

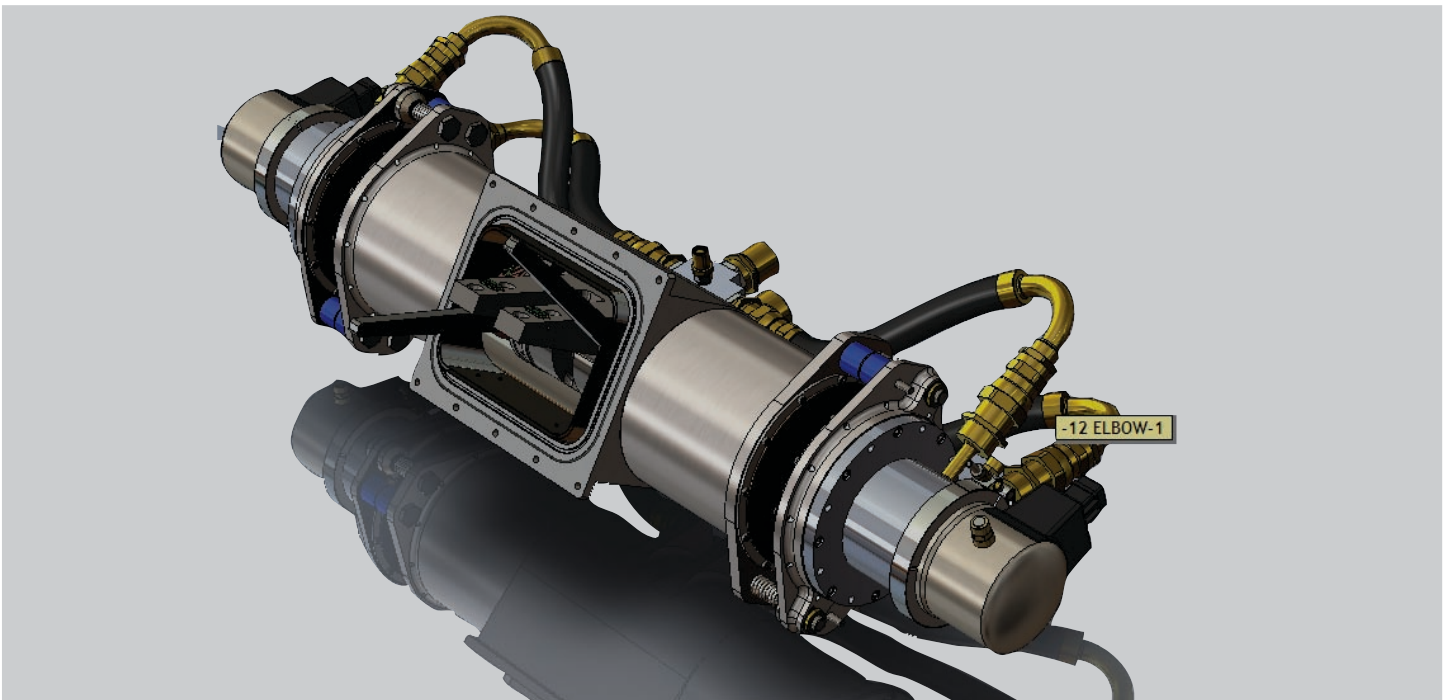
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# DESIGNING BETTER PRODUCTS WITH SOLIDWORKS PREMIUM

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## Overview

SolidWorks® Premium CAD software provides the advanced capabilities you need to design better products—from design, automation, and simulation to validation, collaboration, and data management—all in one comprehensive package.



## Introduction

### What constitutes a better product?

Depending on their job functions and industry roles, designers, engineers, managers, and manufacturers will cite differing factors as to what makes a better product. The answers, in short, are rooted in people's perceptions—which, in turn, are influenced by their life experiences and unique sets of criteria.

