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# Industry Insights – Speeding marine craft and equipment development with Solid Edge

Solution brief

Siemens Digital Industries Software

The marine craft and equipment industry is faced with many challenges. Although growing globally, the industry is relatively fragmented and the number of new manufacturers is increasing. Customer demands for new technology are increasing product complexity. The challenges are also compounded by the need for efficient packaging of accommodations and equipment in complex hull forms, and by awareness of environmental concerns.

Retail customers want innovative accommodations for leisure boats, but it can be difficult to find space for all the required comforts and utilities. Every inch in a cabin can be a precious commodity. Larger commercial customers need high-performing, reliable equipment for their vessels. Large vessels must also package mechanical, electrical and piping components efficiently within complex hull shapes.

Customization isn't the only thing adding complexity to marine craft and equipment design. The desire to minimize adverse environmental impacts and provide a silent, pollutant-free

boating experience is increasing demand for electric motors and hybrids. The addition of electronics and accompanying software has resulted in even more complexity, which can incur huge costs.

Complexity can slow the product development process and result in delayed time to market, lost revenue, budget overruns and poor product quality. To react to growing demand and stay ahead of the competition, manufacturers must accelerate the product development process, from concept design through manufacturing.

Using a comprehensive technology portfolio for product development helps manage complexity and enables manufacturers to meet specific customer requirements. A flexible design process facilitates the creation of multiple options and variants of standard products. Software solutions that streamline the introduction of sustainable products include generative design, composites design, additive manufacturing and integrated electromechanical design. Software can provide realistic models

## The Solid Edge advantage

- Design complex parts and large assemblies quickly and flexibly
- Visualize new products using photorealistic images and animations
- Manage customer requirements and industry regulations
- Re-use existing hull forms and legacy data
- Apply specific solutions for composite layout design and manufacturing
- Speed the design of package interiors
- Design and route electrical wiring, piping and tubing
- Improve design of fabrications and weldments
- Validate and test using virtual prototypes
- Deliver machine tool value for manufacturing
- Prepare parts for 3D printing
- Manage project and engineering changes

# Solution focus

## Key solution components

- **Solid Edge Mechanical Design** for 3D part and assembly design using synchronous technology – accelerates machinery design, speeds revisions and improves the re-use 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

that help optimize designs to achieve tight fits. And, new software tools that exchange data interactively between mechanical and electrical environments automate complex electrical challenges and make it easy to see and react to design changes in different disciplines. Implementing an integrated solution for product development that creates a “digital twin” of the product enables you to leverage design data throughout the product lifecycle.

Siemens Solid Edge® software creates 3D digital models that can be used to accelerate all aspects of product development. With Solid Edge you can use digital models throughout the product lifecycle, speeding the development process and enabling you to bring best-in-class products to market quickly and cost-effectively.

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

## Design complex parts and assemblies quickly and flexibly

Rapidly create new concept designs, easily respond to change requests, and make simultaneous updates to multiple parts within an assembly. Synchronous technology, unique to Siemens, combines the strengths of both history-based and direct modeling approaches to design, allowing you to work directly with design geometry from any computer-aided design (CAD) system. With integrated 2D and 3D sketching,

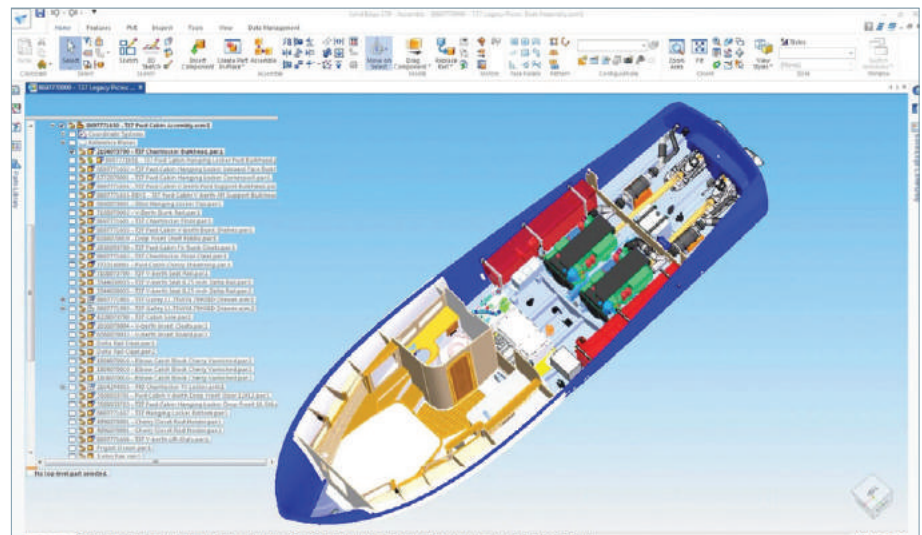
the synchronous technology in Solid Edge allows you to begin concept design immediately, without tedious preplanning, and effortlessly make changes even to history-based models.

## Visualize new products for sales and marketing

Create photorealistic images and animations of proposed products, using them to convey value to potential customers prior to manufacturing. By enabling the creation of rich 3D product information, you can clearly demonstrate your design innovations using the latest visualization technologies. Integrated photorealistic rendering, powered by KeyShot®, creates amazing product images and animations that help you stand out from the crowd with superior marketing materials that clearly communicate your equipment designs.

## Manage customer requirements and industry regulations

Ensure that customer requirements and relevant industry regulations are easily accessible. Customer and regulatory requirements drive complexity into product development, manufacturing and field operations. 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 reduces risk by tracking how requirements are met.



