

Accelerate product development for fluid power systems with Solid Edge

Solution brief

Siemens Digital Industries Software

Fluid power systems and component manufacturers are facing an increasing number of challenges, including heightened global competition, higher product complexity to meet consumer demands and increased demand for product reliability and energy efficiency.

Systems and components manufacturers in fast-growing countries that have lower manufacturing costs are not only meeting local demand, they are competing in global markets. Competition requires vendors to bring new and differentiated products to market more quickly.

Consumers demand the latest technology, which requires the inclusion of more electrical components including sensors, transponders, printed circuit boards (PCBs) and wiring. The focus on electrification and automation is expected to fuel growth but increases product complexity.

Complexity is also an issue when designing highly efficient and reliable systems and components. With fluid power systems consuming three percent of the energy used in the United States, performance optimization is more important than ever. New technologies such as generative design, composites design, additive manufacturing and integrated electromechanical design facilitate the development of highly efficient and reliable products.

Many businesses are reacting to the market's external pressures by investing in a digital transformation across product design and development areas. Software tools can accelerate product development while, at the same time, optimize designs and reduce costs. A detailed 3D digital model of a proposed product can be used as the basis for all areas of product development. Siemens Digital Industries Software's Solid Edge® software enables digital transformation for any business.

The Solid Edge advantage

- Create 3D digital models (digital twins) of products and use them throughout the product development lifecycle
- Design complex parts and assemblies quickly and flexibly using synchronous technology
- Apply different capabilities to support configure-to-order and engineer-to-order processes
- Reuse data from suppliers and customers that is supplied in different CAD data formats
- Integrate electrical and mechanical design to create electromechanical products
- Create P&ID diagrams for piping systems, and develop these piping schematics into full 3D models of piping and the associated flanges, valves and other piping components
- Component level CFD analysis using Simcenter FLOEFD for Solid Edge
- System level 1D analysis of fluid flow using Simcenter Flomaster

Solution focus

The Solid Edge advantage *continued*

- Manufacture parts accurately and efficiently using both traditional machining and new additive manufacturing technologies
- Manage everyday processes including release to manufacturing and engineering changes efficiently and accurately using built-in data management capabilities

Solid Edge is a comprehensive portfolio for product development, from mechanical and electrical design to simulation, manufacturing and technical publications. Solid Edge possesses built-in data management capabilities and includes the ability to access Teamcenter® software for comprehensive product lifecycle management (PLM) capabilities. It also provides a free cloud-based solution for collaborating with your suppliers and customers.

Using Solid Edge improves product development performance in these key areas:

Visualize new products for sales and marketing

Photorealistic rendering and animations created inside Solid Edge can convey a product's value to potential customers even before they are manufactured. 3D digital models can convey the unique value of innovative solutions. And, augmented reality can showcase a product in a real-world environment, improving the communication of designs to prospective customers.

Respond to RFQs and engineer-to-order processes

Automation can address new requirements quickly and accurately while ensuring a design meets customer constraints. Product configuration can be highly complex, as engineered-to-order products may require new variants of parts and designs with each order. Design automation capabilities enable you to automatically create new part designs based on engineering rules. Siemens' Rulestream™ software and Teamcenter automate product and process rules, reducing the time to create bids. 3D visualization and paperless drawings available in Solid Edge convey specific content for request for quote (RFQ) responses.

Speed 3D mechanical design

Designers and engineers are under pressure to work faster to produce part and assembly 3D models and 2D drawings. Solid Edge is a comprehensive, proven 3D computer-aided design (CAD) environment that makes design faster and more efficient. Solid Edge includes next-generation design technologies, including unique convergent modeling capabilities that combine traditional boundary-representation (b-rep) solid models with triangular mesh models. This enables designers to easily work on CAD models that were created in both mesh-based and b-rep formats without the need for conversion between the two.

Streamline P&ID and piping design

Solid Edge modular plant design solutions streamline the workflow process by capturing design intent and/or logic in a 2D piping and instrumentation diagram (P&ID). The P&ID can be used to create a bill-of-materials (BOM) for required components early in the design process; it can also be used to drive the creation of piping components in 3D. Piping can be routed around 3D mechanical assemblies to avoid collisions while ensuring sufficient access for maintenance. Streamlined piping design and manufacturing reduces product development and manufacturing costs and increases quality while accelerating delivery.



Enable electromechanical collaboration

The increased number of electrical components in fluid power systems typically increases the number of wires necessary to carry electrical signals and power. However, routing electrical wiring within a limited space is increasingly complex. Solid Edge Wiring Design software supports the automation of data-driven electrical wiring circuits and qualitative and quantitative validation of circuit performance. Solid Edge Electrical Routing software efficiently creates, routes and organizes wires, cables and bundles in a 3D mechanical assembly. With Solid Edge Electrical Design software, you can minimize the need to create physical prototypes to reduce issues in the design and installation of wiring.

