

DESIGNING AND MANUFACTURING BETTER PRODUCTS WITH INTEGRATED 3D CAD TOOLS

White Paper



OVERVIEW

Today, designers and engineers face growing pressure to develop more innovative products faster and at lower cost to help their companies succeed in a competitive global market. Responding to this challenge requires working smarter—finding ways to save time and lower costs without negatively affecting product quality or innovation. To achieve these goals, you need access to integrated development tools that go beyond 3D CAD (computer-aided design), allowing you to model your designs in 3D and automate many of the tasks required to move products from design through manufacturing without the duplicative work and manual tasks that can contribute to schedule delays and budget overruns. With the SOLIDWORKS® Premium 3D product development platform, you will have access to the integrated tools that you need to model, visualize, simulate, validate, communicate, cost, document, and better prepare your designs for production. In addition to helping you work smarter, SOLIDWORKS Premium 3D product development software will help you support a range of downstream functions, streamlining your organization's design and manufacturing processes and contributing to your company's success.

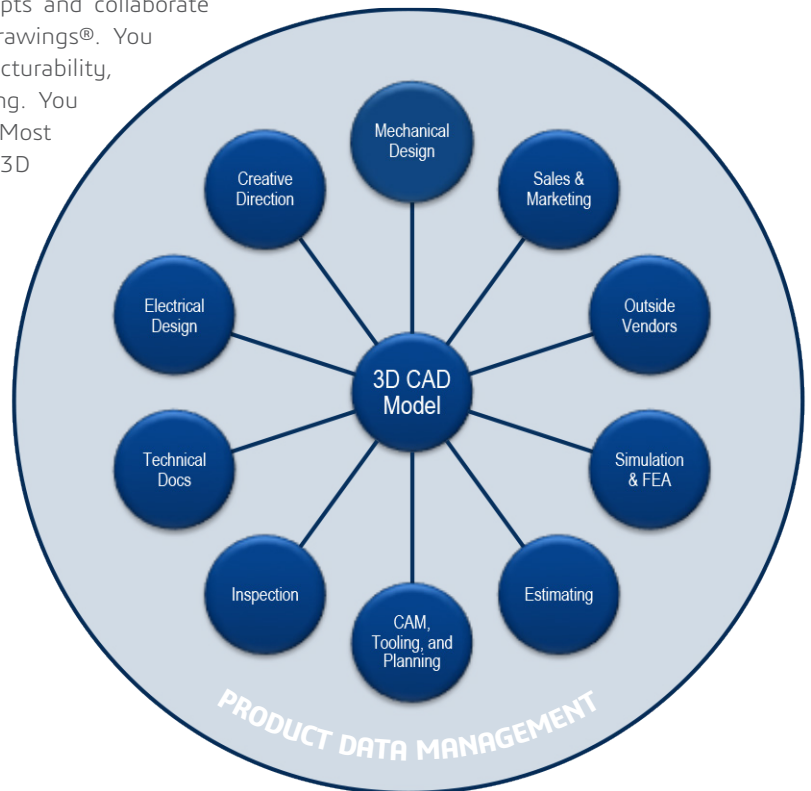
DEVELOPING BETTER PRODUCTS DEMANDS MORE THAN CAD

For many product developers, designers, and engineers, the move from 2D design tools to 3D CAD systems over the past few decades has been driven by the ease of modeling, greater accuracy, and improved visualization that working in 3D provides. Simply put, it's easier to create dimensionally accurate models of product designs and make design changes in 3D, without taking on a lot of detailing, design-checking busy work. Although these aspects of working in 3D have benefited users and their companies, 3D modeling represents only the tip of the iceberg in terms of 3D CAD data's potential to help you to more efficiently design, understand, and create innovative products.

Developing better products demands much more than just modeling shapes and geometries in 3D. It requires you to learn as much about your design as possible—how it will move, behave, look, and feel. It entails the ability to effectively communicate your design concepts and collaborate with others who can offer valuable input. It necessitates understanding the manufacturability and sustainability of a design. It involves finding ways to automate duplicative, time-consuming effort, and manage design data to minimize the likelihood of errors creeping into the process. It calls for supporting downstream functions, such as automating the generation of G Code for machining, or creating images and animations to support marketing. In short, developing innovative products efficiently requires much more than the ability to model something in 3D; it calls for a range of additional design and engineering capabilities.