Although a “better product” has various meanings for different people, six key factors typically define its attributes:

- 1. Decreases manufacturing costs.** Management, in particular, wants to create the product in the most cost-effective manner. In trying to improve a product's manufacturability, they aim to simplify the overall process, reduce operations overhead, and use lower-priced raw materials.
- 2. Speeds customer delivery, beats competitors to market.** Managers have a large stake in making their products available before competitive offerings, as this can create inroads to attaining dominant market share. Likewise, business customers often equate fast delivery with better products—especially when they need to rectify company problems or capitalize on fleeting opportunities. Even design engineers relate better products to streamlining design and development cycles.
- 3. Provides more throughput, requires less maintenance, experiences less downtime.** For industrial and manufacturing companies, maximized throughput and uptime are the standard measurements of better product performance—from packaging machinery and mold, tool, and die equipment to materials-handling machinery and power and process systems. Purchasers of high-precision tooling equipment, milling machinery, and packaging equipment also rely heavily on operational accuracy and repeatability.
- 4. Fits together correctly the first time.** Manufacturers across all industries—whether they mass-produce consumer products or custom-produce specialized machinery—want to avoid fit-and-function problems that hinder part assembly on the floor or in the field. They need to know that better products will fit together repeatedly, without interference or scraping between parts. Instilling such confidence in your customers can reduce the need for prototype development, achieving significant cost savings for your company.
- 5. Offers more aesthetic appeal.** Whether you are designing a DVD player or an industrial machine, fashion never goes out of style. Products that feature organic shapes, complex geometry, and sleek finishes—particularly in the consumer marketplace—are often perceived as better quality.
- 6. Increases efficiency or environmental responsibility.** As corporate citizenship encompasses more community-related responsibilities, managers and consumers are demanding greater participation in “green” initiatives, including saving energy, reducing waste, and eliminating the use of suspect materials. For many people, better products result from manufacturing in more efficient and environmentally responsible ways, such as reducing the number of prototypes and employing more energy-friendly processes.

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## How SolidWorks Premium helps you design better products

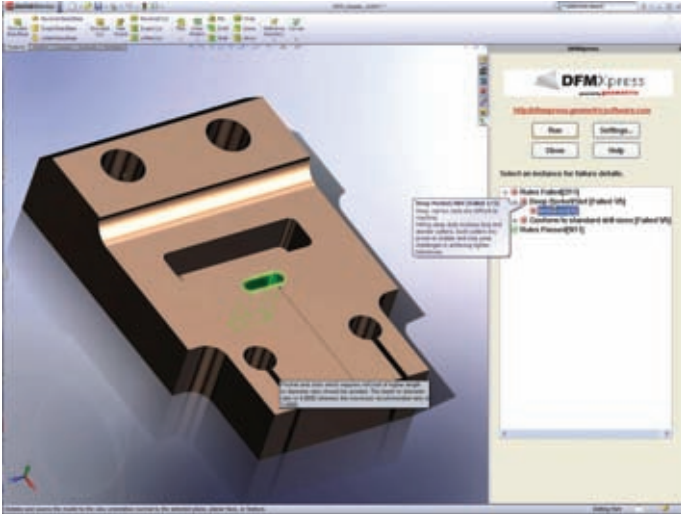
### Lower manufacturing costs

Management is always concerned with how to manufacture a product cost-effectively. Because SolidWorks Premium provides robust functionality in a design-for-manufacturing (DFM) environment, you always have the ability to design products that save you time and money.

SolidWorks software DFMxpress, for instance, is an upfront design validation tool that allows you to identify geometry that would be difficult, expensive, or impossible to manufacture by conventional machining operations, such as milling, drilling, and turning. With DFMxpress, you can determine where it would be less labor-intensive to break an edge with a chamfer than to use a fillet—or where a specific diameter-to-depth ratio poses drill breakage or wander risks.

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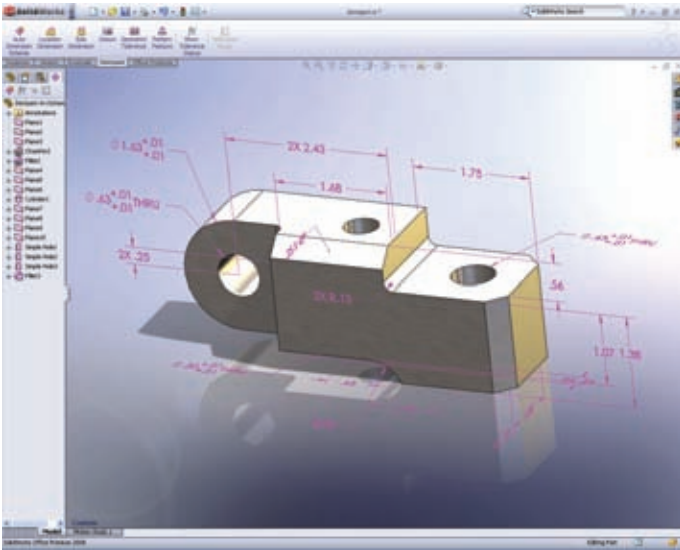
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DFMxpress provides automatic checking and feedback to look for geometry that is impossible or expensive to machine.

