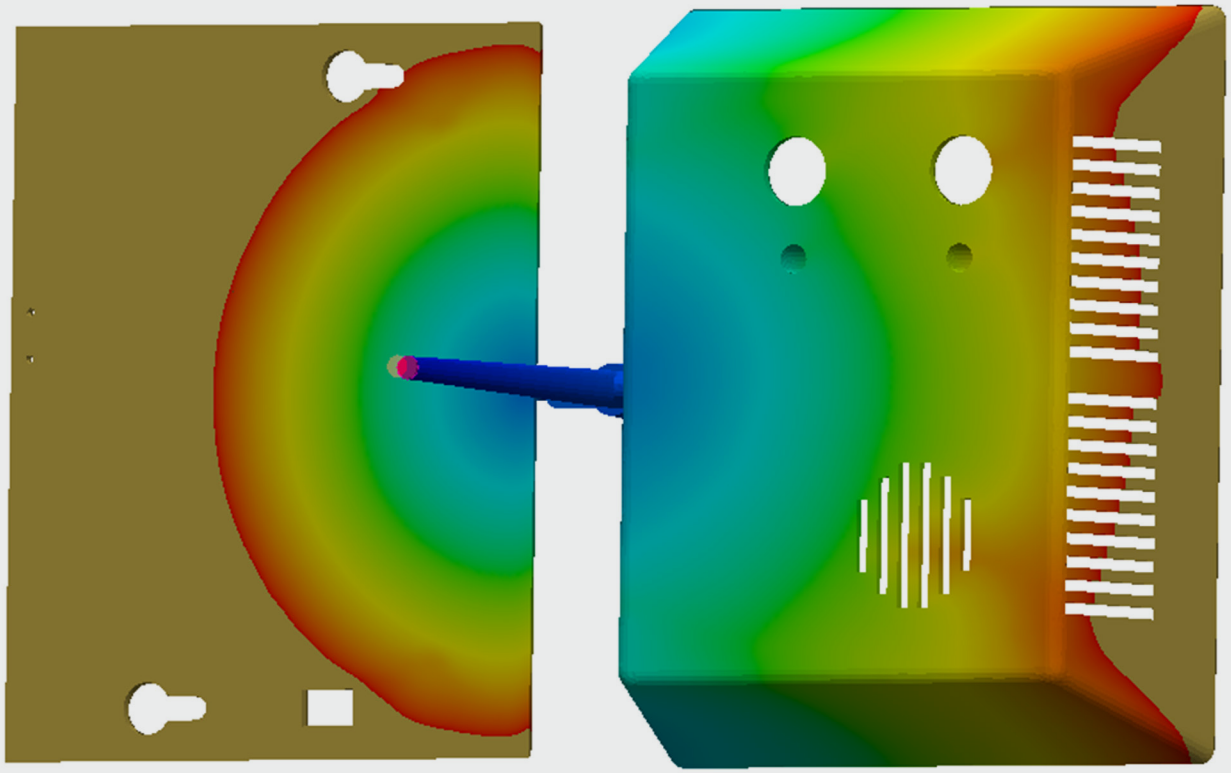
DASSAULT SYSTEMES

SOLIDWORKS

ACCELERATE DEVELOPMENT, IMPROVE QUALITY, AND STREAMLINE INJECTION-MOLDING PROCESSES WITH SOLIDWORKS

White Paper



OVERVIEW

Succeeding in today's competitive global market requires moldmakers and manufacturers of plastic injection molded parts to find ways to compress mold development cycles and accelerate product time-to-market, while simultaneously controlling costs, increasing mold complexity, and delivering consistently high levels of quality. Meeting these challenges requires that you modernize your mold development systems and implement an integrated 3D design platform, so you can realize the benefits of mold-filling simulation and automation, and eliminate the unnecessary tasks, costs, and delays associated with traditional, non-integrated approaches to mold development. By taking advantage of a proven integrated 3D environment like the SOLIDWORKS® design to manufacturing ecosystem, you can design, validate, and produce higher quality, better performing molds in less time and at lower cost.

