

NINE CRITERIA FOR CHOOSING A 3D CAD SYSTEM

White Paper



OVERVIEW

In discrete manufacturing industries, 3D CAD software has become the accepted medium for designing products, tools, and manufacturing equipment. In process industries, 3D systems are increasingly employed in the design of plants and production systems. The explosion of 3D printing technology is bringing an increasing number of new designers into the market for 3D CAD software.

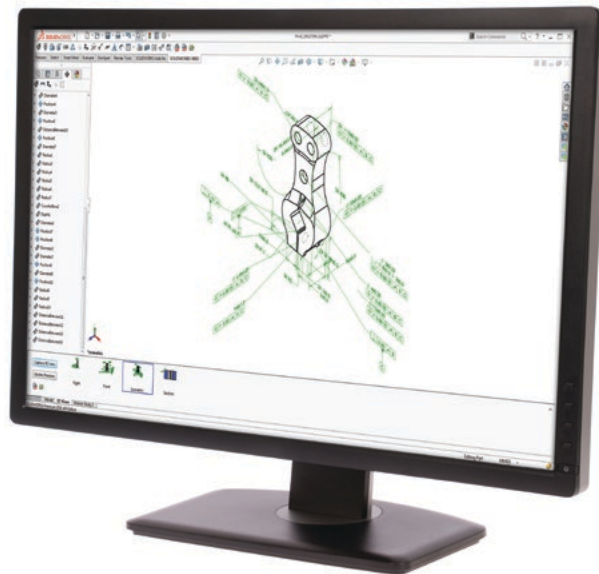
Although some tasks will always be done with 2D CAD, the number of first-time buyers of 3D CAD software continues to grow. Some of these buyers are new to CAD. Others are experienced CAD users and young engineering managers who have never participated in a 3D CAD selection process. This paper is intended to help 3D CAD shoppers identify what capabilities and characteristics are important to them and their organizations.

1. CAPABLE, EFFICIENT 3D DESIGN

The centerpiece of 3D CAD is a 3D master model that's used for all aspects of manufacturing: product design and simulation, drafting, tool design, numerically controlled tool programming, and inspection. The 3D model must accurately represent every part in your company's products and the relationships among them. To maximize efficiency, designers should be able to design in 3D with as few steps as possible without compromising design quality.

When evaluating CAD software, find out how efficient each package is at creating the types of products your company makes. For example, if your company makes sheet metal parts, pay attention to the special aids for modeling them and automatically generating flat patterns. If your firm designs stylish products, look at the tools for creating freeform surfaces and blends with continuous curvature. Designers of machinery should examine how easily they can assemble large numbers of parts and insert purchased parts, such as fasteners and electrical components, from a library.

Because changes are inevitable, assess how hard it is to modify parts and assemblies. A CAD system that can make your company's designs with even 20 percent fewer steps will offer important cost advantages compared with systems that are less efficient. A 3D CAD system that offers the best value will combine exceptional technical capabilities with reasonable cost-of-ownership.



SOLIDWORKS® Model Based Definition application enables engineers to generate one master document for all product and manufacturing information without having to produce and maintain separate sets of 2D drawings.

2. INFORMATION FLOW THROUGH EXTENDED ENTERPRISES

In today's world, few manufacturers are vertically integrated. Most rely on global communities of suppliers for parts, tools, subsystems, production equipment, and design. Whether your company is a supplier, a customer, or both, it can benefit from sharing 3D CAD models with others.

When possible, choose a CAD system that's popular in your industry and supplier community. This choice helps eliminate the need to translate files from one system to another. Translation takes time and can introduce errors.

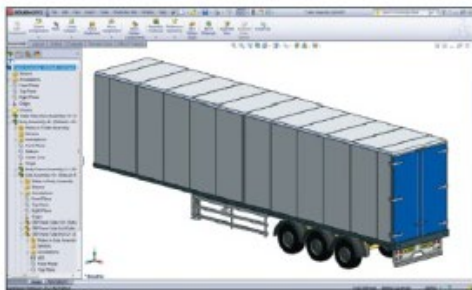
Also look at each system's ability to import files from other systems. Make sure your CAD system supports international standards such as STEP, IGES, VDA, and IDF. Evaluate the tools for fixing damage to imported shapes. How easy are they to use? How well do they work? If your firm must translate many files from several brands of CAD systems, check out the direct translators available with each CAD system and also those from third parties that specialize in translation software.

Don't limit your evaluation of data sharing to file exchanges. Systems based on shared internet hosts enable designers to collaborate in real time with customers to explore options and identify good solutions quickly.

Sharing CAD data with customers or suppliers can save thousands of hours and weeks of schedule time compared with the cost of remastering them interactively. The ability to collaborate in 3D on products and processes can reduce costs while helping to deliver better products.

DriveWorks for SOLIDWORKS enables parts, assemblies, and drawings to be generated automatically in response to customer specifications.