SolidWorks Premium also provides capabilities for Draft Check, Thickness Check, Undercut Check, Geometry Check, and Part Difference Check—so you can easily identify potential problem areas upfront and reduce the number of costly prototypes.

To further manufacturing readiness, the DimXpert functionality automatically generates dimensioning and tolerancing schemes. DimXpert checks geometric dimensions and tolerances (GD&T) for conformance with industry standards, and provides a dimensioning and tolerancing check that graphically indicates when geometry is under- or overconstrained.



DimXpert provides automated dimensioning and tolerancing in 3D per industry standards. Dimensions and tolerances are created with the correct syntax and semantics, and graphical feedback is provided to let you know when your model is fully dimensioned and toleranced.

SolidWorks Premium enables you to generate better, more usable output for manufacturing. As a starting point, many manufacturers employ CAM technologies that rely on 3D CAD rather than 2D CAD data. For example, 3- to 5-axis NC machining operations, rapid prototyping, and mold design usually require 3D models that can be referenced to create NC toolpaths.

With SolidWorks Premium, you can avoid the expense and time of re-creating 2D drawings as 3D solid models, since the native environment is already 3D. By using 3D CAD data provided by the customer to make the toolpath, you can significantly lower the risk of errors introduced when a manufacturer needs to re-create a 3D model based on a 2D drawing.

Furthermore, SolidWorks Premium allows you to output drawings and images in common 2D formats—including DWG, DXF™, JPEG, and PDF. This is especially cost-effective in manufacturing operations that require waterjet, laser cutting, or even 2½ D-axis machining.

With SolidWorks software, you can also generate more accurate quotes. The embedded reuse and automation functionality enables you to capture, archive, and view cost-related information from prior projects that utilized the same parts or vendors, allowing you to maintain better profit margins.

Since SolidWorks Premium has the simulation capability to produce virtual prototypes—and eliminate the need for costly physical prototypes—you can reduce expenses accordingly.

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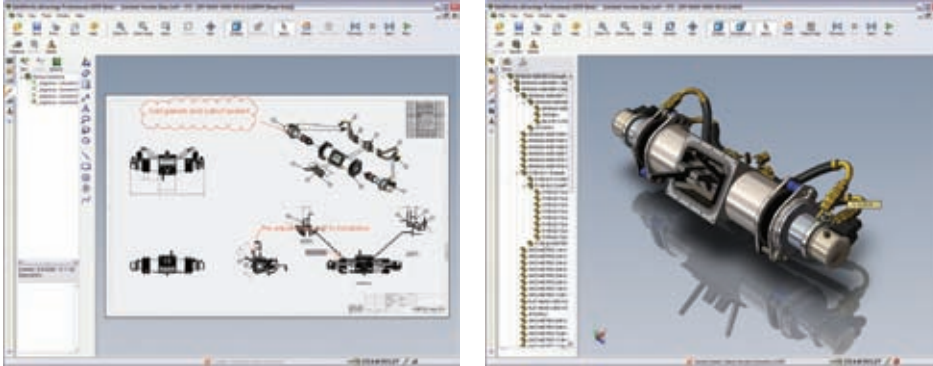
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## Accelerate customer delivery, beat competitors to market

Collaboration is at the core of any successful business initiative. The exchange of ideas stimulates innovation and creativity, thereby accelerating product design and development as well as manufacturing and delivery. To streamline the product development process, SolidWorks Premium offers robust collaboration features and functionality.

SolidWorks eDrawings® allows you to share product design information with anyone in any location by simply attaching the file to an email. eDrawings files supply accurate, detailed representations of 3D models and 2D drawings. With eDrawings markup capabilities, your design team can capture comments and feedback for fast responses and revisions, thereby helping to expedite the review and decision-making processes.

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SolidWorks Premium provides a host of tools to help you shorten design cycles, while simultaneously decreasing design costs and increasing production efficiencies.



eDrawings provides markup capabilities, allowing you to communicate quickly and easily with your design team, manufacturers, and customers.

