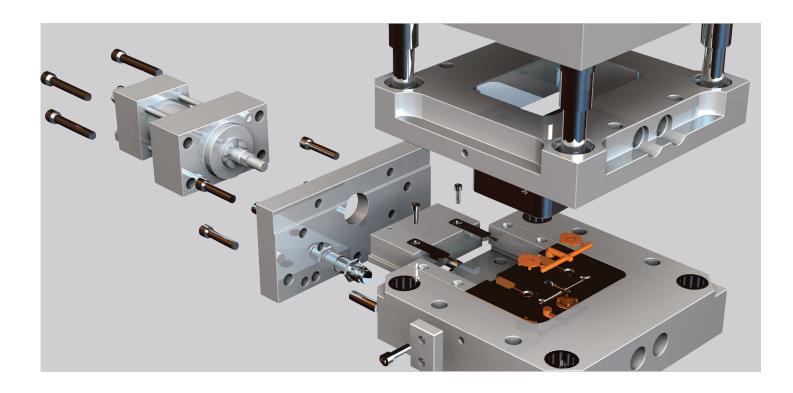# DESIGNING MOLDS QUICKLY, ACCURATELY, AND COST-EFFECTIVELY WITH SOLIDWORKS SOFTWARE

Overview

Achieving success in today's increasingly competitive mold-making industry requires fast, accurate, and cost-effective mold design. SolidWorks® Premium software can help you meet these critical challenges. Automated mold design and validation tools enable you to produce better molds while saving time and money. With SolidWorks software, you can meet customer demand for shorter lead times and reduced pricing, and improve your profitability at the same time.

SOLIDWORKS

Introduction

SolidWorks software helps designers develop molds that are more accurate, save time, and improve profitability. With SolidWorks software, not only do you have the ability to define mold geometry, but you also have access to a wide range of automated mold design tools. As a result, you can validate critical aspects of your mold designs before releasing them for production. Plus, you can automatically identify undercuts, complete side cores, verify draft angles, define parting lines, create parting surfaces, and ensure mold durability. Using SolidWorks software, you can perform all these functions within the same familiar modeling and surfacing environment. What's more, you have access to mold bases and other standard components, as well as integration with computerized numerical control (CNC) machining applications.

In an increasingly competitive mold-making market, your customers can demand shorter lead times and reduced pricing, or they can award their business to cheaper overseas suppliers. Mold developers do not have the option of cutting corners in the design process to reduce prices and shorten lead times. Therefore, you must ensure that your mold produces parts that meet your customers' exacting geometrical and mechanical specifications. Oftentimes, you must also incur the cost of any necessary changes if the mold does not work right the first time.

SolidWorks software provides a unique set of powerful, mold-specific design automation and verification tools to help you overcome today's mold-making challenges—so you can develop molds more quickly, accurately, and cost-effectively. Anyone familiar with SolidWorks software can use these integrated tools, which are available at no additional cost, without having to translate files or convert geometry.

In addition, Gold Partners or Solution Partners also provide libraries of standard and proprietary mold components that you can automatically drag and drop into mold designs and assemblies. Because SolidWorks software is fully associative, any changes made to components, assemblies, details, or bills of materials are automatically applied to all related entities. The combination of mold-specific design automation and validation tools in SolidWorks software and integrated partner applications enables you to develop molds and respond to customer design changes efficiently and cost-effectively.

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Requests for proposals

Most requests for proposals (RFPs) consist of either a 3D solid model or a series of 2D drawings that defines the geometry of the injection-molded part. The first step in responding to an RFP is to assess the customer's part geometry. SolidWorks software can open more different types of CAD files than any other design system. Whether you receive neutral file formats, such as DXF™, DWG, IGES, STEP, ACIS®, and Parasolid®, or formats that are native to other systems, such as Inventor®, Mechanical Desktop®, Unigraphics®, CADKEY®, AutoCAD®, Pro/ENGINEER®, and Solid Edge®, SolidWorks software allows you to access the geometry.

Because data errors can occur when importing geometry from another design system, SolidWorks software provides a comprehensive set of tools to fix imported files and clean up geometry. You can automatically create a solid model during import by simply knitting together entities in a neutral file into solid geometry. SolidWorks software also offers diagnostic tools to help you knit entities into a solid. The Check Entity capability, for example, lets you identify and locate geometry problems. Using the SolidWorks Import Diagnosis tools, you can identify and patch open boundaries as well as repair bad faces. The result is a 3D model that is ready for tooling design.