Fortunately, you can quickly and easily tap the tools that you need to deliver better products by using an integrated 3D design platform like SOLIDWORKS Premium software, which includes a host of time- and money-saving integrated 3D CAD tools. You can learn how your design will behave and move using integrated structural and motion analysis, and then hold it in your hand via 3D printing support. You can work with mesh and cloud point data, and create complex surfaces and shapes. You can automate the routing of pipes, tubes, and ductwork, and the CAM (computer-aided manufacturing) programming that drives CNC (computer numeric control) machining. You can easily communicate design concepts and collaborate with colleagues and partners using SOLIDWORKS eDrawings®. You can estimate production costs, assess design manufacturability, evaluate product sustainability, and then create tooling. You can even create photorealistic images and animations. Most importantly, you can do all this without leaving your 3D CAD system. This paper explains how.

In an integrated tool with CAD at the center, all the design data "are easily shared throughout the product development process."





...a case in point

In only four years, Synaptive Medical, Inc. has introduced a range of products and systems that help neurosurgeons operate more precisely and effectively, introducing technology that could potentially lead to improved outcomes for brain surgery patients.

When the Toronto-based medical device manufacturer's founders launched Synaptive Medical in 2012, they realized the company would need a 3D product development platform that not only provided extensive, integrated capabilities, but also was established enough to enhance recruitment efforts and support rapid growth, according to Director of Engineering Josh Richmond.

Synaptive Medical chose SOLIDWORKS solutions, including SOLIDWORKS Premium design and analysis software, to support its ambitious product development goals because the software is easy to use, provides a wide range of integrated capabilities, and is the preferred design tool of a large number of designers and engineers. "With SOLIDWORKS, we have the integrated functionality to quickly develop and support products, enabling our company to grow," Richmond stresses.

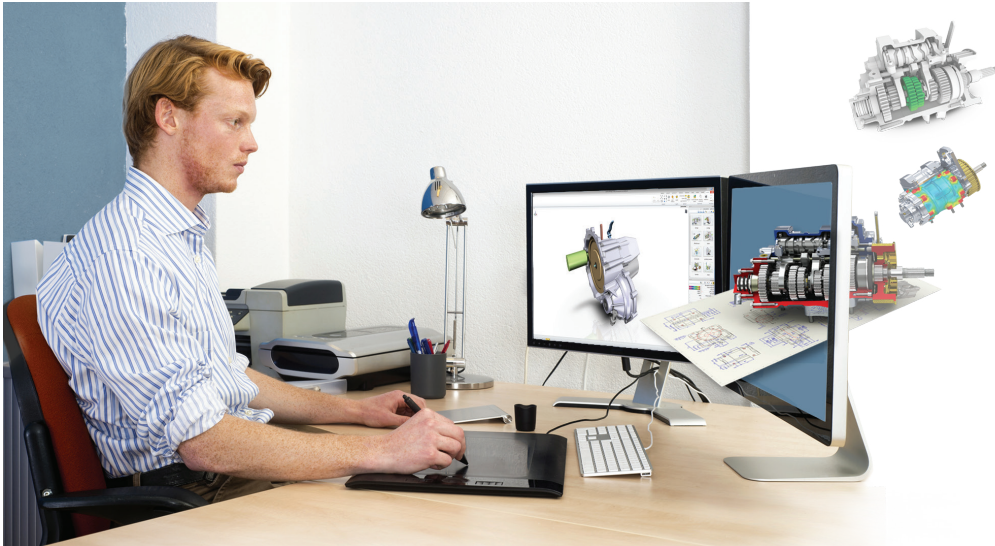
"SOLIDWORKS has helped us to quickly develop several products and expand our engineering and design staff from one to 100 engineers in just four years," adds Mechanical Engineer Mark Morreale.

By choosing SOLIDWORKS Premium software, Synaptive Medical was able to develop its comprehensive surgical product set in four years, grow its engineering staff from one to 100, enhance recruitment of trained designers and engineers, and support its rapid company expansion.