GREATER USE OF INJECTION-MOLDED PARTS REQUIRES FASTER, LESS COSTLY, AND MORE ACCURATE MOLD DEVELOPMENT

Like all manufacturers, moldmakers and producers of injection-molded parts face increasing competitive pressures related to doing business in a global market. Customers today not only demand shorter and shorter lead times for mold development, they also want injection molds to perform better, last longer, and cost less. This situation is particularly acute in the injection-molding sector because the use of components made from plastic materials in nearly all types of products—from consumer electronics and automobiles to children's toys and medical devices—has steadily increased.

The trend toward greater use of plastic parts—80 percent of which must be injection molded—stems not just from their lower cost, but also from the fact that they don't rust or corrode like metals; are lighter in weight than traditional materials; and are extremely pliable, enabling parts to be molded into more complex patterns and shapes, and with more elaborate surface details. In short, plastics are better suited for meeting the product development needs of a growing number of today's manufacturers.

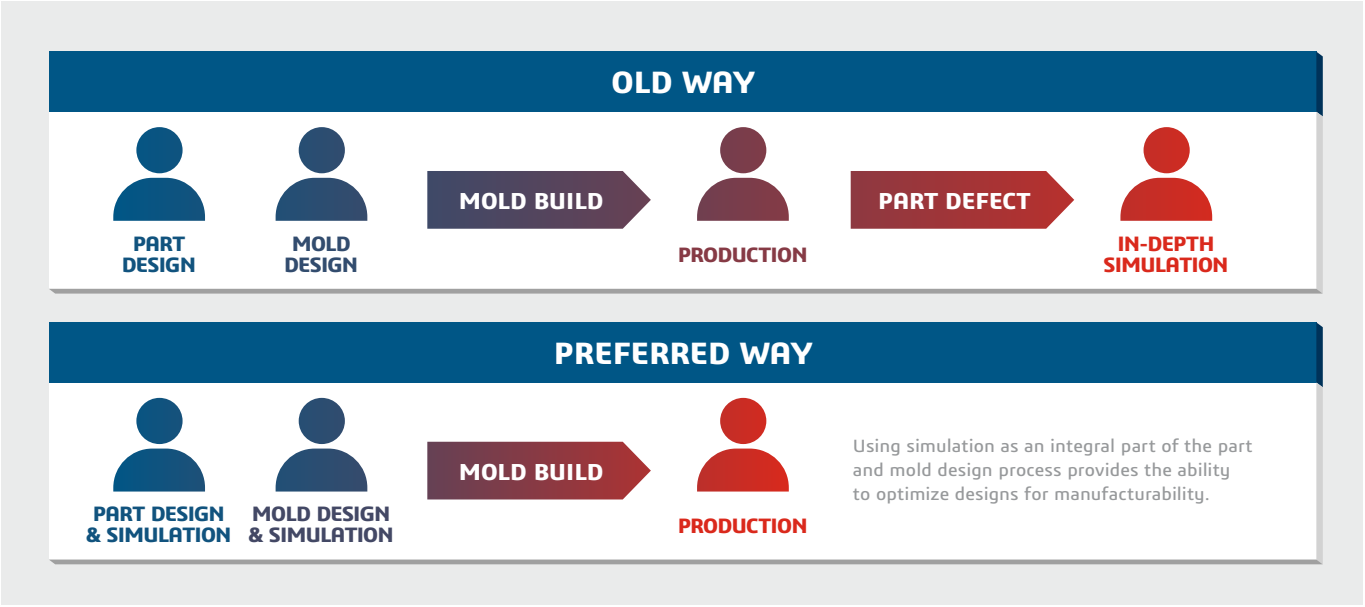
However, traditional approaches to mold development are inefficient, expensive, and disjointed, resulting in slow, costly design iterations and test cycles that can actually compromise the rationale for using plastics and put a manufacturer at a competitive disadvantage. Part designers often rely on iterations with the moldmaker and the moldmaker's expertise to evaluate the manufacturability of a part. Moldmakers draw upon their experience and expertise to develop molds, but still need to create trial-and-error prototype molds to validate mold performance. Manufacturing professionals frequently need to iterate with designers and moldmakers. Unfortunately, the lack of integrated data, mold-filling simulation, and process automation adds unnecessary time and costs to the process.

"Customers today not only demand shorter and shorter lead times for mold development, they also want injection molds to perform better, last longer, and cost less."