The feature recognition capabilities of SolidWorks software also enable you to import and export 2D and 3D geometric data from other CAD systems and re-create it as SolidWorks software native files. You can use the imported part as a single body or automatically break the part into its individual design features. SolidWorks software even allows you to directly edit individual features by merely clicking on the imported geometry. Such functionality not only increases the value of translated files, but also eliminates the time-consuming task of rebuilding models.

In order to accelerate customer delivery and time-to-market, however, you must have the tools to speed the product design phase. SolidWorks Premium provides a host of tools to help you shorten design cycles, while simultaneously decreasing design costs and increasing production efficiencies.

With the visualization and animation capabilities of SolidWorks Premium, you can effectively communicate your ideas in 3D, enabling your design team, vendors, and customers to easily “see” the manufactured product via a 3D image, video, or animation. By enhancing the overall understanding as well as the communication process, 3D visualization and animation tools accelerate design feedback, alterations, and corrections. These tools represent the most advanced CAD technology and provide insights into how finished products will look.

When you make design changes, SolidWorks Premium automatically updates drawing views—so you no longer need to revisit all the views and manually incorporate changes in each one. If you use other CAD systems to make changes to a part, however, you must ensure those changes are reflected everywhere that part is used—from part drawings through assembly drawings. With SolidWorks Premium, you can rely on the software to implement all your changes, as well as automatically track and identify where the part is used—including which subassembly, higher-level assembly, and drawings.

### Large assemblies and drawings

SolidWorks Premium can handle even your most complicated assemblies. With specialized functions like Large Assembly Lightweight Mode, Selective Open, and SpeedPak, SolidWorks Premium lets you easily manipulate large assemblies of tens of thousands of parts—as if you are working with only a few assembly parts.



SolidWorks software provides unparalleled large assembly and drawing performance, which becomes an important issue as designs grow in size.

Moreover, SolidWorks Premium always produces accurate and current bills of materials (BOMs). When changes are made to parts and assemblies, its automatic update capabilities immediately revise the BOM. With this exhaustive list, you always know what parts and components are needed. So you can prevent any last-minute delays caused by an incorrect BOM.

### Rapid learning curve—easy to use

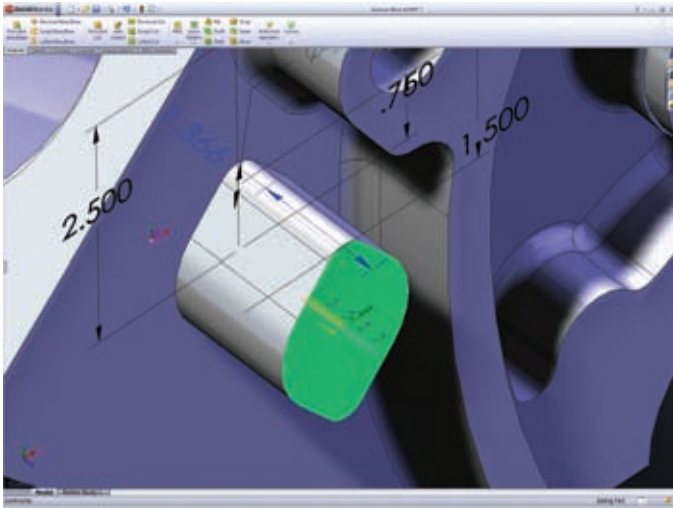
SolidWorks Premium offers incomparable ease of use. By eliminating the complexities of 3D modeling and minimizing the learning curve, you can focus on creative challenges and design development. With Heads-up User Interaction, Instant3D modeling, intuitive display control functions, and customizable shortcut menus, you can keep clicks and mouse travel to a minimum.

For instance, you can perform most of your actions directly on the 3D model environment. SolidWorks software provides an intuitive Heads-up User Interface that helps you easily find the functionality you need. Instead of picking and clicking in sidebar menus, Instant3D capabilities allow you to quickly click and drag sketches to make 3D geometry. Instant3D is also valuable when you need to modify models. Simply click, drag, and alter the geometry—such as a fillet radius or a chamfer size—and the model geometry updates instantly.

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Instant3D is part of the SWIFT capabilities inside SolidWorks software. Combined with the Heads-Up User Interface, Instant3D greatly reduces the number of picks and clicks, providing an easier, more intuitive way to design.

