# 10 REASONS WHY SOLIDWORKS PREMIUM IS THE BEST CHOICE FOR CONSUMER PRODUCT DESIGNERS

Overview

Dassault Systèmes SolidWorks Corp. continues to further its mission to unleash the power of 3D for everyone in the product development process. The SolidWorks® Premium suite of design and analysis tools helps bridge the gap between product designers and other disciplines, eliminating the inefficiencies of differing design systems and revolutionizing the design process.


3S SolidWorks
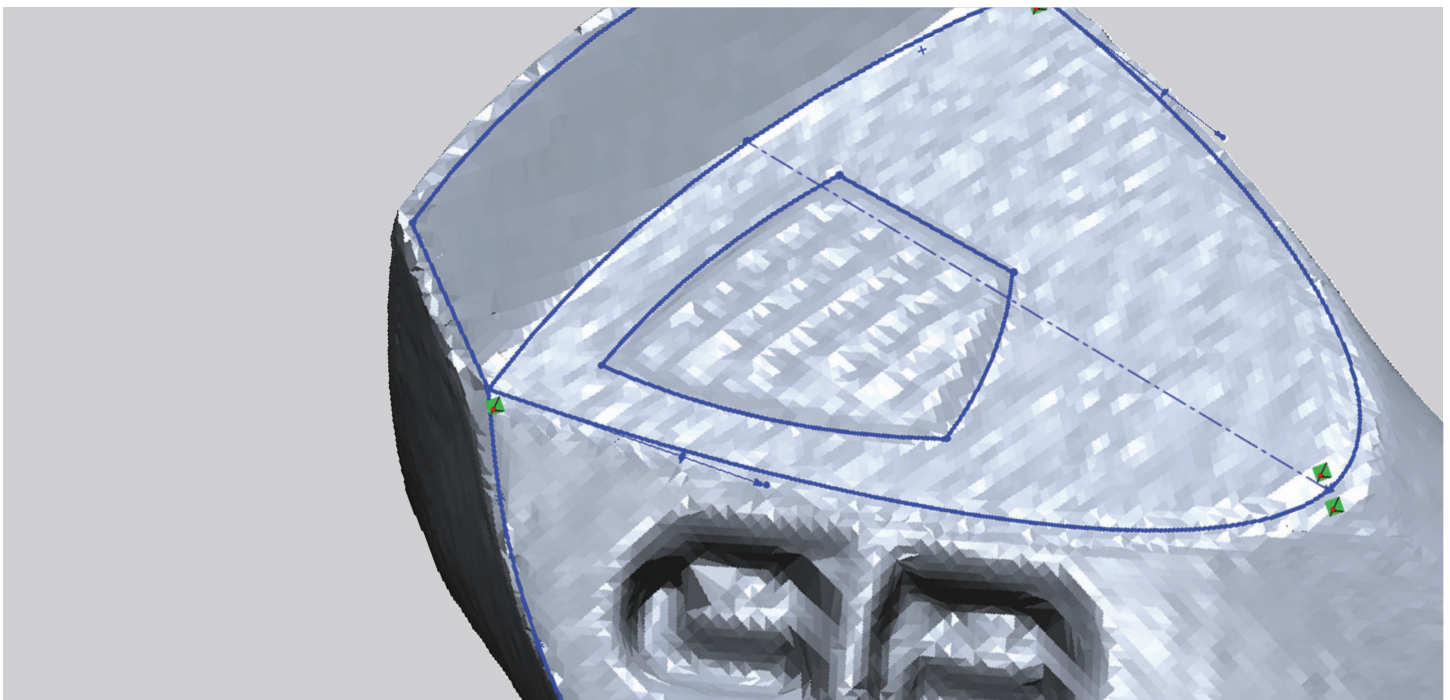
Introduction

In the product design industry, mechanical CAD (MCAD) tools are in high demand for successfully conceptualizing and manufacturing consumer products. As a designer of consumer products, you have needs and deliverables that vary greatly from those of your mechanical engineering counterparts who design machinery and equipment. In fact, you often need more complex modeling functionality. Knowing that your concept could change or be rejected, you must be able to quickly create and modify your design. When many factors and specifications are already determined, MCAD tools can efficiently accommodate a certain amount of change. But if your concept is in a high state of flux, making conceptual changes can bring your MCAD system to a halt. This is why most product designers still conceptualize with pen and paper, along with foam or clay modeling, instead of MCAD software. For those who have the talent to draw and sculpt, these traditional tools are often more efficient than computer-based tools.