Optimize kinematic and dynamic behavior

Integrated kinematic and dynamic motion analysis can optimize motion characteristics of hydraulic and pneumatic actuators and systems. By simulating all aspects of motion and understanding the true dynamic function of a design before producing or assembling physical hardware, you can minimize the cost and time required to build physical prototypes. Solid Edge Simulation software provides integrated analysis of kinematics and dynamics of Solid Edge assemblies.

Analyze stress and vibration

Virtual prototypes are used to optimize designs prior to manufacturing. By identifying and resolving issues early in the design process, you can realize a significant drop in costs and delivery time. Using harmonic response analysis to simulate vibration levels during product operation can ensure designs successfully overcome resonance. Solid Edge Simulation provides stress simulation tools that provide static, dynamic and fatigue analysis. Siemens' Femap™ software provides high performance analysis to solve the toughest engineering problems.

Simulate fluid performance in components and systems

Modern designs bring new heat transfer and fluid flow challenges. It is especially important to understand how to make choices and tradeoffs for optimum performance without unwanted side effects. For the analysis of fluid flow at a component level, Simcenter™ FLOEFD™ for Solid Edge® software provides integrated computational fluid dynamics (CFD) analysis embedded in Solid Edge 3D design software. You can examine trends and eliminate less-desirable options early in the design process. For analysis of fluid flow in complete systems, Simcenter™ Flomaster™ software provides powerful one-dimensional analysis of the performance of complex piping systems.

Manufacture accurately and efficiently

By creating machining toolpaths and using simulations based on digital models, you can reduce errors and rework in manufacturing. Choosing the best manufacturing process and taking advantage of new manufacturing technologies can help. Working with different computer-aided manufacturing (CAM) solutions while creating toolpaths that are associative to the CAD model ensures accurate and efficient manufacturing processes. Solid Edge CAM Pro software provides the ability to define accurate and efficient machining processes.

Prepare components for 3D printing

Minimize the need to maintain a large inventory of spare parts using in-house 3D printers. You can manufacture small-volume parts efficiently while minimizing tooling costs. Additive manufacturing techniques included in Solid Edge help prepare components for 3D printing. Solid Edge also includes direct access to cloud-based services for quoting and manufacturing of parts in a variety of materials.

Manage project and engineering changes

Product development teams need to access and track design, analysis and manufacturing data and processes. Integrated design management tools built into Solid Edge include preconfigured workflow capabilities that enable your team to access and track design projects and engineering change information. Solid Edge speeds new product development and time-to-market with scalable data and process management capabilities. As your data management needs increase, Solid Edge includes a growth path to Teamcenter for comprehensive PLM capabilities.

Manage customer requirements and industry regulations

Customer and regulatory requirements drive complexity into product development, manufacturing and field operations. Making customer requirements easily accessible to everyone involved in product development can ensure that the product delivered meets the customer's requirements. Easy-to-use tools for capturing and displaying customer requirements in Solid Edge Requirements Management software link customer requirements and industry regulations to projects and 3D models. This can reduce costly rework and improve customer satisfaction.

Collaborate with customers and suppliers

The sharing of multi-CAD design data must be controlled to protect intellectual property. Faster and controlled communication of design intent with suppliers and customers reduces errors and speeds the product development process. Solid Edge Portal provides free cloud-based collaboration tools for easy access to professional 3D CAD data across different devices through a browser.

Key solution components

- Solid Edge Mechanical Design for 3D part and assembly design using synchronous technology – accelerates machinery design, speeds revisions and improves the reuse of proven components in new designs
- Solid Edge Electrical Design for the design of wiring, cables, bundles and printed circuit boards – enables true electromechanical co-design collaboration
- Solid Edge Simulation for digital validation of critical components – reduces the need for physical prototypes, lowers material/testing costs and improves reliability and durability
- Solid Edge Manufacturing for definition of accurate machining, fabrication and assembly processes – improves overall efficiency with additive and subtractive manufacturing
- Solid Edge Technical Publications for creating illustrations and technical documents – communicates manufacturing, installation and maintenance procedures globally
- Solid Edge Data Management for searching, managing and sharing product data – improves collaboration within the design team and with other departments, suppliers and customers
- Solid Edge Cloud Collaboration – online CAD management, viewing and collaboration



Install and maintain

Clear communication can ensure products are installed, used and maintained correctly to ensure performance and reliability. Online catalogs, graphical user guides and maintenance instructions must be current. Solid Edge technical publications software creates interactive 3D work instructions that clearly communicate the correct manufacturing, installation and maintenance procedures for your designs. Changes to an existing design are easily incorporated into existing documents, ensuring that published documents reflect the current design.

Realize significant benefits

Designers and engineers in the fluid power systems and components manufacturing industry report significant benefits using Solid Edge. Some examples from published case studies include:

- Reduced number of prototypes by 80 percent
- Reduced manual data transfer by 75 percent

- Created complete product range in little over a year
- Reduced design time from 2 days to about 30 minutes
- Eliminated half an hour of paperwork, per engineer, each day
- Improved assembly efficiency by more than 20 percent
- Reduced number of costly physical prototypes
- Dramatically reduced the number of warranty issues

For more information on this offering and to read customer case studies, please visit

<https://solidedge.siemens.com/en/industries/fluid-power-system-design>