WORKFLOW: AUTOMATING DESIGN ON THE WEB



1 Save out SOLIDWORKS file to DriveWorks 3D format



2 Open DriveWorks 3D file in DriveWorks 3D Workshop to capture



3 In DriveWorks Administrator build the interface (forms) and rules to drive how your model will change



4 Embed the form in your website and configure in the browser

5 New variations can be played with in the browser and online

3. DRAFTING TOOLS THAT MEET YOUR STANDARDS TODAY AND IN THE FUTURE

Even though you'll be designing in 3D, your suppliers and factory workers may need drawings. A clear drawing shows information that isn't obvious in a 3D model: critical dimensions and tolerances, material and surface-finish specifications, and notes about processing, such as curing or heat treatment. Be sure any 3D CAD system you buy can make drawings to your current standards for dimensions, tolerances, lettering, and parts lists. And be sure your drawings can be exported in popular formats, such as PDF, DXF, and DWG.

But 3D CAD is changing drawings as we know them. Leading manufacturers are employing annotated 3D models that convey the information found on drawings without a separate document. This so-called "model-based definition" saves drafting time, simplifies product-data management, and enables automated manufacturing and inspection systems to read dimensions and tolerances directly from 3D models, helping to eliminate errors.

4. TOOLS TO TAKE YOUR DESIGNS FROM CONCEPT THROUGH MANUFACTURING

Designs don't make money until physical products are delivered. Look for 3D CAD software with a rich variety of applications that can reduce not only design time, but testing, machining, cost estimating, and inspection.

Companies that design systems to order can benefit from software that generates parts and assemblies automatically in response to customer specifications. Such tools may be general purpose, such as configuration software, or special tools optimized for designing products such as mold assemblies or stamping dies.

Because physical testing is costly and slow, you should look to reduce the number of physical tests by simulating physical behavior, such as kinematics, dynamics, stress, deflection, vibration, temperatures, or fluid flow. Look for a system that has integrated analytical tools or efficient interfaces to your preferred simulation software.

Software for designing electrical wiring can help reduce errors and ensure machinery is wired correctly. Cost-estimating software enables designers to hit cost targets by revising designs sooner instead of waiting for estimators to say they are over budget. Inspection software can slash the time needed to prepare documents for inspecting parts on delivery.

Picking the right add-in applications for your company's business can slash the time needed to bring products to market. To make sure you have the best tools, choose a CAD platform that gives a broad choice of solutions. It should have an extensive and well-documented application programming interface (API). Good APIs make it less costly for third parties to integrate specialty applications with your CAD system. And they let your own programmers write software tailored to your ways of using CAD models.



SOLIDWORKS Conceptual Designer enables engineers to collaborate with customers and suppliers without exporting files or losing control over them.

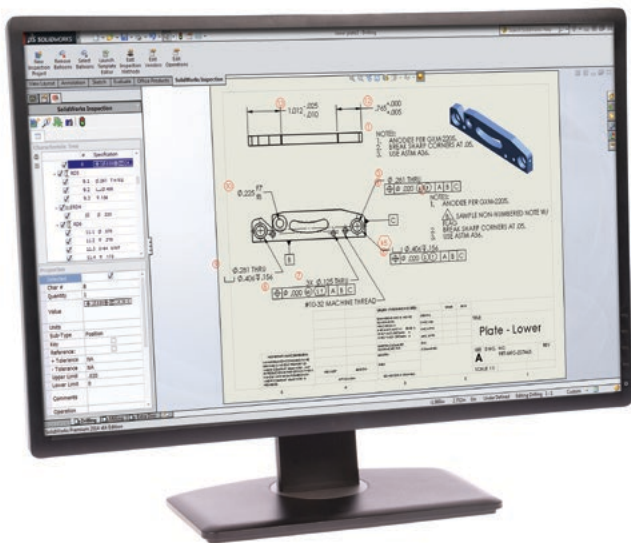
5. HELP MANAGING DATA

Organizations with more than just a few designers can benefit from product data management (PDM) software integrated with their CAD tools. Because relationships among files in 3D systems are so complex, an automated system to store and organize them is essential. Without PDM, designers can unknowingly overwrite each other's work, reinvent parts that have already been designed, and send the wrong revision levels to manufacturers. Together, these sorts of errors can waste hundreds of hours of work each year and thousands of dollars in defective parts.

PDM systems do much more than store and organize files. They also help designers find existing parts to re-use instead of reinventing them, generate materials lists for cost estimating, and feed data to manufacturing resource planning (MRP) systems. More advanced PDM software can automate change-control processes to ensure that out-of-date or unreleased information isn't sent to factories or suppliers.

6. INNOVATIVE R&D TO PROTECT YOUR INVESTMENT

Computing technology is constantly changing. If your CAD vendor doesn't take advantage of this evolution, in a few years you'll find that your organization has an obsolete and costly-to-maintain CAD system. Buy from suppliers that have a proven record of being manufacturing industry leaders with large and sophisticated R&D teams.



SOLIDWORKS Inspection software streamlines and automates the creation of inspection drawings and reports.

7. PLEASANT BUSINESS RELATIONSHIPS

Believe it or not, some of the greatest sources of friction between buyers of CAD software and their customers are the nontechnical business aspects of the relationship. Just as some airlines annoy customers with extra fees for checked baggage, flight changes, drinks, and blankets, some CAD suppliers levy hidden charges for software and services that most customers need.