SolidWorks Intelligent Feature Technology (SWIFT™) is another innovative tool set that helps even a novice design like an expert. SWIFT handles many of the special techniques required in 3D modeling to ensure your geometry comes out looking as expected. Functions such as filleting, drafting, dimensioning a sketch, or even assembling parts can be confusing to a person using 3D CAD for the first time. SWIFT automatically manipulates the 3D CAD data to give you exactly what you need. For example, you may want to add draft to a model that is already fully filleted. Once you pick the faces to draft, SWIFT automatically determines how to manipulate the surrounding geometry to achieve your desired result—drafted faces—even if the surrounding edges are filleted. In this way, SWIFT bears a large portion of the CAD workload by having built-in, highly specialized CAD knowledge.

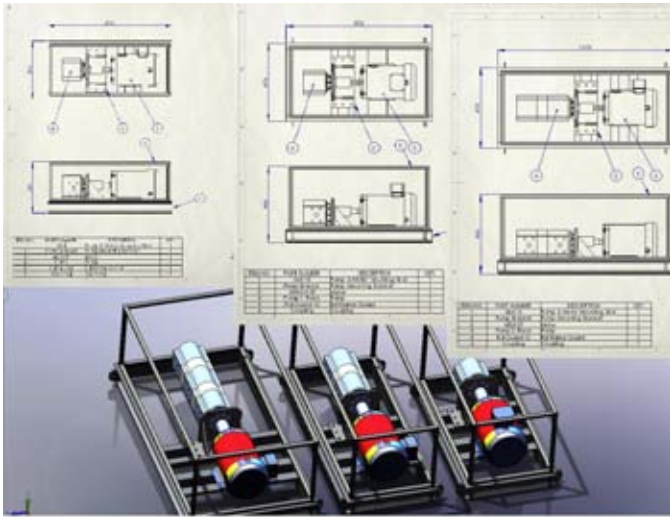
Another effective way to shorten design development involves reuse and standardization. Configurations among parts are often so similar (design requirements of ¼-inch, ½-inch, and ¾-inch screws), that leveraging existing designs is much more time-efficient than creating new ones. SolidWorks software configuration capabilities let you easily create configurations of your design by simply filling in a spreadsheet of information. Click on an instance, and the configuration is created automatically.

SolidWorks Premium also helps accelerate design development with DriveWorksXpress. A powerful automation tool, DriveWorksXpress automates repetitive design tasks by capturing valuable design rules inside SolidWorks software and automatically generating assemblies, drawings, and models. With sophisticated platform configurability, you can configure your work for high degrees of product customization in an environment that facilitates the reuse and standardization of designs.

DriveWorksXpress also enables you to capture and access important information about prior projects, such as costs incurred, length of delivery cycle, and vendors used. By leveraging this historic data, you can develop highly accurate quotes that help maintain better profit margins.

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### CAD libraries

As a designer, you spend a lot of time looking for things—fasteners, supplier parts, even existing designs within your own company. Because SolidWorks Premium provides powerful search engine functionality, you can locate and use any SolidWorks software or drawing file—whether it resides locally, in the Design Library, on the network, in SolidWorks Workgroup PDM product data management software, or online in 3D ContentCentral®. If you are looking for premade 3D models, SolidWorks software offers several solutions, including:

- **3D ContentCentral.** This online component catalog allows you to download 3D models and 2D drawings of supplier-certified components from major suppliers directly into your designs. You simply capture the existing data you need and drop it into your design.
- **Design Library.** Here, you can save frequently used features you have created, and access them when needed. You can also store a broad spectrum of standard, vendor-specific, and internal company design libraries in one central location—promoting reuse and providing a platform for consistently applying company standards.
- **Standard components library.** Here, you can access standard parts and leverage SolidWorks Smart Components functionality to automatically select appropriate fasteners and assemble them in the proper sequence—ensuring your design conforms with industry or company standards.

Two additional SolidWorks Premium tools help facilitate reuse and standardization. With Design Clipart, you can extract views, blocks, tables, and images from DWG files—as well as sketches and features from SolidWorks software parts and assemblies. Then you can reuse them in new SolidWorks designs, rather than manually re-creating the geometry. With the Design Checker tool, you can automatically identify elements that may be inconsistent with your organization's design standards, locating and correcting potential errors before design release.