Read the full Synaptive Medical story here: [Synaptive Medical, Inc. Case Study.](#)

DEVELOPING BETTER PRODUCTS REQUIRES CAD-INTEGRATED TOOLS

While most product designers and engineers are well aware of the additional tools they would like to have integrated inside their 3D CAD system to help them develop better products, sometimes you don't know what you need until you have it. Considering some of the obstacles that you routinely encounter during product development will give you an idea of the types of additional tools that you could put to good use.



In order to build better products, you are tasked with understanding and communicating every aspect of your design as it goes from concept to manufacturing.

Can You Work With Legacy Data?

Modifying and adapting existing product designs—reworking and improving prior concepts rather than starting from scratch—requires the ability to import and work with legacy design data, whether it be older 2D files or more recent 3D models in different CAD formats. With CAD-integrated tools for connecting to and working with legacy data, you can avoid the time and effort involved with bringing in unintelligent file formats, such as IGES and STEP, and begin working with feature-rich drawings and models immediately.

Can You Communicate Design Concepts Effectively?

Showing a 3D CAD model to someone looking over your shoulder at your screen is an excellent way to share and communicate design concepts. But what happens when the people with whom you need to communicate and collaborate are located in another office or on the other side of the world? If they use the same CAD system, you can send them the model; but what if they use a different CAD package or don't use CAD at all? For these situations, you need a simple, neutral, yet robust design format that doesn't require recipients to have your CAD package or know how to use it.

How Will Your Design Perform?

Understanding how your design will perform—whether it will bend, break, move, deflect, or deform—while you are modeling it is certainly more efficient than waiting for validation or physical prototyping after the fact. If you can pinpoint and resolve design performance issues while modeling a part or product, you'll save time and money compared to discovering them later in the process. CAD-integrated motion and structural analysis tools will enable you to understand and address product performance during design, allowing you to avoid downstream surprises and giving you more confidence regarding the behavior of your design.

How Will Your Design Look and Feel?

Design aesthetics have become increasingly important to product success. While a 3D CAD model is certainly an enormous improvement over 2D drawings in terms of visualization, truly assessing a design's look and feel means taking visualization, not to mention tactile impressions, to another level. CAD-integrated tools that let you quickly and easily create photorealistic renderings and animations of design concepts—as well as offer support for 3D printing—can provide the capabilities that you need to effectively gauge design aesthetics.

Can You Model Complex Surfaces Accurately?

Organic shapes, which are characterized by asymmetrical, irregular dimensions and curvy, swoopy surfaces, have become increasingly popular in product design, especially for consumer products. In the past, designers used separate surface modeling packages to create shapes that were beyond the reach of most solid modelers. Today, however, CAD-integrated advanced surfacing tools can help you utilize lofts, sweeps, and curves to create shapes that are bound only by the limits of your imagination.

Can You Manufacture Your Design?

The most elegant, beautiful product design ever created is of little commercial value if it cannot be manufactured at volume and sold at a profit. As you know, thinking about the processes through which you will manufacture your designs is an important part of the design process. Can your design be machined or will it need to be produced with an injection mold or investment casting? Integrated tools that let you evaluate the manufacturability of a design while you develop it—and then allow you to easily create the G Code for CNC machining, or the injection mold, or investment casting—will make you more efficient and your designs easier to make.

What Will It Cost to Produce Your Design?

Considering production costs as a key variable during conceptual design is becoming increasingly necessary as global competition grows. While you may know what material you'd like to use from an engineering standpoint, how will material selection and production processes affect manufacturing costs? Although you may be able to come up with answers to those questions through additional research, wouldn't you like to be able to automatically estimate the costs of production from within your CAD system and see how material and process options affect the costs to produce your design?

“The SOLIDWORKS Costing tool gives us a competitive advantage in terms of turning around accurate proposals. The information provided by the Costing application is very accurate, so we use it as the basis of all of our manufacturing proposals.”