How your organization leverages integration, simulation, and automation during mold development will have a direct impact on your company's profitability and success. Manufacturers can improve their competitiveness by upgrading from methods that rely on non-integrated, point solutions in favor of faster, better-controlled, data-driven, concurrent, fully integrated 3D design, validation, and manufacturing approaches. This paper examines how traditional mold development methods and technologies can hold your organization back, how you can streamline mold development with a fully integrated 3D platform, and how the integrated SOLIDWORKS design to manufacturing ecosystem provides you with the greatest competitive advantage.

TRADITIONAL, SEQUENTIAL MOLD DEVELOPMENT PUTS YOUR COMPANY AT A DISADVANTAGE

The traditional, step-by-step, non-integrated approach to mold development carries a plethora of limitations that diminish a product development organization's competitiveness in today's global market. These limitations involve the duplicative effort, unnecessary tasks, and numerous data exchanges associated with working with a variety of non-integrated tools for design, validation, manufacturing, quality control, assembly, and documentation, all of which adds time, costs, and a greater probability of errors to the process.



It Takes Longer

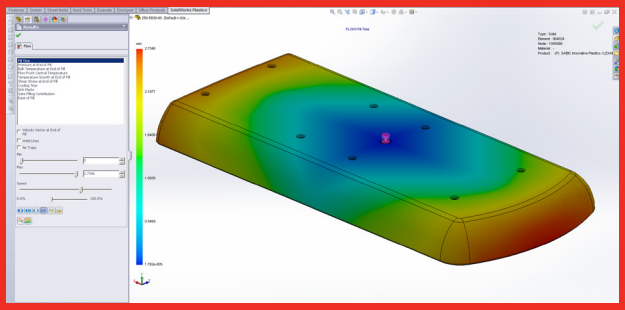
It doesn't matter if you are using 2D tools or non-integrated 3D modeling applications for mold development, the lack of data integration across functions that are critically important adds time to your development process and lengthens time-to-market. The lack of data compatibility among your CAD application, mold-filling simulation tools, product data management (PDM) system, quality control software, CAM application, and assembly instruction and documentation preparation tools results in duplicative efforts and unnecessary tasks. Data incompatibility forces you to operate sequentially because of the need to import/export and convert/translate files to support other functions. Working in a non-integrated development environment also inhibits your capacity for making design and tooling changes quickly and easily, and complicates your ability to communicate efficiently and effectively with customers, resulting in additional delays.

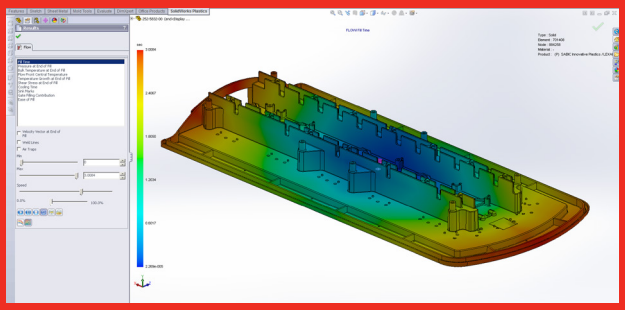
It Costs More

Time is money, but there are also a litany of unnecessary costs associated with developing injection-molded parts and tooling in a sequential, non-integrated fashion that have nothing to do with time. Do you rely too heavily on physical prototype molds or are you utilizing integrated mold-filling simulation tools to minimize prototyping cycles? Is it easy for you to find and reuse proven design concepts or do you often need to start from scratch? Are you leveraging 3D design data throughout the development and manufacturing process—for design visualization; design validation; inspection reports; cost estimating/quoting; generation of bill of materials (BOM), product manufacturing information (PMI), and geometric dimensioning and tolerancing (GD&T) information; CAM tool path generation; and product documentation preparation? Can you make changes quickly and easily at any stage of the process or do such changes cost too much?

It Negatively Impacts Quality

Trying to maintain consistently high levels of quality while also attempting to accelerate time-to-market and reduce costs is a losing proposition if you continue to work in a sequential, non-integrated way, because the steps that many manufacturers choose to cut from the process—the traditional engineering trade-off—can influence and affect the overall quality of your products. Do you use design simulation technology to check machine performance and mold-filling simulation tools to validate tooling? Are you maximizing design reuse? Are you assessing the manufacturability of designs as part of your process? Are your quality and revision controls formalized and tightly managed? Have you identified errors related to file transfers and data conversions? Does data incompatibility limit your ability to make design changes quickly and easily? Does this prevent you from making quality improvements late in the process?