To avoid aggravation and lower your costs, look for suppliers who offer straightforward software packages that have what you need. Look at the terms for floating licenses that enable designers who don't need CAD full-time to share licenses. And be sure your best designers can use the software both at work and at home without hassles.

8. SHORT LEARNING CURVE

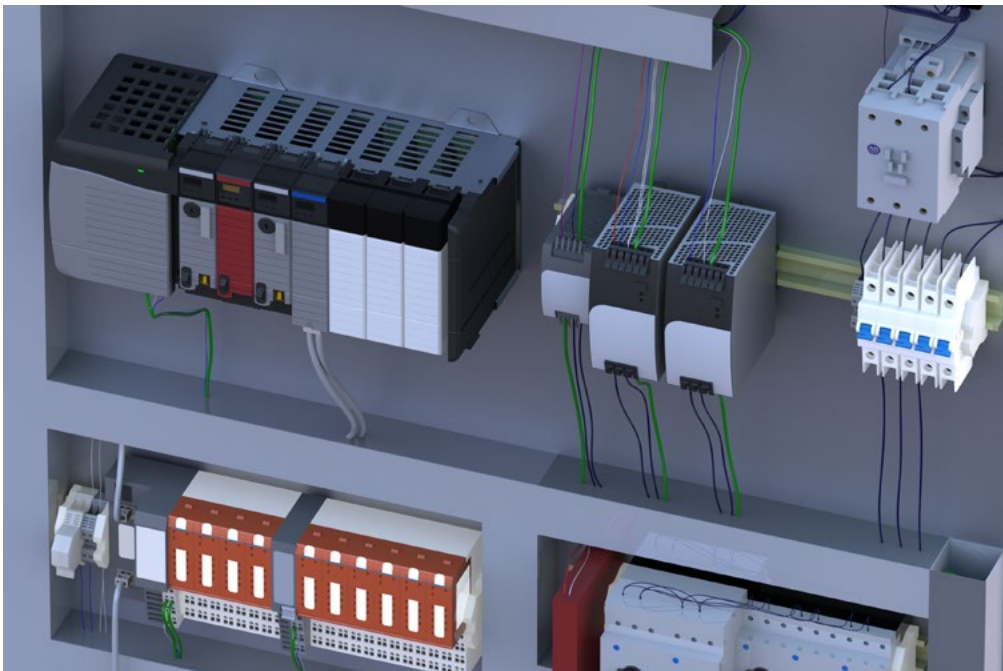
Adopting 3D methods requires training and experience. So choose a system that's easy to learn as well as capable. Look for a system that has a consistent user interface throughout. Be sure design and manufacturing procedures flow logically from start to finish. Some systems have hidden dungeons and dragons that stop designers halfway through a task and make them start over.

Developing your own training materials is costly. Choose a system with built-in tutorials, a rich array of computer-based training aids, and a vibrant online community that lets workers ask questions and get answers. You'll also want a system that's taught in local schools and universities so you can hire students who are ready to work.

9. A DEALER WHO CAN HELP YOU

A successful relationship with your CAD software dealer only begins with the sale. Buy from a dealer with the skills and experience to help you successfully integrate 3D design with manufacturing. Find out how many 3D customers potential dealers have trained and supported. Look at the availability of quality training classes. Does the dealer support a viable user group? Does the reseller offer ongoing training classes to help you improve your design and manufacturing processes?

Ask for the resumes of the technical staff and interview them before you buy. Ask reference customers if the dealer's technical staff is capable of solving tough problems. Good local support can make the difference between a costly adoption of new CAD software and one that advances your business objectives now and in the future.



SOLIDWORKS Electrical enables designers to easily integrate electrical schematic design with 3D models of wiring in machines or control panels.

10. ONE SIZE DOESN'T FIT ALL

Not all the criteria listed above apply to every organization. Making intelligent choices requires careful thought and deep knowledge of your company's engineering needs.

The biggest mistake any organization can make is to select a 3D system without shopping. Engage with at least three vendors to educate yourself about the capabilities of available software packages and dealer support organizations. Making the wrong choice wastes time and money. Don't make emotional decisions based on brand preference or focus on too limited criteria. Do consider the full range of capabilities your company needs to bring better products to market faster.



3D CAD model of a horizontal grinder (Image courtesy of Vermeer Environmental Equipment of Pella, Iowa).

L. Stephen Wolfe is a professional mechanical engineer based in San Diego, California. He was founder and publisher of *Computer Aided Design Report* and *Product Data Management Report*. For more than 20 years, these publications filled the role of Consumer Reports for the CAD industry. Wolfe has written two books on how to pick CAD/CAM systems: *The Smart Manager's Guide to Selecting and Purchasing CAD Systems* and *The CAD/CAM Strategic Planning Guide*. He currently consults in the mechanical engineering software field, assisting customers in defining their requirements, conducting independent research, identifying and negotiating with software suppliers, and implementing new software efficiently.

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