Advanced Assembly Automation division, which specializes in developing component assembly and test systems for automotive industry plants, used SolidWorks Simulation to cut its design costs by 10 percent, reduce steel usage by 10 to 15 percent, and increase throughput by 10 percent.

Documentation

Documenting process and plant design projects—including the creation of engineering drawings, manuals, material take-offs/bills of materials (MTOs/BOMs), and illustrations—requires an organized approach to managing design data. By combining 3D design and integrated PDM software, you can secure your valuable intellectual property, organize project design data, and automate the generation of high-quality documentation.

3D tools eliminate manual approaches to documentation production. Using 3D CAD software, in conjunction with an integrated PDM system, you can automatically create drawings, material take-offs/bills of materials (MTOs/BOMs), and illustrations, and securely store them electronically. With photorealistic rendering software, you can create stunning visuals for use in operating manuals and project communications. You can even create animated instructions of assembly operations using 3D technical communications software.

Effective documentation of your process and plant design projects is imperative to meeting deadlines and remaining within budget ceilings. 3D tools not only automate documentation creation, but also improve the quality of documentation materials.



...a case in point

F.L. Smidth & Co. A/S, the world's principal builder of cement plants, implemented SolidWorks Enterprise PDM. By doing so, the company integrated its global engineering operations, reducing its mechanical equipment engineering effort by 30 percent.

"We have experienced an increase in productivity in mechanical equipment design, reducing the engineering effort by as much as 30 percent, which is our final goal, while simultaneously improving design quality and minimizing errors. But the mechanical equipment is only the first stage in the development of a cement plant. We anticipate additional productivity gains because SolidWorks Enterprise PDM provides the data foundation through which we intend to refine workflows and introduce lean manufacturing initiatives. It enables us to re-evaluate our business processes on a global scale."

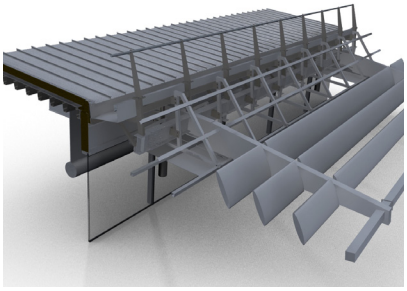
Sture Plaugmann
Executive Assistant
F.L. Smidth & Co. A/S

Procurement and construction

Once your process and plant design is complete, it's time to procure equipment and materials, and begin construction. This is also the time when delays can crop up due to production stoppages and inefficient interaction with vendors and suppliers. You can avoid these unforeseen setbacks by using a 3D development platform in concert with an integrated PDM system.

PDM allows you to formalize and manage workflows, so that estimating and quoting take place well in advance, resulting in just-in-time delivery of materials and equipment. For equipment that must be manufactured or fabricated by a supplier, 3D design data streamlines the manufacturing process by eliminating redundant data entry and facilitating production. Using 3D tools also elevates quality and ensures that you receive your equipment and systems as designed.

Procuring equipment and materials and building your plant or processing system may be the last step in the process, but it is also one of the most critical to delivering your project on-time. 3D tools can help you make sure that construction goes off without a hitch.



...a case in point

The Martifer Group, a global construction, energy, and biofuels company, standardized on SolidWorks design, simulation, and PDM software. The company was able to streamline operations, reduce development costs, increase innovation, and cut development cycles by 15 percent in the process.

"SolidWorks Simulation tools allow us not only to study the effects of stress, flow, and temperature on our designs, but also to ensure an appropriate factor of safety."

António Caroço
Director of Information Systems and Best Practices
Martifer Group

3D design solves critical process and plant design issues

Although every process and plant design project has its own unique requirements, they all share the same goals. You want to build a plant or processing system that performs optimally as fast as you can, while controlling costs. To do so, you need to address a range of challenges and obstacles to success. This paper has addressed how 3D tools can help you to streamline process and plant development so you can achieve your objectives.

This section will more specifically address how SolidWorks 3D solutions—including SolidWorks 3D CAD software, SolidWorks Simulation, SolidWorks Enterprise PDM, SolidWorks Sustainability, and 3DVIA Composer™—can help you overcome the design challenges that you face.

Controlling costs

The costs related to process and plant development are diverse. SolidWorks software can help you to control costs in various ways:

- **Energy costs.** In process and plant development, energy costs are an important consideration. SolidWorks Simulation and SolidWorks Sustainability software enable you to evaluate and identify potential energy savings as they relate to both construction and operation of the plant or system. With SolidWorks Routing software, you can help to automate and optimize the layout of cabling, piping, and other energy delivery systems.