...a case in point

As the world's largest manufacturer of emergency warning products, Electronic Controls Company (ECCO) depends on the development of high-quality, injection-molded plastic parts. The company's backup alarms and warning lights for commercial vehicles—and red and blue warning lights for emergency vehicles—typically operate outdoors, where they are exposed to all types of weather conditions. In such an environment, ECCO often prefers to use plastic parts because they don't rust. With light lenses, using plastics for optical components is a necessity.

After realizing productivity benefits from using SOLIDWORKS Professional and SOLIDWORKS Premium design software, and the SOLIDWORKS Enterprise PDM product data management system, ECCO acquired SOLIDWORKS Plastics Professional mold injection simulation software to improve the manufacturability of plastic parts.

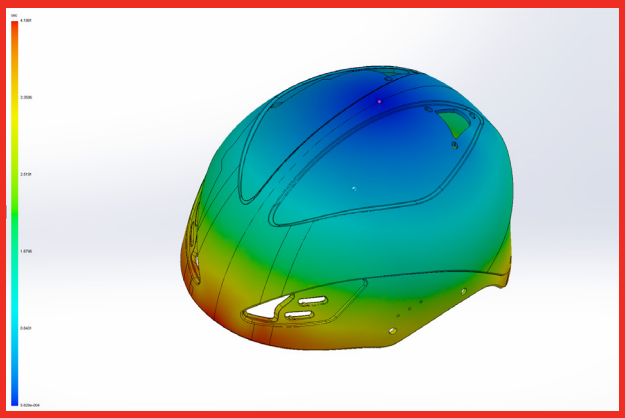
"Prior to 2012, we relied on our tool manufacturer to spot and address injection-molding issues," recalls Mechanical Design Engineer John Aldape. "However, when we received glass-filled nylon alarm enclosures with surface-knitting issues, we decided to investigate mold-filling simulation technology. We wanted to independently assess how a mold would fill and where knit lines would be, instead of waiting on iterations with the toolmaker."

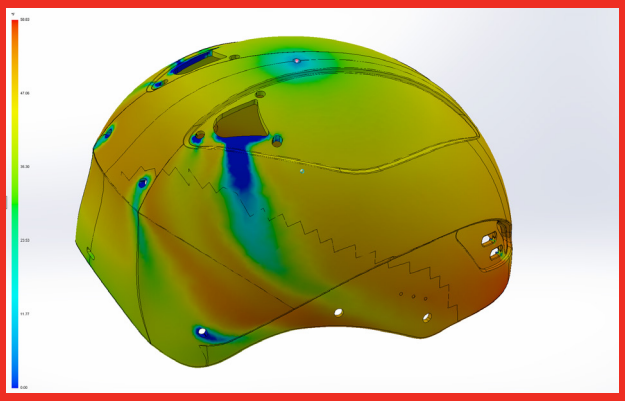
ECCO chose the SOLIDWORKS Plastics solution because it is easy to use and simulates how the plastic will fill the mold, helping the company avoid manufacturability issues. By implementing SOLIDWORKS Plastics Professional software, ECCO has minimized iterations with its moldmaker, eliminated mold-related production issues, optimized parts for mold injection, and improved lens optics and product aesthetics.

Read the full story here: ECCO Case Study.

CONCURRENT, INTEGRATED MOLD DEVELOPMENT BOOSTS COMPETITIVENESS

Developing and producing more innovative, higher quality injection-molded parts and tooling in less time and at lower cost is the very definition of success in today's competitive marketplace. Achieving this success requires a level of automation that is only possible through the use of integrated 3D design technologies, concurrent workflows, total data compatibility/management, and the ability to completely leverage 3D design data across all vital functions. By utilizing an integrated, 3D development ecosystem for part and mold design, validation, manufacturing, quality control, assembly, and documentation, you can boost efficiency, control costs, and improve quality—all at the same time.





...a case in point

Ambix Consulting specializes in precision injection molding and demanding engineered plastics. President, founder, and owner Jeffrey D. Nicoll leveraged his extensive expertise in plastics failure analysis to establish the full-service product development company, which provides product research and development, industrial design, prototyping and functional testing, failure analysis, tooling design, and material selection services, as well as contract manufacturing through sister company Ambix Manufacturing.