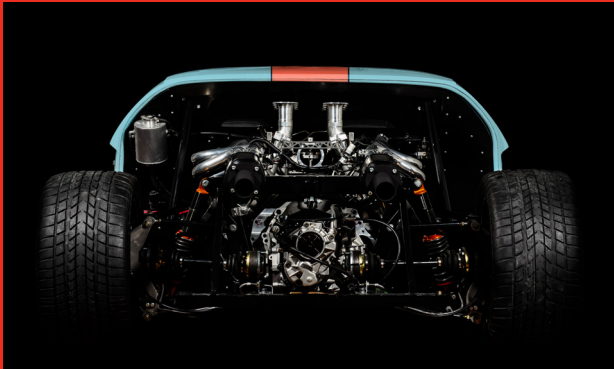
— P. Chandramouli, Managing Director, Domotech Appliances

Are You Sure that You're Working With the Right Revision?

Managing design data without a product data management (PDM) system can be a losing proposition because you'll need to spend additional time to make sure that all of the links, mates, and references in your assembly model are intact, as well as to verify that you're working with the latest revision. In the absence of a separate PDM system, wouldn't it be nice if your CAD system contained some basic PDM capabilities to make your job easier? Fortunately, CAD-integrated PDM capabilities that support you at the workgroup level are available.

Is Your Product Sustainable?

Increasingly, projecting the environmental impact that your design will have and understanding whether your design is environmentally sustainable have become critically important to a product's long-term success. Until recently, you would have had to conduct a formal, lengthy lifecycle assessment of a product's environmental impact to gain such insights. Today, CAD-integrated lifecycle assessment capabilities can help you quickly and easily determine the sustainability of your product designs.



...a case in point

Automotive Performance Solutions—Roaring Forties (APS) is an Australian automotive engineering consultancy that produces custom modern versions of the classic Ford GT40 sports car, and provides design and engineering services to leading automotive companies and original equipment manufacturers (OEMs).

APS originally used 2D drawings to work with machine shops to create components, a process that was both slow and costly. To efficiently and cost-effectively develop GT40 replicas bearing modern parts and mechanicals, APS needed an integrated 3D development platform.

“As a low-volume replica car manufacturer, we needed the flexibility of an all-in-one mechanical package that would enable us to quickly and affordably design, validate, and produce new parts and assemblies,” says Business Development Manager Ivan Viduka. “We found that package in SOLIDWORKS Premium software.

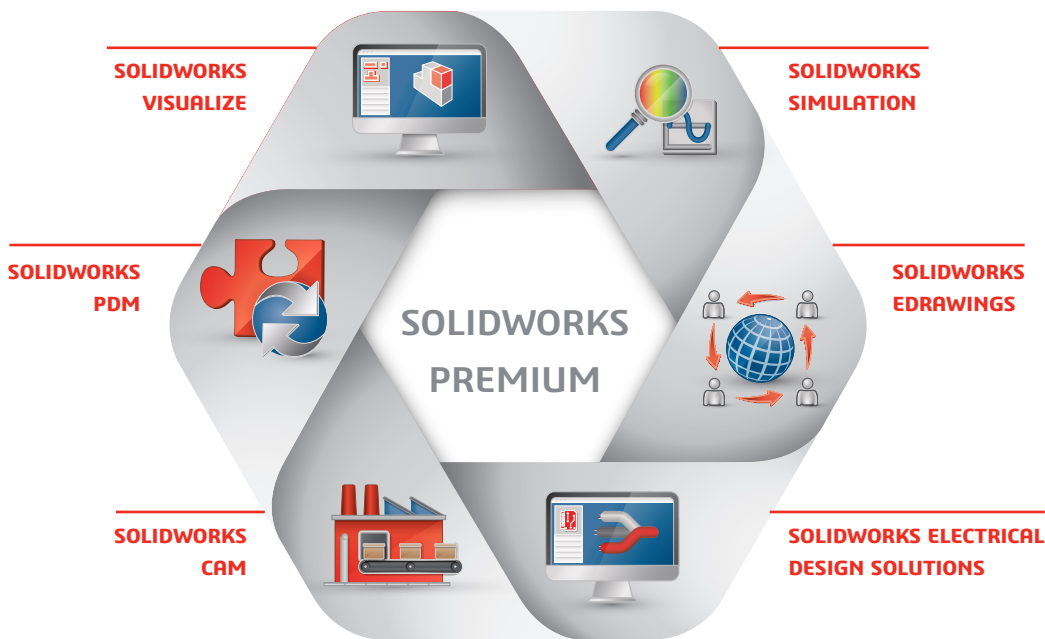
“With the automation that SOLIDWORKS Premium software provides, we’ve cut our vehicle assembly cycle times nearly by half and improved quality along the way,” Viduka continues. “In fact, we can leverage the dynamic motion, interference detection, and FEA [finite element analysis] tools of SOLIDWORKS Premium software to increase the assembly accuracy and meet our performance targets for both components and assemblies.”