- **Opportunity costs.** Lost financial opportunity due to failure to begin operation of a facility on-time is a real concern to plant owners. SolidWorks design software provides tools for reducing engineering time. With SolidWorks Simulation, you can eliminate errors, improve quality, and minimize rework. SolidWorks Enterprise PDM controls revisions, automates workflows, and improves coordination. Together, these solutions can help prevent lost operational opportunity.

- **Capital costs.** Controlling capital costs requires developing a process or plant as quickly and cost-effectively as possible. SolidWorks design software enables you to quickly work through various design approaches that often use less costly standardization and modular design techniques, which can result in simpler, less costly designs. In fact, many manufacturers of standard components use SolidWorks software to design their products, and provide models that can be dragged and dropped into your design to speed modeling. See www.3dcontentcentral.com for leading examples. SolidWorks Simulation lets you optimize material usage to reduce material costs. By supporting common data formats, SolidWorks design software facilitates collaboration with important suppliers, and can help you bring designs online faster, improving the return on your capital investment.

- **Operational costs.** The cost of running a plant or facility is as important as the cost to build it. SolidWorks Simulation and SolidWorks Sustainability software can help you to gauge your operational energy costs and consider design options for reducing it. You can use SolidWorks design software to address maintenance needs. SolidWorks Simulation lets you ensure reliability and prevent failures and costly retrofits. These 3D tools can help you to better understand and address operational costs as part of the design process.

- **Engineering services costs.** Optimizing the impact of engineering services prevents additional costs for future services. SolidWorks software—and those provided by its range of Solution Partners—enable you to optimize equipment design and layout development. SolidWorks Enterprise PDM facilitates effective coordination with subcontractors. Together, these solutions enable you to hold the line on engineering services costs.

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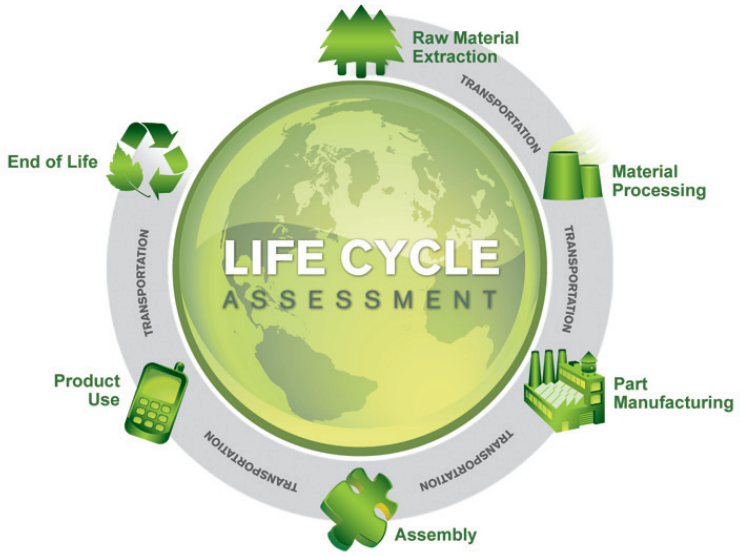

SolidWorks Sustainability is a suite of tools that enables the product and process designer to make better decisions on materials and sourcing regarding efficient resource use.

Ensuring on-time delivery

Delivering a processing system or plant on-time requires a smooth-running development process that is free of waste, duplicated effort, and redundancy. You can ensure on-time delivery by eliminating errors, managing data, and streamlining processes.

- **Minimize design errors.** Making sure that a process or plant design has no unanticipated problems or surprises is a key factor to completing projects on-time. With SolidWorks 3D CAD software, SolidWorks Simulation, and SolidWorks Enterprise PDM, you will have the ability to identify and correct errors during the design phase, well before they can generate problems or delays.

- **Eliminate duplication of effort.** Duplicated effort is not just wasted effort; it can also derail your projects. Because SolidWorks software solutions are fully integrated and compatible with 2D legacy data, you should never have to re-create a model or a drawing. You can use SolidWorks 3D CAD software, SolidWorks Simulation, and SolidWorks Enterprise PDM with whatever legacy design data you may have, eliminating the need for duplication of effort.

- **Improve data management.** Time spent searching for a model or locating the most current revision can add hours, days, and even weeks to project schedules. With SolidWorks Enterprise PDM, you can manage engineering data effectively and locate models and drawings immediately, cutting time spent trying to manage design data manually.

- **Streamline interaction.** With multiple parties involved in process and plant design—including equipment manufacturers, subcontractors, engineering services firms, skid systems developers, and owner/operators—interaction among them is a given. Making the interaction among contributors more streamlined and efficient saves time and often results in better designs. With the support for common data formats of SolidWorks software, you can work design communication tools also facilitate smooth, efficient interaction.