As demand for Ambix's expertise in plastics and moldmaking increased, Nicoll decided to invest in an injection-molding simulation solution to accelerate complex mold development. "The historical approach to injection molding is to continue creating prototype molds and shooting samples until an acceptable mold is reached," Nicoll explains. "To avoid this type of project creep and provide the most efficient, cost-effective solutions to our clients, we sought to utilize injection-mold simulation software to resolve manufacturing issues upfront, taking both time and cost out of the mold development process."

Having used SOLIDWORKS Professional design and SOLIDWORKS Simulation analysis software, Nicoll chose SOLIDWORKS Plastics Professional simulation software because it's easy to use, provides robust injection molding simulation capabilities, and is completely integrated inside SOLIDWORKS CAD software. By implementing SOLIDWORKS Plastics Professional software, Ambix cut mold development time in half, achieved 95 percent first-shot success on molds, increased annual molded output from a few thousand to 10 million parts, and realized close correlation between simulations and production.

Read the full story here: Ambix Case Study.

Faster Design, Tooling Development

With an integrated 3D product and mold design platform, you can take advantage of workflow automation to completely eliminate duplicative tasks and redundant efforts—as well as trim time wasted on file transfers and data exchanges—and achieve additional efficiencies by completing certain steps in the process concurrently instead of consecutively. For example, you can use design configuration tools to automatically create an entire family of products—and related tooling—from a single, base design; automatically generate BOM, PMI, and GD&T information for the entire line; and begin creating product documentation in the time that it would take to model a single design in the past. Customer communications in a 3D integrated system become virtually instantaneous, and because 3D design technology is parametric, design changes at any stage of the process ripple across all related data, including tooling design, product documentation, and assembly instructions.

Controlling Mold Development Costs

Accelerating mold development cycles won't blow the budget if you use an integrated 3D development platform. Potential cost savings related to working in an integrated 3D design environment include reduced prototyping requirements, through the greater use mold-filling simulations for virtual prototyping iterations and design validation; increased design reuse by leveraging the PDM; and more extensive use of 3D CAD data to perform other functions, such as design visualization; inspection reports; cost estimating/quoting; generation of BOM, PMI, and GD&T information; CAM tool path generation; and product assembly instructions and documentation preparation. With integrated parametric 3D design technology, you can make design changes at any stage of the process—your change will ripple across all related data, including tooling, product documentation, and assembly instructions—without incurring additional costs.

"You can take advantage of workflow automation to completely eliminate duplicative tasks and redundant efforts—as well as trim time wasted on file transfers and data exchanges."

Achieving Consistently High Quality

An integrated 3D design environment will complement your quality improvement efforts in a number of ways. In addition to supporting the use of integrated mold-filling simulation tools, to identify and resolve potential production issues, and an integrated inspection application, to generate inspection requirements and catch errors in manufactured components, an integrated 3D system provides the structure and controls that you need to consistently maintain high levels of quality. Integrated PDM not only provides the workflow constraints needed to drive development processes forward, it also will improve your handling of engineering change orders (ECOs) and encourage reuse of proven design solutions. With an integrated parametric 3D development ecosystem, design changes become so fast and simple that you will be able to take steps to improve quality at any time, instead of waiting to make improvements to a future model.

SOLIDWORKS INTEGRATED 3D ECOSYSTEM STREAMLINES MOLD DEVELOPMENT AND MANUFACTURING

Manufacturers of injection-molded parts can maximize the time, cost, and quality advantages of using an integrated 3D development platform and streamline development processes by implementing the integrated SOLIDWORKS 3D design to manufacturing ecosystem of design and engineering solutions. Using integrated SOLIDWORKS mechanical design, mold-filling simulation, product data management, model-based definition (MBD), inspection, communication, documentation, and visualization solutions, you will realize the greater efficiencies, cost reductions, quality improvements, and effective communications that are essential to your future success.

Part and Mold Design

SOLIDWORKS 3D mechanical design software will help you design better, more accurate injection-molded parts and tooling more cost-effectively and rapidly—50-percent reductions in design cycles are common—allowing you to satisfy demands for shorter lead times. Because SOLIDWORKS is parametric, and updates and generates design changes to models and drawings automatically, making design changes doesn't create duplicative effort or delays. Industry-leading mold design and analysis tools—including draft, wall thickness, and parting line analysis tools—enable you to easily create molds directly from part geometry while simultaneously assessing the manufacturability of a design. And, you can use the same SOLIDWORKS mechanical design model data to support all downstream engineering and manufacturing functions.