After you have imported the part geometry, you can use SolidWorks software-integrated tools to gather the information you need to estimate the cost of the mold and formulate a quote. These tools allow you to predict whether you can create an acceptable mold based on the original 3D solid model of an injection-molded plastic part. You can use the undercut detection capabilities of SolidWorks software to identify areas of the part that require side action in order to eject the part from the mold. SolidWorks software also includes a "thickness checker," so you can pinpoint areas of the part that are below a specified thickness, which could cause issues during manufacturing if not corrected.

When you are responding to an RFP, these mold analysis tools enable you to quickly evaluate the moldability of a part. With this capability, you can substantially reduce the cost of designing and testing the mold, because it takes much less time and much less money to fix problems during the early stages of the design process. Your proposals will also be more accurate, because you can identify potential problem areas and point them out to prospective customers during the proposal development process.

Using the SolidWorks eDrawings® collaboration tool, you can quickly communicate design change recommendations to customers before finalizing your proposals. With eDrawings, you can streamline the proposal development process by improving communications with customers. You can email eDrawings files containing 2D drawings and 3D models to your customers, who can quickly view, print, and review them with free viewer software. They can pan and rotate models to view them from any angle, as well as zoom in or out, while intuitive markup tools enable them to provide complete and thorough feedback. Not only is eDrawings a great way to bring your customers closer to the process, but it also differentiates your company from the competition.

With SolidWorks product data management software—the integrated solution that is also part of SolidWorks 3D CAD software—you can securely archive and organize multiple versions of previous projects, enabling you to quickly search through both 2D and 3D designs to find a relative baseline for the mold assembly. This tool will instantly generate a bill of materials for the baseline, so you can accurately determine costs.

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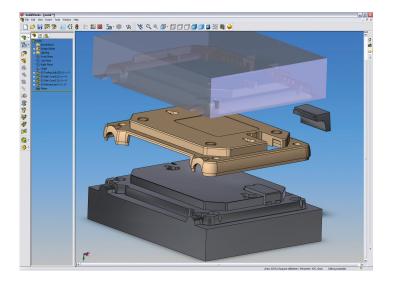
Mold design

Typically, the first step in designing the cavity and core for a mold is to apply a shrinkage factor to the part based on its material. With SolidWorks software, you can do this with a single mouse click. Plus, SolidWorks software will automatically suggest the optimal parting line based on the direction of draft within the part.

With another mouse click, SolidWorks software will identify all areas on the part that have insufficient draft. You also have access to tools that expedite draft angle correction, such as the parting line draft command, which angles a face relative to any adjacent edge.

Usually, the next step in mold design is to create the parting surfaces that define the separation between the core and cavity. In addition to automatically generating the parting surfaces for simpler molds, SolidWorks software provides an extensive array of solid modeling and surfacing tools—so you can create parting surfaces for even the most complex molds.

Core capabilities include sophisticated solid modeling features, such as lofts, variable-radius fillets, shells, and draft angles. Advanced surface modeling capabilities include an n-sided surface patch that allows you to fill in a surface tangent to a space defined by any number of boundaries. You can also sketch a network of curves and pull any point in a curve to modify the surface, as well as combine both analytical entities and splines into a single feature.
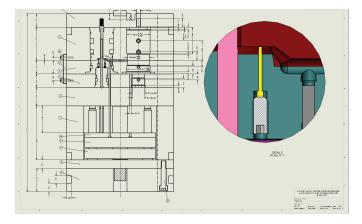

SolidWorks software provides tools that allow you to easily move from a part design to generate all the core and cavity geometry necessary for machining.

Once you have created parting surfaces, you can use the Tooling Split command to split the mold into two solid bodies. The next step is to build the core and cavity of the mold around the surfaces that you defined in the tooling split. Then you can use these solid bodies to create an assembly that is associated to the original multibody part design. SolidWorks software offers a side-core feature that automatically creates all side core and lifter geometry necessary to extract finished parts from molds.

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Between 20 and 90 percent of the content of a typical mold base consists of purchased components. With 3D ContentCentral®, you save time, improve accuracy, and get easy access to 3D CAD models from leading partners that provide libraries of complete mold bases and components, such as guide pins, guide bushings, ejector plates, ejector housings, and Sprue Bushings®. You can browse product categories to view competitive products, configure parts from suppliers to meet your requirements, and drag and drop their supplier product models right into your designs.