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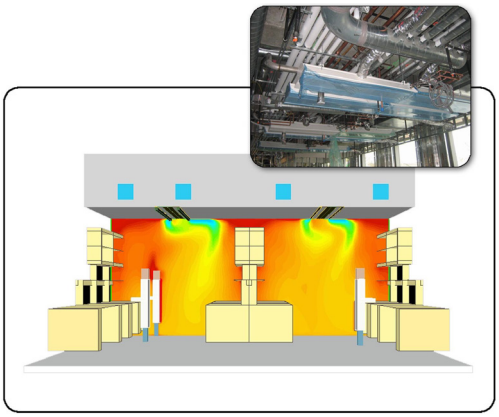


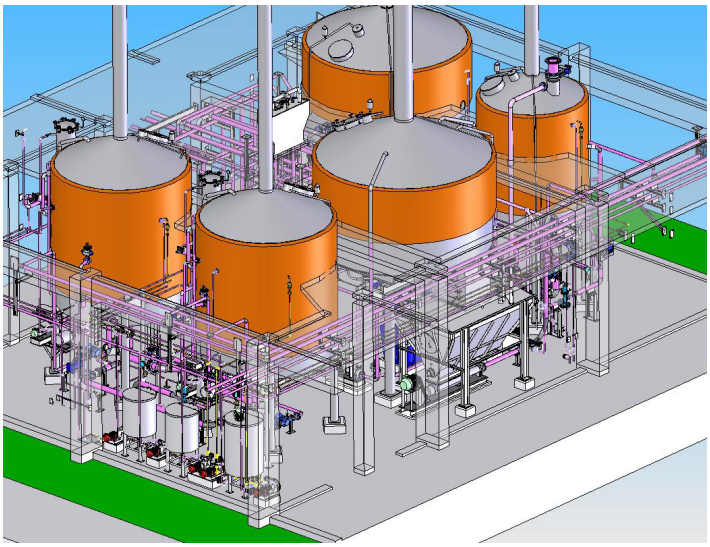
SolidWorks Simulation tools enable structural, kinematic, thermal, and flow simulation—all critical tools for process design tasks.

Creating successful bids

Winning process and plant development contracts in today's environment requires the ability to quickly turn around solid, information-rich proposals. 3D design tools provide the most effective capabilities for developing quality bids faster than the competition.

- **Communicate design intent.** To win process and plant development business, you need to effectively communicate design intent. SolidWorks design software—in combination with PhotoView 360 photorealistic rendering and 3DVIA Composer technical communications software—gives you the ability to generate high-quality 3D visualizations of design intent.

- **Accelerate response time.** Not only do you need to develop a good proposal to win business, you also have to respond quickly to new opportunities. SolidWorks design software helps you to accelerate bid response time by providing tools that let you maximize design reuse. With SolidWorks Enterprise PDM, you can also find and assemble existing design information into new bids quickly and easily.



SolidWorks software is used to design components, equipment, and complete processes such as this brewing facility.

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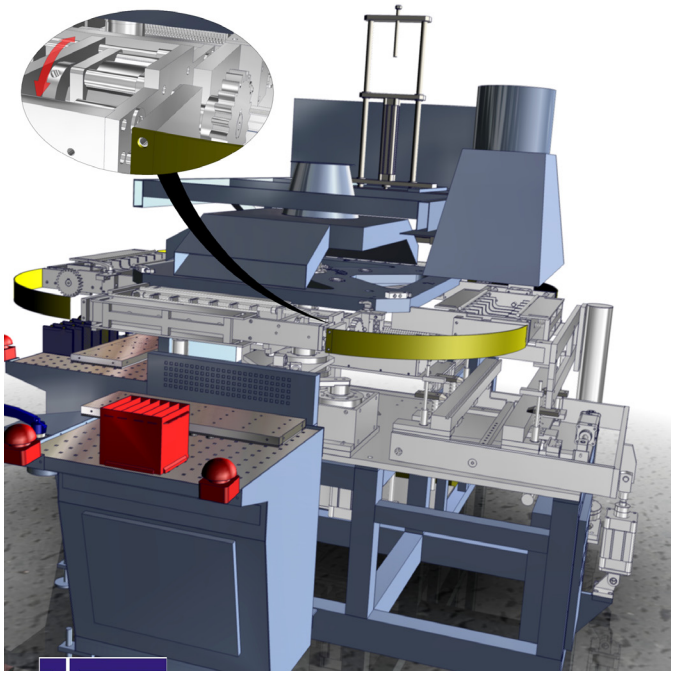
Meeting specifications consistently

To win process and plant design business, you need an established track record of successfully and consistently meeting project specifications. This means developing reliable, functional, well-documented systems.

- **Ensure process design interoperability.** Consistency requires interoperability. Your process designs need to work with your own system and those of your customers and collaborators. With SolidWorks design software, you can take advantage of support for a wide range of data formats to enable data sharing. Use of standardization and modular design further improves interoperability.