### Re-use existing hull forms and legacy data

Accurately import complex hull data into 3D CAD to work with legacy design data and use hull designs that are created in third-party naval architecture and surface design software, including Rhino® and Orca3D. Design data often comes from suppliers and customers in different CAD formats. Solid Edge can directly import design data created in a wide variety of 2D, surface and solid model CAD formats.

### Apply specific solutions for composite layup design and manufacturing

Understand how composite material will lay out in a 3D model. Composite parts have unique characteristics; they must link a part's geometry with the material's behavior. However, disparate systems and manual workflows often result in inconsistent production quality and overbuilt products. Solid Edge can help automate the design of composite layout with links to Siemens Fibersim™ portfolio; together these tools provide an effective solution for the design of both interior furniture and equipment and the outer and inner hull moldings.

### Optimize 3D design and package interiors

Work efficiently with large, complex assemblies to optimize design. Customers demand innovative accommodations that maximize every inch of internal space in marine craft. A comprehensive, proven 3D CAD solution produces accurate part and assembly 3D models and 2D drawings that can make the best use of available space. With Solid Edge, you can create assembly models representing all interior components of your design, including wooden parts, tubing and electrical systems. This streamlines design, makes changes faster and increases re-use of existing components.



### Design and route electrical wiring

Create accurate electrical wiring circuitry and route wires around complex hull forms. Because customers want the latest electronics in their marine equipment, routing the necessary wiring through boat hulls with limited space is increasingly complex. Solid Edge Wiring Design provides semi-automatic routing of wiring in complex 3D models while establishing correct wire lengths and enabling quick design completion. The software also validates the design for optimized wire gauges and fuse ratings, reducing the need for prototype testing.

### Streamline tubing and piping

Streamline the design of mechanical routed systems. Solid Edge delivers automated, structured workflows for tubing and piping design that increase productivity. Fully integrated with Solid Edge 3D CAD, the software uses process-specific workflows that embody industry best practices to accelerate your routed systems designs, improve bill of material accuracy and lower costs through standardization.

### Improve design of weldments and fabrications

Evaluate structural integrity and comply with welding standards to efficiently design fabricated structures while minimizing material and labor costs. Solid Edge includes process-specific applications that speed the creation of structural steel fabrications and weldments and automatically calculate appropriate intersections and end treatments. You can also use embedded capabilities to simulate, test and optimize structures prior to manufacturing. Solid Edge includes a comprehensive library of international standard weld symbols to communicate the correct weld types to manufacturing.

### Validate and test using virtual prototypes

Validate and improve performance of products with scalable simulation tools that enable virtual prototyping. Digital models can be used to validate and test a design prior to physical prototyping; virtual prototypes can even eliminate the need to build costly physical prototypes that reduce total return on investment. Solid Edge Simulation enables you to digitally validate part and assembly designs within the Solid Edge environment with integrated stress simulation tools, including static, dynamic and fatigue analysis. Simcenter™ FLOEFD™ for Solid Edge provides integrated computational fluid dynamics analysis that enables you to frontload analysis, moving simulation early into the design process where it can help identify trends and eliminate less desirable design options.



## Deliver machine tool value for manufacturing

Manufacture parts accurately and efficiently. Using a single unified computer-aided manufacturing (CAM) system allows you to get the most from your tools. Solid Edge CAM Pro, powerful numerical control (NC) programming software, can be used to create toolpaths that are associative to the Solid Edge CAD model. These toolpaths can be automatically updated when the design is changed. Solid Edge 2D Nesting efficiently generates optimized layouts for cutting fabrication materials, saving time and money by improving material utilization.

## Prepare parts for 3D printing

Manufacture parts on demand and minimize the need for large inventories of spare parts. Generative design techniques combine design tools with topology optimization, enabling you to quickly create lightweight, highly complex shapes that are uniquely suited for 3D printing. The part models produced by generative iteration are ready for manufacturing using additive processes. Solid Edge supports 3D printing needs from creating an initial prototype to printing the final product, which can result in a significant reduction in costs and time to delivery. It also supports a cloud-based bureau for additive manufacturing of parts in a variety of materials.

## Manage project and engineering changes

Manage everyday processes, including release to manufacturing and engineering changes, efficiently and accurately using built-in data management capabilities. Integrated design management tools 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 that includes analysis or manufacturing data. As your data management needs increase, Solid Edge includes a growth path to Teamcenter® software for comprehensive product lifecycle management capabilities.



## Collaborate with customers and suppliers

Collaborate quickly and easily with suppliers and customers by sharing multi-CAD design data in a controlled way while protecting intellectual property. Controlling the communication of your design's intent with suppliers and customers reduces errors and speeds the development process. The Solid Edge Portal provides free, cloud-based collaboration tools that provide easy access to professional 3D CAD data across different devices through a browser.

## Service, maintain and refurbish

Communicate correct manufacturing processes to shop floor personnel to make certain that products are properly installed, used and maintained to safeguard performance and reliability. Interactive 3D technical publications can leverage design models and data to fully and accurately communicate the manufacturing process. Solid Edge technical publications solutions automatically create graphical user guides, maintenance instructions and online spare parts catalogs from your design. Clear documentation helps end users operate and maintain products correctly.



## Realize significant benefits

Designers and engineers in the marine craft and equipment manufacturing industry report significant benefits using Solid Edge. Some examples from published case studies include:

- Shrinking tolerances and achieving tighter fits to maximize space
- Lowering the number of required engineering changes
- Elimination of physical mockups to save two months of development time
- Setting the stage for a digital development process that permits greater boat customization
- Improved design productivity and product quality
- Reduced errors using a reliable, automated design process

For more information on this offering and to read customer case studies, please visit [www.siemens.com/marine-craft](http://www.siemens.com/marine-craft).

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