Today, many initiatives in the MCAD industry focus on capturing the design intent earlier in the process, thereby reducing the product design cycle and time-to-market. Because design intent is critical to successfully producing and manufacturing products, DS SolidWorks Corp. has made great strides in not only meeting this challenge, but also in streamlining the entire design process. As a result, SolidWorks Premium software can help you easily execute and conceptualize your designs.

Sketching on paper has been, and continues to be, a pervasive medium for capturing initial ideas for others to see. However, the author of the sketch often reads much more into its meaning and understanding than others would. Imagination, along with the sketch as a reference, is the catalyst for making a particular idea more tangible and concrete. By using SolidWorks software early in the design process, you can better convey your ideas to others.

1. Sketch Picture and importing geometry

With SolidWorks software Sketch Picture, you can successfully transfer the important references and subtlety of the hand-drawn sketch into the SolidWorks software modeling environment. SolidWorks software Sketch Picture allows you to open a scanned sketch or an image file onto a 2D sketch plane and display it along with other 2D and 3D geometry. Once it is loaded, you can easily scale, rotate, and even mirror the concept sketch. Because only the hand-drawn (pen and ink) area of the sketch is of importance, the surrounding white portion is a hindrance when you visualize in 3D. SolidWorks software Sketch Picture, however, enables you to make these white areas transparent. You can use the file's built-in transparency, or you can sample a color of the sketch, defining the areas that should be transparent. Plus, you have the capability to set the transparency of the overall sketch. As you sketch new curves, SolidWorks software Sketch Picture provides a clear reference to the significant aspects of the original hand-drawn sketch, greatly enhancing visualization for your entire design team.
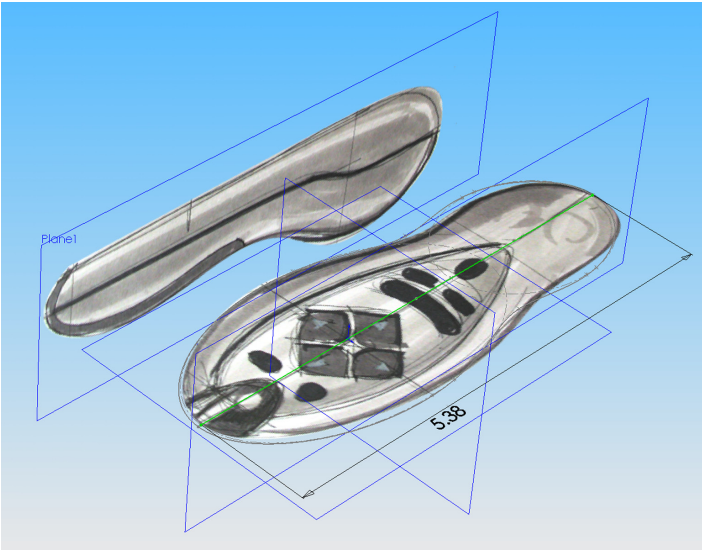
The white areas surrounding the original images are made transparent.

2. ScanTo3D

A design concept often begins as a physical model made in the model shop—with the essence of the design intent captured in a foam, wood, or clay model—rather than as a concept on the computer. Since these models become the design concept reference from which the final design choice will be made, this reference must not be lost when you convert to a 3D CAD model. With the ScanTo3D utility in SolidWorks Premium, you can open scan data directly into the SolidWorks software window. Then you can directly reference that data, either a cloud of points or a mesh, to build surface and solid models. Two wizard tools are also included—one for cleaning up, repairing, and orienting the mesh, and another for converting it to a surface or solid model. When you combine this capability with the NextEngine® Desktop 3D Scanner™, you have a complete, low-cost solution for capturing design intent from models and prototypes.

Some shapes that are sculpted in the model shop are extremely difficult to model in CAD. For instance, an ornate crown molding with gold-leaf inlay that is usually sculpted in just a few hours could take days, if not weeks, to model in a surface or solid model system. However, with ScanTo3D, you can directly scan the section of molding using the Desktop 3D Scanner, and the mesh immediately opens into the SolidWorks software window. At this point, the mesh becomes an important 3D reference. You can draw 2D and 3D sketches directly on the mesh, inferencing the mesh vertices.