- **Improve documentation quality.** In addition to meeting specifications consistently, you need to be able to show new customers that you have done so. SolidWorks 3D CAD software, PhotoView 360 rendering, and 3DVIA Composer enable you to create the professional, high-quality project documentation that serves as a testament to your consistent performance.



3DVIA Composer generates technical documentation for assembly, maintenance, and construction processes for everyone in the organization—not just for engineering.

"With 3DVIA Composer software, we can document our products in a professional manner directly from the final CAD model, which allows us to reduce the time it takes to document common designs by about 25 percent and large, complex assemblies by 35 to 50 percent. If we make design changes, we do not have to do all the work again. Instead, we can simply update the documentation with the revised model. Our SolidWorks software enables us to develop concepts from creation through documentation as quickly as possible."

Antoine Corbeil
President
Brayton Energy Canada

Improving design coordination

With so many contributors involved in process and plant design projects, design coordination becomes the name of the game. Software that enables you to handle this coordination the most deftly and productively will make you the most successful in meeting time and budget targets.

- **Prevent data losses and errors.** Data transfers and file conversions are fraught with the potential for data loss, corruption, and error. SolidWorks Enterprise PDM allows you to avoid these pitfalls by securely safeguarding data. By supporting common data formats, SolidWorks software eliminates the need for conversions. SolidWorks software design communication tools facilitate interaction and communication without putting valuable design data in jeopardy.

- **Eliminate data entry duplication.** In today's high-technology world, no one should ever have to re-enter data or re-create models or drawings. SolidWorks Enterprise PDM and its support for common data formats mean that duplicate data entry is truly becoming a thing of the past.

- **Increase design reuse.** Nothing improves coordination like realizing that you can save time by using a design that already exists instead of reinventing it. Maximizing design reuse lets you employ the same proven design again and again in new projects, allowing you to save design and testing time. With SolidWorks 3D CAD software and SolidWorks Enterprise PDM, finding the same standardized, proven, existing designs is quick and easy.

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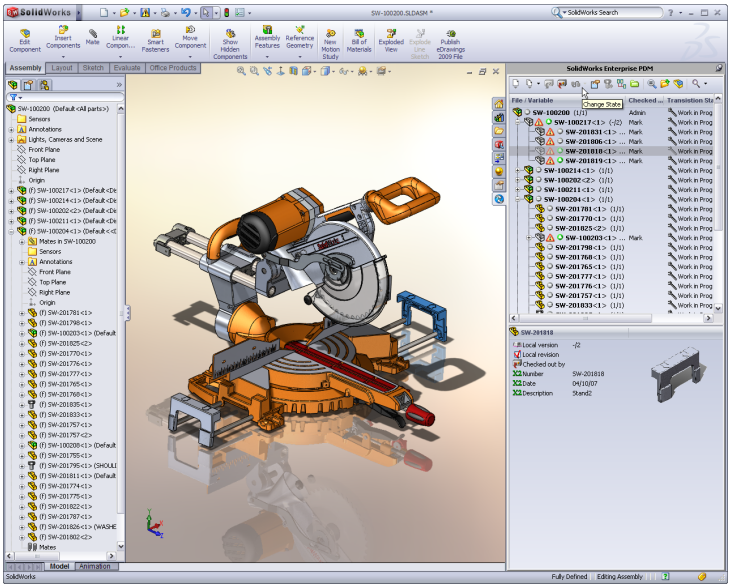

SolidWorks Enterprise PDM facilitates workflow management, revision control, design reuse, and cost control for equipment or process designs.

Energizing process and plant design with 3D

Process and plant design has reached an exciting crossroads, where traditional 2D approaches are giving way to more efficient, reliable 3D development techniques. We live in a 3D world, and technology, increasing competition, innovative products, and new technologies demand a more visual, better organized approach to developing the factories and process systems of the new millennium.

In industries as diverse as oil and gas production, alternative fuels development, power generation, pharmaceuticals, food processing, mining, wastewater treatment, and manufacturing, the need to complete process and plant design projects quickly, reliably, and affordably is now more important than ever.

Streamlining process and plant design is not a destination, however. It's a journey, an ongoing quest to control costs, deliver on-time, perform reliably, and improve coordination and collaboration. From planning, equipment design, and 3D design to simulation, documentation, and procurement/construction, designing and building a modern facility is a complex, elaborate undertaking, a journey fraught with challenges to overcome. With an integrated 3D development platform like SolidWorks software, you can begin your trip into the future of process and plant design and open up new avenues of productivity, efficiency, and growth. Let's get started.

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To learn more about how SolidWorks solutions can improve process and plant design for you, visit **www.solidworks.com/energy-process-plant** or call 1 800 693 9000.

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