The SolidWorks Design Library provides a platform for developing company standards, which consists of feature, part, and assembly models that you can drag and drop into new mold designs. The SolidWorks Toolbox, also part of SolidWorks Premium, provides access to models of ANSI, ISO, DIN, and JIS standard parts, such as fasteners, bearings, retaining rings, and gears. You can drag and drop models of bolts, nuts, and washers from SolidWorks Toolbox, and snap them into place on the assembly. Smart Components automatically sizes and positions the components according to where and how they interface within the assembly.

SolidWorks software automates the creation of complete 2D documentation from the 3D mold design.

SolidWorks software makes it easy to generate production-level 2D drawings from a 3D assembly model. By just drawing a line in SolidWorks software, you can section the assembly and automatically create the drawing. At any point, you can add or change dimensions, which will update instantly to accommodate your design changes. You can quickly create exploded views to describe how the mold operates by first arranging components in 3D, and then selecting sections to define 2D detailed drawing views. Plus, you can easily annotate these views with balloons keyed to the bill of materials.

Sometimes, mold makers must guarantee the ability of their products to withstand rigorous duty cycles. You can use SolidWorks Simulation, included with SolidWorks Premium, to determine the stress, strain, deformed shape, and displacement of components during operation to avoid field failures. With this tool, you can quickly identify the weaknesses in your initial design. The fast, inexpensive generation of new software prototypes enables you to solve problems that would otherwise go undetected until testing or, worse yet, in the customer's plant. By evaluating the exact duty cycle of the components, you may be able to reduce the cost and weight of the mold by using a smaller and lighter base.

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Design changes

SolidWorks software allows you to tie interrelated components together; so if one part changes, the related components also will change. When your customer changes the design and sends over a new CAD file, you can simply import the CAD file into the original part design and use it to automatically update the mold design.

With SolidWorks software, you can also avoid costly mistakes by ensuring that changes made anywhere in the process automatically update all product documentation, including parts, assemblies, and drawings. So you can use a 2D drawing of the base to control the size of all or some of its components. When you change the layout, the ejector plates, guide pins, guide bushings, and other components will automatically change to the appropriate dimensions.

SolidWorks software provides powerful tools for identifying the differences between two versions of the same part. This capability is particularly useful in instances when a customer sends a new version of the part midway through the mold development process. You can synchronize the views of different versions to compare geometries, faces, and features, and can apply the feature parameters and attributes from one version to the other. These tools allow you to understand the impact of a design change on any existing tool design.

With the animation capability in SolidWorks software, you can produce animations that let your customers view virtual molds in operation so they can fully understand your design. SolidWorks software animation enables you to demonstrate how the moving parts of the mold operate, as well as explode or collapse the assembly to show how the components fit together. The animation can fly around the mold, or you can revolve the mold 360 degrees on a turntable to show what it looks like from every angle.

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Testing and manufacturing

Dassault Systèmes SolidWorks Corp. partners with industry-leading, computer-aided manufacturing (CAM) software companies to deliver a variety of powerful CNC programming solutions for milling, turning, and electronic discharge machining. Since certified CAM solutions read native SolidWorks software geometry and are fully associative, your design changes are reflected in the CNC program. Certified CAM Products also provide single-window integration with the SolidWorks software design model, enabling generation of the CNC program path within the familiar SolidWorks software environment. Other Certified Gold Products provide additional integrated analysis solutions for validating mold designs, automating mold development, and creating and modifying components.

The DS SolidWorks manufacturing network, SupplierSource.com, simplifies the process of finding design and manufacturing service providers that use SolidWorks software. By working with native SolidWorks software files, you do not have to worry about converting or re-creating design files. You can easily find the right supplier on the network by browsing through different categories, such as milling, electrical discharge machining, and reverse engineering, or by searching on keywords.

Conclusion

SolidWorks Premium can help mold designers improve profitability. Reducing the time required to create proposals and design molds, as well as evaluating proposals and designs as they are developed, enables you to avoid problems that might otherwise go undetected until the development of a prototype mold. By providing a wide range of integrated capabilities, the SolidWorks software design environment helps you automate many aspects of the design process. Plus, a powerful array of integrated analysis tools enables you to validate mold designs using software prototypes, thereby ensuring that you get the design right before releasing it for production. Additional integrated solutions allow you to simplify the transition to manufacturing, as well as communicate efficiently and effectively with your customers. SolidWorks software gives you the required tools to design molds quickly, accurately, and cost-effectively—and to succeed in an increasingly competitive tooling environment.

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