Once these 2D and 3D sketch curves are created, you can use standard SolidWorks software surfacing functionality to re-create the molding surfaces and eventually turn it into a solid model. ScanTo3D also provides a surfacing wizard that can automatically convert the mesh into a solid model in a single step. Alternatively, you can divide the mesh into submeshes and extract faces from those submeshes. Together, ScanTo3D and the Desktop 3D Scanner can help you significantly reduce the time it takes to turn physical objects into virtual ones.
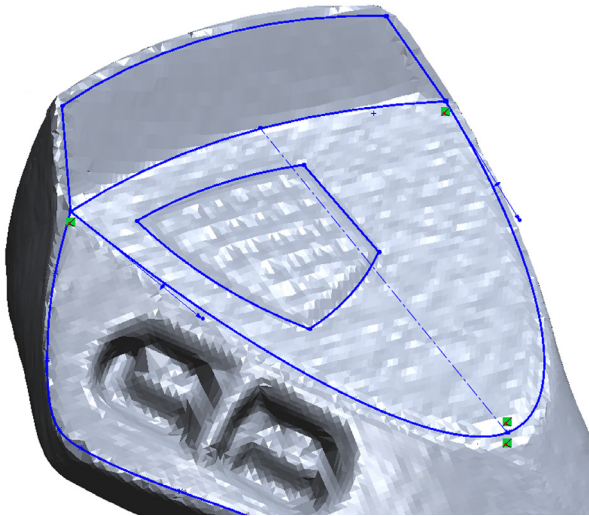
2D and 3D sketches can occur directly on the scanned mesh.

3. 2D and 3D sketch splines

Once you position the hand-drawn sketch views into a SolidWorks software part, you have a graphical reference for creating curve geometry, which will become the sketch entities that define the three-dimensional surfaces of the concept. SolidWorks software provides a powerful sketching environment, both in planar (that is, a 2D sketch) and in three-dimensional space (that is, a 3D sketch). Unlike other surfacing programs, many of the SolidWorks software 2D sketch entities are available in the 3D sketch environment and contain nearly all the 2D benefits, including relationships, dimensioning datum planes, and construction geometry.

The recently improved SolidWorks software spline technology not only provides all the control and ease of use found in other systems, but also surpasses the competition by offering the added value of parametrics. For example, you can draw 2D or 3D splines and then align them to other geometry or surface references, matching the adjacent edge with a tangent or C2 (curve continuous) condition. You can also dimension the "weighting" of the tangency right onto the spline handle as well as its vector angle. A curvature analysis display helps you build high-quality splines that, in turn, lead to high-quality surfaces.
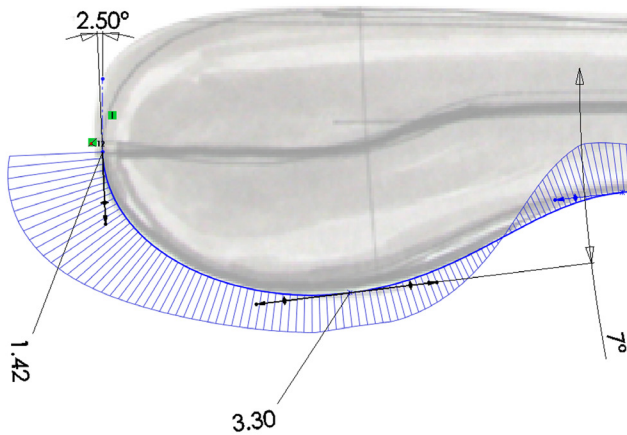
Sketch splines are displayed with handle control constraints, so you can dimension both the tangent length and angle vector of the spline point.

4. Swept surfaces with guide control

After you create curves, SolidWorks software provides a number of surfacing features that can fill in between these curves. Most of the features described in this paper can be accomplished as either a surface or a solid feature. The Sweep feature is particularly useful. Unlike traditional lofted surfaces that need a number of cross-sections in order to define the shape, the Sweep feature requires only one cross-section and then another curve to act as a path to guide it. When combined with more than one path (that is, guide curves), the Sweep feature becomes very powerful. Since the Sweep feature can translate complex cross-sections, it saves you time and added work. By following the style and profile lines of the main shape instead of focusing on the cross-sections, the Sweep feature also helps you adhere to the design intent.
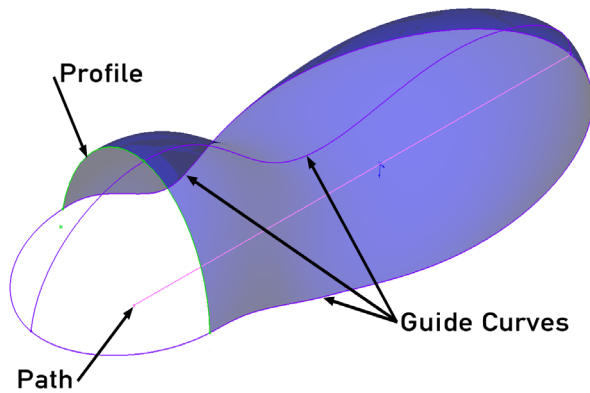