By implementing SOLIDWORKS Premium software, APS cut its design cycles by 50 percent, reduced its development costs by 30 percent, decreased assembly time by 40 percent, and minimized design errors.

Read the full Automotive Performance Solutions story here: [Automotive Performance Solutions Case Study.](#)

DESIGN BETTER PRODUCTS WITH SOLIDWORKS PREMIUM 3D-CAD-INTEGRATED CAPABILITIES

SOLIDWORKS Premium 3D mechanical design and analysis software is the all-in-one product development package that designers and engineers need to create better products faster, and at lower cost. Packed full of integrated tools that advance your product development capabilities, SOLIDWORKS Premium will allow you to model, visualize, simulate, validate, communicate, cost, document, and prepare your designs for production, while saving time, holding down costs, improving quality, and enhancing innovation.



SOLIDWORKS Premium provides the integrated tools to answer all of your design challenges as you go from design to manufacturing.

Working With Legacy, Multi-CAD Data

Whether you need to work with 2D legacy files, mesh/cloud point data, or 3D models in a multitude of formats, SOLIDWORKS Premium software will improve your ability to work with other forms of design data. The software's 3D Interconnect feature enables you to work with both neutral and native CAD data from a variety of sources, a capability that can unlock powerful new approaches to collaboration with customers, partners, and suppliers.

Communicating Design Concepts

Do you need to communicate your design with others who either are not at your location or don't use CAD? With integrated SOLIDWORKS eDrawings Professional capabilities, you can send 3D representations of your designs via a compact email application, as well as receive model markups and feedback, without exposing the underlying intellectual property (IP) in your design. For communication needs requiring higher-quality imagery, you can use the SOLIDWORKS Visualize Standard tools that are included in SOLIDWORKS Premium software.

Simulating and Optimizing Design Performance

With the CAD-embedded motion and structural analysis tools included with SOLIDWORKS Premium software, you can determine how your design will move and perform while you are modeling it. You can use a time-based approach for rigid body kinematic and dynamic problems to calculate the forces and motions of an assembly as it would move under environmental loads (external forces) or internal loads (motors, springs, and dampers). Then you would use those results to carry out structural simulation on parts and assemblies with finite element analysis (FEA) tools to better understand strength and stiffness. These capabilities enable you to optimize your design for performance, minimize the need for prototypes, and avoid problems later in the process.

Visualizing and Feeling Design Aesthetics

Using SOLIDWORKS Premium software, you can create photo-quality images and animations of your designs, as well as produce rapid prototypes via 3D printing. It gives you the tools you need to truly assess the look, feel, and aesthetics of your designs. SOLIDWORKS Premium software includes SOLIDWORKS Visualize Standard (formerly known as Bunkspeed) capabilities, enabling you to quickly and easily render visual content that communicates your design's vision, passion, and emotion. SOLIDWORKS Premium software also includes industry-leading support for 3D printing, allowing you to quickly and cost-effectively hold your design in your hand, when necessary.

Modeling Complex Surfaces Accurately—Advanced Surfacing

Do you want to stylize the shape and contours of your designs with advanced surfacing capabilities? With SOLIDWORKS Premium software, you no longer need separate surface and solid modeling packages because the software lets you create complex solid and surface geometry, including stylish, curve-continuous surfaces. SOLIDWORKS Premium software simplifies advanced surface design to make creating sophisticated parts with complex shapes much easier. Such devices are common across a range of industries, including consumer products, vehicles, molds, and medical devices.