Design Visualization and Communication

Using your SOLIDWORKS model, you can efficiently create photorealistic renderings and animations to support design visualization with SOLIDWORKS Visualize software, and easily share design information with customers via email through the use of SOLIDWORKS eDrawings® tools. There's no need to extrapolate mold designs from 2D line drawings with the integrated SOLIDWORKS design to manufacturing ecosystem, because you can quickly create 3D renderings that are virtually indistinguishable from photographs, and then use tools like cutaways and transparency to fully interrogate injection-molded part and tooling designs. With the new SOLIDWORKS 3D Interconnect capability, you will also be able to seamlessly work with design data in other 3D CAD formats, enabling you to collaborate more effectively with customers and partners, and allowing you to reuse design data accurately and efficiently.

Design Validation/Virtual Prototyping

Integrated SOLIDWORKS Plastics mold-filling simulation, SOLIDWORKS Simulation (FEA), and SOLIDWORKS Flow Simulation software provide the tools that you need to conduct virtual prototyping of injection-molded parts and molds without having to incur the delays and costs associated with physical prototyping of molds. Whether you need validate how a mold fills or whether after-ejection part warpage is acceptable, or need to complete design optimization runs or perform structural, thermal, flow (CFD), deformation, vibration (frequency and dynamic), buckling, fatigue, or nonlinear analyses—on a single component or a multi-part assembly—SOLIDWORKS Simulation packages provide the capabilities that meet your needs—all from within your 3D modeling environment.

Product Data Management

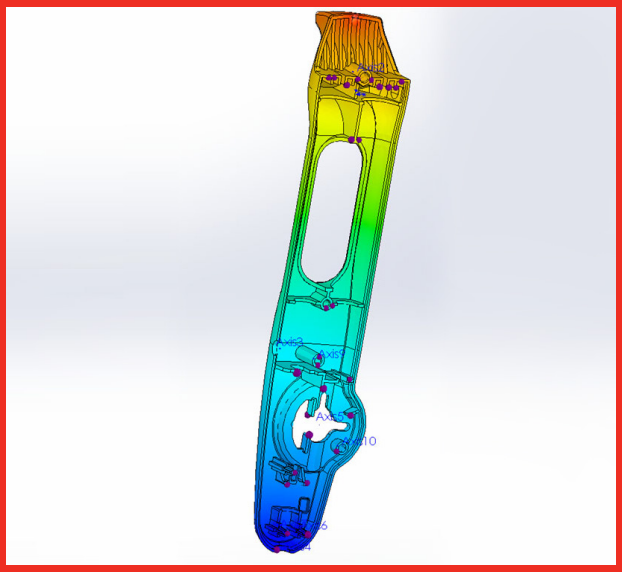
The SOLIDWORKS PDM system does much more than manage your product design data. It allows you to fully automate your injection-molded part and tooling workflows, tightly control revisions, and encourage designers and engineers to reuse proven concepts. SOLIDWORKS PDM provides fast system search capabilities, so you can find the design, component, or mold that you're looking for with little effort. With email notifications and electronic signatures, the system is configurable and scalable to your specific requirements. The SOLIDWORKS PDM system lets you automate your standard product development workflows, ECO approval and execution processes, and any other processes related to your product development and manufacturing effort.