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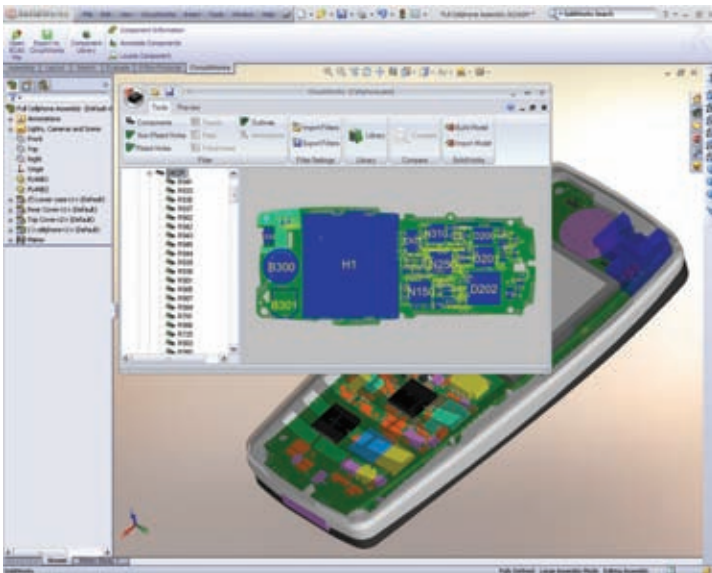
## Specialized tools for customized design tasks

SolidWorks Premium offers specialized tools for customized design activities, such as:

- **Frame weldments.** This functionality allows you to design weldments by sketching the frame layout and choosing the structural cross-section for each member, with capabilities that include trimming members and creating welds, end caps, and gussets.
- **Sheet-metal parts.** These design capabilities include edge flange, miter flange, selective fold/unfold, rip, tear, and auto-relief functionality. You can design in flat or bent states with equal flexibility and automatically generate a flat pattern.
- **Piping and electrical routing.** Streamline the design of machinery, equipment, or small facilities with automated design tasks for routing tubes, pipes, electrical cables, and harnesses. SolidWorks Premium also helps simplify design development with a library of specially routed system fittings, harnessing documentation, and drag-and-drop components.
- **Mold and die tooling.** This capability allows you to import part geometry from other CAD systems or use a SolidWorks software file to make downstream mold and die tooling. You can find and fix drafts, identify and correct undercut and thickness problems, and locate parting lines and surfaces to quickly and easily extract core, cavity, or side-core geometry.
- **ECAD/MCAD integration.** The CircuitWorks™ capability enables bidirectional collaboration between electrical and mechanical design engineers to ensure that printed circuit boards (PCBs) fit and function in mechanical products. By enhancing communication between these two disciplines, CircuitWorks streamlines the design development process, reduces design errors, and helps improve both design and product quality by creating more accurate 3D PCB models.

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- **Design checking.** Before releasing your design for manufacturing, you can run it through an automated Design Checker tool, ensuring that your documentation and models meet company standards.
- **Other frequently run checks.** SolidWorks Premium lets you find the differences between two versions of a part. You can also quickly identify and highlight problematic geometry that may affect downstream applications like manufacturing.

Through SolidWorks Workgroup PDM, SolidWorks Premium also speeds up the design process. A powerful product data management tool, SolidWorks Workgroup PDM controls CAD file revisions and manages project data securely and efficiently. It captures design metadata and file revision histories automatically, allowing you to instantly access desired files, determine who has worked on them, and ascertain when changes were made.

Finally, the simulation capability within SolidWorks Premium provides virtual prototypes—so you can reduce the time typically spent on manufacturing and testing physical prototypes. This capability greatly impacts how quickly you can deliver products to customers and to the marketplace.

### **Ensure better performance, with less downtime and maintenance**

When developing industrial or manufacturing equipment and machinery in the 3D world, it helps to ensure that products, once installed, will operate as expected. If industrial machinery fails to perform as expected or constantly needs repairs and adjustments, your customer's entire assembly or manufacturing line can go down, costing them millions of dollars in lost revenue opportunities.

Design engineers, therefore, need modeling tools that provide accurate answers to complex questions, such as: Will this packaging machine be able to achieve and sustain a high throughput rate? How reliable will this machine be over long periods of constant operation? How will this machine respond to different operating conditions? Are any parts vulnerable to breakage or excessive wear and tear?

SolidWorks Premium provides the design validation tools you need to ensure that products will meet or exceed performance requirements—without having to build and test physical prototypes. Since a single industrial machine can consist of thousands of intricate parts, being able to ascertain machine performance digitally can substantially reduce prototype development time.