Assessing the Manufacturability of Designs

SOLIDWORKS Premium software helps you evaluate the manufacturability of your designs regardless of your approach to production. You can utilize DFMXpress to compare your design against standardized manufacturing rules. For machined parts, you can make sure that your design can be machined with a geometry check for CAM. For injection-molded parts, you can conduct draft, wall thickness, and undercut analyses. For sheet metal parts, you can automatically flatten your design to check manufacturability. You can even use TolAnalyst™ tolerance analysis, a tool that automatically checks the effects of tolerances on parts and assemblies to ensure consistent fit of components and to verify tolerancing schemes before the product goes into production.



...a case in point

Ironman triathletes Bryan Pate and Brent Teal founded ElliptiGO, Inc. to develop elliptical bicycles, which function like the elliptical trainers used in gyms but provide an outdoor, low-impact workout that's a lot more fun.

As the innovator of the world's first elliptical bike, the California company needed access to advanced 3D design and simulation technology, according to Co-founder and Co-president Teal. "Without a 3D design tool, it would have been much more difficult to develop the first ElliptiGO, and then build out the product line," Teal explains. "There was so much trial and error involved in engineering an elliptical bike that we needed a powerful design and simulation environment for iterating and gaining insight into our design, then efficiently and cost-effectively expanding our product line."

ElliptiGO chose SOLIDWORKS Premium software because the software is easy to use, provides integrated design simulation and visualization capabilities, and supports manufacturing requirements. "SOLIDWORKS has played a significant role in helping us build out the product offering of the company," Teal notes. "I've used SOLIDWORKS design and simulation tools for more than 10 years because the software enabled us to introduce a revolutionary, first-of-its-kind product, and then refine the concept to offer additional models while simultaneously keeping costs down."

SOLIDWORKS Premium software has helped ElliptiGO develop and expand its line of cutting-edge elliptical bikes by shortening time-to-market, reducing manufacturing costs, and improving product performance and quality.

Read the full ElliptiGo story here:
[ElliptiGo Case Study.](#)

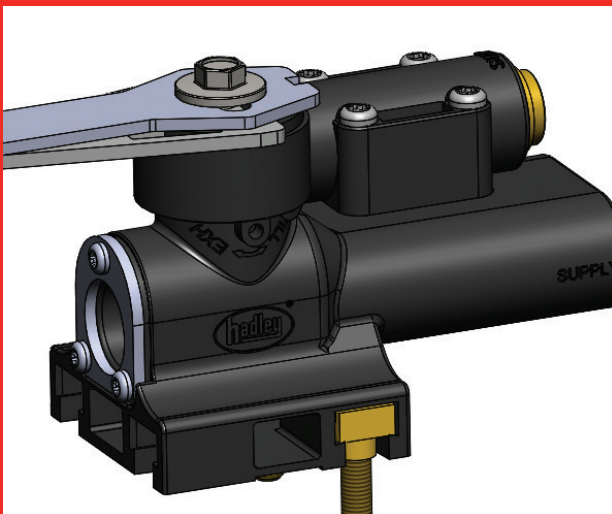
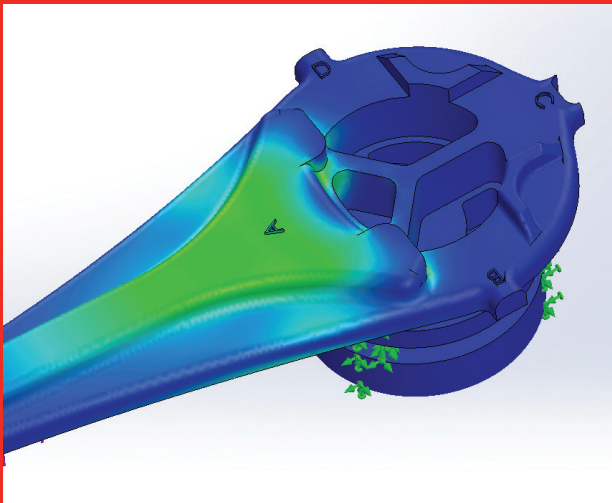


Estimating Production Costs—Costing

Understanding the production costs associated with your design could help you make better design decisions. With the automatic cost estimation tools included with SOLIDWORKS Premium software, you'll be able to continuously check your designs against cost targets. SOLIDWORKS Costing allows you to easily monitor manufacturing costs as you design, thereby avoiding costly redesigns and production delays later on. Your organization can also utilize SOLIDWORKS cost estimation tools to automate your quoting processes, saving additional time and effort.