Sweeping with multiple paths, guide curves can easily produce complex shapes.

5. Fill Surface

Fill Surface is arguably the most invaluable advanced modeling feature in SolidWorks Premium. At times, you may want to create a design that is aesthetically beautiful to behold, but extremely difficult to achieve geometrically. These difficulties may seem simple in the physical world, but they are complex in the NURBS-based modeling world.

For instance, consider a surface that is stretched at five corners. As a physical metaphor, a four-sided blanket is easy to understand. You have four corners and four individuals who hold these corners to stretch the blanket. However, if you add a fifth corner to the blanket without an extra person to hold it, you will not be able to stretch the blanket uniformly. The industry refers to this type of surface as the "n-sided" patch—a surface feature that has the ability to smoothly fill in between any number of sides (hence the term "n-sided"), and to do so while matching tangency on the surrounding faces.

The SolidWorks Fill feature is a simple-to-use surfacing feature that allows you to choose and fill in any number of sides, and patch that area with a smooth surface that is tangency- or C2-matched to the surrounding faces. Furthermore, the Fill feature lets you place internal curves or points, thereby altering the internal shape of the fill. You can even jump over small gaps in the surrounding area that you want to fill. As a result, you are not forced to overbuild the surface and trim it back, which is the accepted industry practice for designers who do not have this capability. Instead, you can build to the original edges that represent the initial design intent.
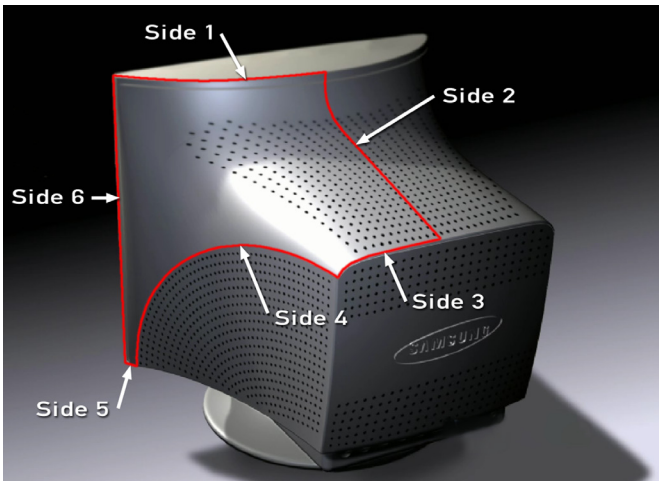
This n-sided area allows a smooth patch among several discontinuous curve boundaries.

6. Boundary surface

In consumer product design, boundary surfaces are the most commonly used surfacing feature in CAD models. Therefore, it is essential that you provide ample capability and versatility for this staple feature. Typically, designers use this surface type to create major portions of the exterior surfaces of their design by defining "style curves" (see "2D and 3D sketch splines"). The Boundary feature then uses these curves to drive a surface patch that interpolates between the curves as a smooth B-spline surface. These surfaces must be as smooth as possible not only between the curves, but also to the adjoining faces that surround the Boundary feature. To meet this demand, SolidWorks software can build the boundary with tangency or C2 matching in one or both directions. To help better define the precise area that needs to be surfaced, you can use draggable connectors to further shape and alter the resulting surface. By modifying the curves and dragging tangency handles, you are able to dynamically reshape the surface. Since you have immediate feedback and control, you can fine-tune the shape to your exact specifications.
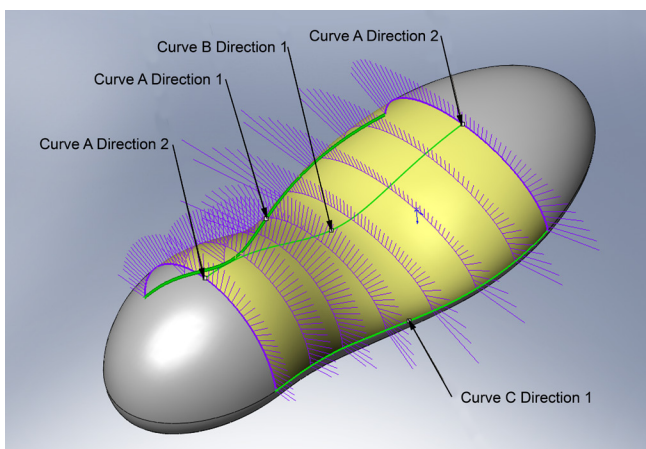