With SolidWorks Premium, you can analyze the effects of motion on product performance, determine how fast a machine will accelerate, and subject a machine to varying environmental forces and study its reactions. You can also investigate whether lighter material will affect a product's durability, analyze how an alternate manufacturing method will impact a machine's operation, and determine if pieces will hit each other as they move around inside.

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SolidWorks Premium includes the following simulation and validation capabilities:

- **SolidWorks Simulation.** Providing stress, strain, and displacement analysis capabilities for parts and assemblies, this design validation and optimization tool enables you to improve product quality by identifying areas prone to weakness and failure. You can perform first-pass design checks without incurring any manufacturing costs and validate the structural integrity of components.
- **SolidWorks Motion.** This software enables you to study the physics of moving assemblies, helping you to refine designs and enhance reliability. With SolidWorks Motion, you can estimate peak motor torque, analyze robotic performance during operation, size motors/actuators, and determine power consumption. In addition to laying out linkages and developing cams, you can analyze gear drives, size springs/dampers, determine how contacting parts behave, and minimize force imbalances in rotating systems.
- **FloXpress.** You can use this wizard-based tool to simulate fluid flow and cooling, and display results as slice planes or flow trajectories.

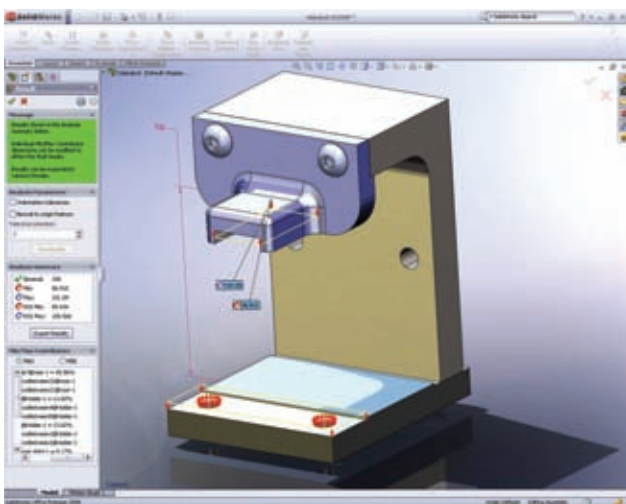
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### Provide products that fit together correctly the first time

When it comes to product assembly, customers and manufacturers want to avoid surprises. Parts that do not fit together as intended—whether in mass-production or specialized custom-production environments—can cause major setbacks and delays that jeopardize the company’s reputation or financial performance.

With SolidWorks Premium, you can be sure that products will fit together correctly the first time, thereby eliminating the need for time-consuming rework. These powerful capabilities enable you to perform automatic checks for interference, collision, hole alignment, and clearance.

The TolAnalyst™ functionality allows you to conduct automated tolerance stack-up analysis and determine the effects that tolerances have on parts and assemblies, including maximum/minimum worst-case and RSS maximum/minimum tolerance stack-up analysis. With TolAnalyst, you can verify tolerances and dimensioning schemes, and then quickly make necessary changes until you achieve the desired tolerance stack-up results.



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SolidWorks Premium also includes rich assembly documentation capabilities. The 3D assembly models can quickly and easily display “exploded” drawing views, allowing assemblers and fabricators to zoom in and hide parts from view so they can see details with greater clarity. Using eDrawings files and animation tools, you can interact with models—rotate them, see animations of a machine in operation, even virtually walk through your designs—to gain a better understanding of how things fit together.

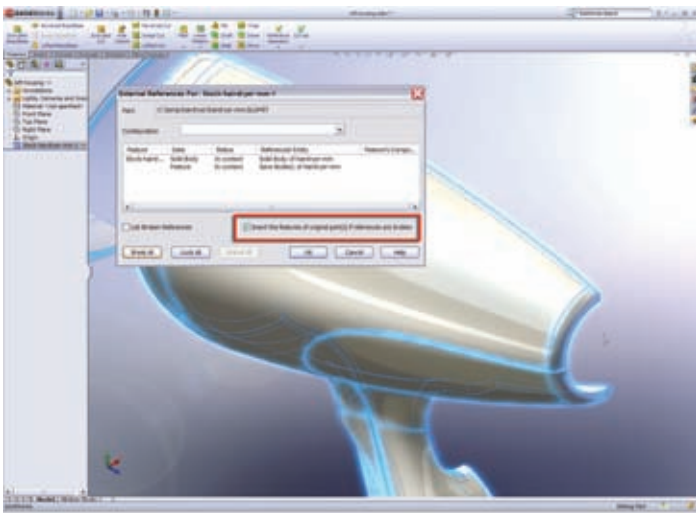
Given the associative capabilities of SolidWorks Premium, an accurate and current BOM is guaranteed. Whenever you make changes to parts and assemblies, the BOM is automatically updated.