Managing Design Revisions and Data—PDM Standard

SOLIDWORKS Premium software also includes tools to help you manage product design data and control design revisions. The software includes the SOLIDWORKS PDM Standard applications, a data management solution for smaller workgroup environments in a single location. SOLIDWORKS PDM Standard eliminates the overhead of managing SOLIDWORKS data on local and shared network drives, providing the revision control and checks needed to ensure that your design data match your design.



...a case in point

Since introducing the Hadley horn—a recognizable icon in the trucking industry—Hadley has been producing high-quality parts and systems for the heavy truck and transit industries. A Tier 1 supplier to truck original equipment manufacturers (OEMs) and Tier 2 supplier to suspension manufacturers, the company designs and manufactures components, systems, and products for vehicles, tractor trailers, and associated aftermarkets. Hadley also makes products for the transit and shuttle bus, recreational vehicle (RV), motor coach, and specialty vehicle markets.

Until 1999, Hadley used AutoCAD® 2D design tools. That's when increasing competition and greater use of injection-molding manufacturing techniques prompted the company to transition to a 3D development platform, according to Principal Engineer Dick Winter.

Hadley chose the SOLIDWORKS development platform, including SOLIDWORKS Premium design and analysis software, because it's easy to use and provides the best value for the price. "SOLIDWORKS [Premium] helps us improve design manufacturability, such as making sure the model has sufficient draft, and reduce iterations with our mold maker," Winter stresses. "With improved visualization in 3D, we can sit down with the mold maker and go over part and mold design. This allows us to see potential issues inside the tool and quickly make changes in the design and mold so we get the part right the first time."

By selecting SOLIDWORKS Premium software, Hadley has cut its mold and tooling development process by 20 percent, improved the accuracy of its tooling designs, reduced its prototyping requirements, and decreased the number of individual parts in its assemblies.

Read the full Hadley story here:
[Hadley Case Study.](#)

Preparing for Manufacturing–CAM Standard

With SOLIDWORKS Premium software, you get both a CAD and a CAM package in one. The software includes SOLIDWORKS CAM Standard, a fully integrated, knowledge-based technology that allows you to integrate design and manufacturing processes under one system. It allows you to evaluate designs earlier in the process and avoid unexpected costs and delays in finishing products on time. The application leverages the rich content in the 3D CAD model to speed up product development and reduce the number of error-prone, time-consuming, repetitive manual steps required to prepare for manufacturing, like programming CNC machines.

Evaluating Design Sustainability–Sustainability

Knowing whether a product design is sustainable has become a critical factor for success from both a sales and a manufacturing perspective. If a product damages the environment, it's unlikely to sell over the long term, nor will your organization want to continue to manufacture it. SOLIDWORKS Premium is the only 3D CAD package to include an environmental assessment application. With SOLIDWORKS Sustainability capabilities, you can simulate the environmental impacts of your design by conducting a Life Cycle Assessment of Environmental Impact from within your CAD system.

DEVELOP INNOVATIVE PRODUCTS FASTER WITH THE SOLIDWORKS PREMIUM 3D-CAD-INTEGRATED DEVELOPMENT PLATFORM

3D CAD technology offers much more than ease of modeling and enhanced visualization, especially when designers and engineers have access to the additional integrated tools that they need to save time, reduce costs, and design better products. Using a 3D CAD package that includes integrated tools like SOLIDWORKS Premium software, you will be able to model, visualize, simulate, validate, communicate, cost, document, and better prepare your designs for production.

By helping you design and manufacture more innovative products faster, more accurately, and at less cost, SOLIDWORKS Premium software will enable you to work smarter, letting you improve your job performance while simultaneously better supporting downstream functions and the goals of your organization.

To learn more about how the SOLIDWORKS Premium 3D-CAD-integrated development platform can help you design and manufacture better products faster, visit www.solidworks.com or call 1 800 693 9000 or +1 781 810 5011.

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