Multiple first and second direction curves can be incorporated with C2 continuity and curvature analysis.

7. Freeform

At some point in the design process, you might need to slightly modify the form without going back and redefining the original curves. Alternatively, you may need to create a complex surface, such as a handgrip, which would take an extraordinary number of curves and tweaking using the boundary surface.

Created for this type of task, the Freeform feature is a general-purpose "shape editing" tool. With the Freeform feature, you can easily and dynamically pull on surface points to deform the shape you need, without creating sketch curves or other predefined references. Although many of our competitors have similar "push-pull" functionality, SolidWorks software goes one step further by allowing you to define specifically where you want to pull on the surface. By establishing a "control curve" through the solid face or surface and once defining that curve, you can pull a number of points in any of three directions to modify the underlying surface. Because these surface modifications happen in real time—and without the need to create sketch curves—this intuitive process enables immediate feedback on how the changes will affect the final form. Optionally, you can control the boundaries of the Freeform face to be tangency- or C2- matched. Plus, you can choose to actually move the boundary using the "moveable" option. The Freeform feature provides optimum versatility and control for exploring and altering design intent.
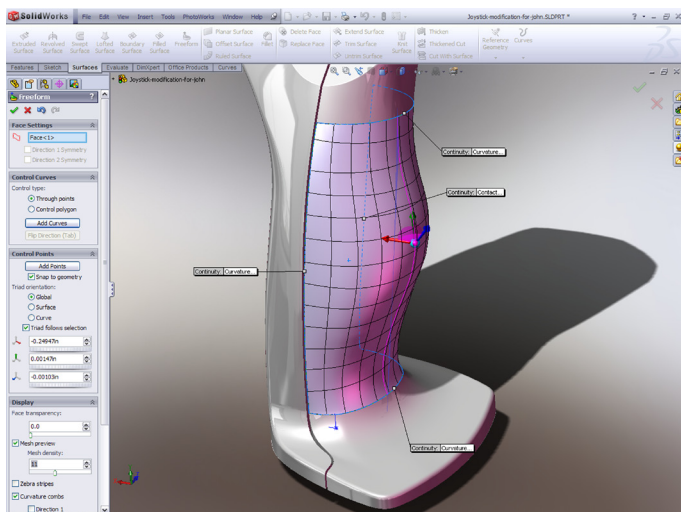

The Freeform feature allows you to place points where you want to pull and dynamically drag the surface to change its shape.

8. Multibody

Historically, product design trends have varied from the simple and prismatic to the wildly organic, but most successful product designs fall somewhere in between. You can easily create prismatic shapes by using solid modeling techniques, but more complex shapes simply cannot be constructed in this manner. Instead, you need a combination of two distinct techniques, which is called "hybrid modeling." This allows you to work simultaneously with multiple solid or surface bodies, deciding when and where in the history of the part to place a feature, as well as when to make that feature solid.

When you need to handle multiple solid forms in a single part file, SolidWorks software treats each of the solid bodies as its own identity. You can isolate and apply unique features to that body or to multiple bodies at once, with the freedom to choose how the various parts of the design will interact. For example, you can detail the entire design in a single part file, ultimately describing all the individual plastic parts that comprise the design (that is, the upper housing, lower housing, battery door, etc.) as multiple solid bodies. Because they are in a single part file, all references are made available to all the solid bodies.