### Create more aesthetically appealing products

For some products, especially those in the consumer market, fashion often takes precedence over function. SolidWorks Premium provides the capabilities you need to make products more aesthetically appealing:

- **Organic shapes.** SolidWorks software allows you to create complex solid geometry such as sweeps and blends, as well as free-form curve-continuous surfaces for industrial designers—all in the same modeling environment.
- **Photorealistic display.** With SolidWorks software, you can create photorealistic images and view your model in real time. By working in a 3D environment that renders products lifelike, you can analyze your design choices and make alterations that may not have otherwise occurred to you. If you select chrome for a product’s finish, for example, the SolidWorks software photorealistic display could indicate that the overall effect is too shiny and convince you to select an alternate material.
- **Reverse engineering and output for rapid prototyping and CNC tools.** Since many designers still sculpt and work in nondigital formats, ScanTo3D allows you to scan concept sketches and handcrafted models into SolidWorks software, re-create the geometry, and complete the designs in 3D solids. Then you can send these models to rapid prototyping or CNC, or create molds and dies from the geometry.

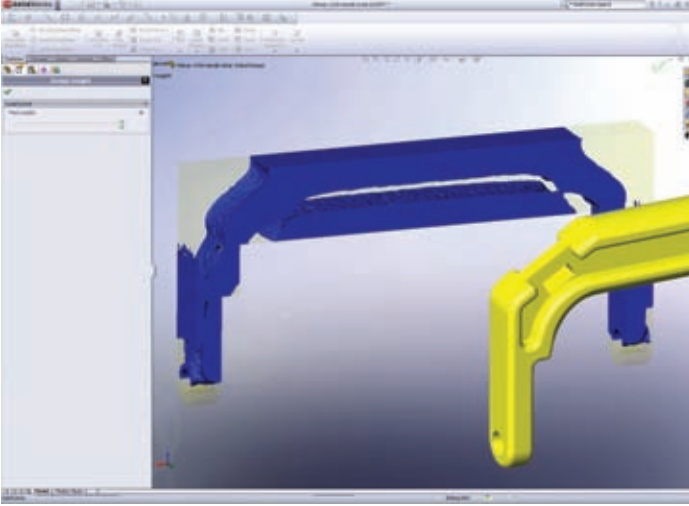
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## Make products more efficient or environmentally responsible

SolidWorks Simulation allows you to develop designs in ways that not only enhance a product's performance, but also reduce its environmental footprint—all while decreasing the cost for customers. For example, you can use SolidWorks Simulation to design a product that weighs less than originally anticipated, and thus save energy during its operation. In addition, virtual prototyping capabilities can dramatically reduce the need for physical prototypes, further decreasing waste, energy consumption, and associated prototyping costs.



The SolidWorks Design Insight capability provides graphical feedback on where you can remove material from your design to reduce weight—without sacrificing design integrity.

Furthermore, the Design Checker tool enables you to identify and modify design elements that are not in compliance with environmental standards—for instance, the European Union-based Restriction of Hazardous Substances (RoHS) directive, which bans new electronic equipment containing more than the agreed-upon levels of hazardous materials. By using the Design Checker tool, you can ensure that products are in regulatory conformance from the very beginning of the product development cycle.

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## Conclusion

SolidWorks Premium CAD software offers advanced capabilities to help you design better products—from design, automation, and simulation to validation, collaboration, and data management—all in one comprehensive package. While designers, managers, vendors, and manufacturers may differ on what defines a better product, they do agree on six key attributes:

1. Costs less to manufacture
2. Speeds customer delivery, beats competitors to market
3. Provides more throughput, requires less maintenance, experiences less downtime
4. Fits together correctly the first time
5. Offers more aesthetic appeal
6. Is more efficient or environmentally responsible

With its robust, built-in functionality, SolidWorks Premium meets all these criteria—enabling you to do what you do best—design better products.

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