Since most other systems use an assembly-based approach, they do not have the capability to handle multiple bodies with intelligence. With SolidWorks software, however, you benefit from a master model approach that establishes an overall form and allows it to drive the various parts. Any change that occurs in the master form reflects through to the individual parts.
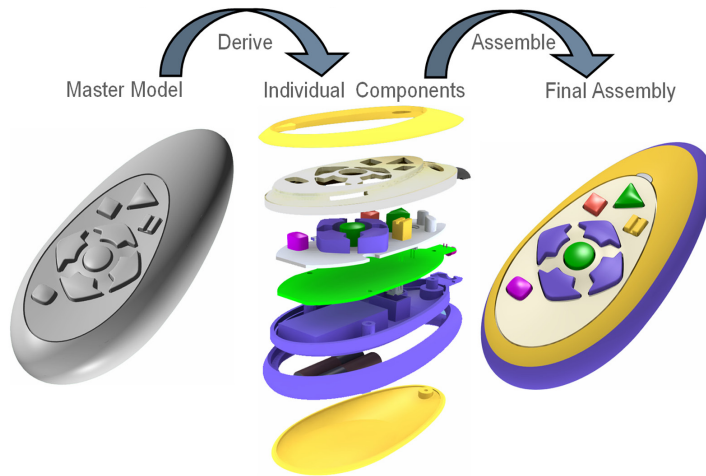
Creating individual components from the master form multiple bodies are derived to separate parts and then reassembled into a main assembly. When the master model is altered, all changes are propagated into the final main assembly.

9. PhotoWorks

Creating geometry that can be used later to create mold tools for manufacturing the design is of paramount importance. Yet, an even more significant deliverable occurs before the concept is built for manufacturing. After the concept is created in the SolidWorks software environment, your first deliverable will be an image of the design that you can present to the management team for evaluation and direction. In the past, product designers had to create a physical prototype of the design, then paint and detail it before photographing the final model. But with PhotoWorks™ software, you have the necessary tools to produce photorealistic renderings and animations that are often more cost-effective than producing a physical model, especially in the early stages of concept development.

PhotoWorks offers machine and consumer product designers a rich array of industry-specific materials that have been optimized for maximum realism. This includes polished, brush, and satin metals; polished, high-gloss white, translucent, and Mold-Tech®-like plastics; and clear reflective, translucent, and sandblasted glass. In addition, PhotoWorks provides a wide range of wood grains and end-grains. You can apply most of these materials by simply dragging and dropping them from the Resource Pane. Many of these materials also can be dynamically positioned, rotated, and scaled in the SolidWorks software window.

PhotoWorks also provides a number of HDR (Hi-Dynamic Range) scenes that are completely predefined. Simply choose a scene, select your materials, and click the render button—SolidWorks software does the rest. Since the HDR scenes completely light the scene in a much more realistic way than SolidWorks software lights could do alone, you no longer need to define light sources in SolidWorks software. Because of increasing demands to compress the product design cycle, your rendering must be easy to accomplish and predictable. With PhotoWorks, you and your design team can easily realize and validate your designs.

Many sophisticated materials have been added to the PhotoWorks library of materials, including brush and matte metal, etched and frosted glass, as well as Mold-Tech-like textured plastics.

10. Ease of use and visualization

When you design with MCAD tools, you need software that is easy to use. From its inception, DS SolidWorks has made ease of use a top priority. And with every release, the company strives to find better and more intuitive ways to help designers manage and simplify the complex task of creating consumer products.

SolidWorks software is one of the few native Microsoft® Windows® applications that adheres to the industry's standard methods, such as opening files, copying, and pasting. Many other companies claim that their design tools are Windows-compliant, but they simply are not. In fact, they cannot even offer the level of integration with Windows, or with other Windows applications, that SolidWorks software does. In addition to all the tools mentioned in this paper, many other features are also fully integrated into the SolidWorks software environment. As a result, you do not need to learn other software interfaces that supplement your main application.

SolidWorks software makes extensive use of previews and interactive on-screen drag handles to guide you in making the correct decisions. You can drag or drop files, as well as sketches and features, from one SolidWorks software object to another. SolidWorks software is one of the first applications that allows you to work in a fully shaded mode, even while defining sketches—an added advantage to designers and engineers alike. Both disciplines are visually oriented, and DS SolidWorks excels at visualization.

Conclusion

When it comes to conceptualizing and executing a concept, you cannot afford to constantly relearn complex interfaces, procedures, and formulas in order to achieve a quick turnaround of your concept. Ease of use, Windows standardization, and rich visualization all come together to make SolidWorks software one of the three most intuitive 3D modeling programs on the market today. SolidWorks Premium is capturing the attention and imagination of designers everywhere who value the powerful, easy-to-use, and highly visual SolidWorks software modeling environment.

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