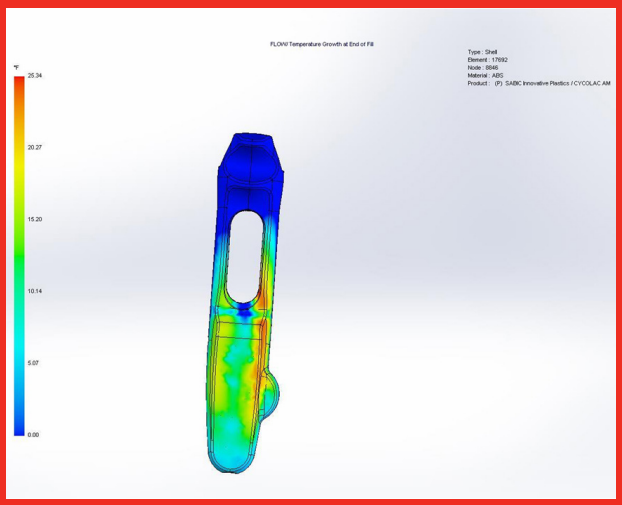
Quality Controls

In addition to realizing the product quality benefits associated with using SOLIDWORKS Simulation technology for virtual prototyping and design validation of both injection-molded parts and tooling, and from using the SOLIDWORKS PDM system to more tightly control revisions and all associated product design data, you can leverage SOLIDWORKS Inspection software to formalize your quality assurance and inspection procedures and generate inspection reports. With SOLIDWORKS Inspection, you will be able to document, track, and know when vendors supply inferior or defective parts long before they can negatively affect your business.

Transition to Manufacturing

When it's time to transition a part design into mold development, SOLIDWORKS software provides a range of valuable capabilities. You can use the Costing module to estimate what it should cost to manufacture your product and use that information to secure and negotiate quotes. The software's Design for Manufacturability tools enable you to assess whether your current design can actually be made or whether you need to make modifications to support injection molding. SOLIDWORKS also allows you to automatically generate production drawings and BOM information without the tedious effort required by non-integrated systems.





...a case in point

The Center for Advanced Medical Learning and Simulation (CAMLS) collaborates with medical device manufacturers by combining cutting-edge simulation technologies with research and innovation to move the latest advances in healthcare into practice. For example, CAMLS collaborated with Cooper Surgical, Inc., on the development of a new device for conducting sono-hysterosalpingography (sono-HSG), an ultrasound exam for studying the contour of the uterine cavity and the patency of the fallopian tubes to determine potential fertility issues.

Instead of using a contrast medium and separate procedures like traditional devices, the ABBI® (Air Based Bubble Infuser) uses saline infused with air bubbles, an approach that is less painful and uncomfortable for patients, and allows physicians to perform both exams in a single procedure.

CAMLS used SOLIDWORKS solutions on the project, including SOLIDWORKS Plastics simulation software to optimize the injection mold used to produce the device housing/handle. "Our injection-mold specialist used SOLIDWORKS Plastics software to determine where the gating locations should be to minimize the appearance of sink marks and knit lines," says Chief Engineer Mario Simoes. "The simulations also enabled us to understand that by keeping the device in the mold a little longer and at higher pressure, we could contain the sink marks to an acceptable level. SOLIDWORKS tools saved us time while improving quality."

With SOLIDWORKS solutions, CAMLS cut development time by 30 percent, accelerated time-to-market, improved quality, and optimized production mold performance.

Read the full story here: CAMLS Case Study.

Production

Are you ready to design and manufacture in 3D? SOLIDWORKS MBD software enables you to digitally output all PMI in 3D—including GD&T information—permitting you to completely eliminate paper 2D drawings and drive injection-molding production with the same 3D design data that you utilized for all other functions. SOLIDWORKS data is directly integrated with leading Gold CAM machining, milling, and manufacturing partners, enabling you to make changes to your SOLIDWORKS design and have the model changes automatically update associated tool paths. You can also tap SOLIDWORKS Composer software to automate the preparation of assembly instructions, user manuals, and product documentation, again using the same 3D design data that you leveraged for other functions.

IMPROVE PROFITABILITY WITH THE INTEGRATED SOLIDWORKS 3D DESIGN TO MANUFACTURING ECOSYSTEM FOR MOLD DEVELOPMENT

As a manufacturer of products utilizing plastic injection-molded parts, your organization faces mounting pressure to design better products faster and at lower cost. Demand for shorter lead times, improved quality, and greater capabilities in mold development is constant, and competition is increasing from every corner of the globe. How your organization responds to these competitive forces will directly affect your company's future profitability and success.

Addressing these market realities while continuing to utilize the traditional, step-by-step, non-integrated approach to injection-molded part design, tooling development, and manufacturing is improbable if not impossible. Saving time and controlling costs while ramping up quality and innovation requires a more streamlined, automated approach. With an integrated 3D design, engineering, and manufacturing platform like the integrated SOLIDWORKS 3D design to manufacturing ecosystem, you can achieve your efficiency, cost reduction, and quality goals and secure a real competitive advantage, no matter where your products are sold.

To learn more about how the SOLIDWORKS 3D design to manufacturing software can improve your injection-molded part design, tooling development, and production processes, visit www.solidworks.com or call 1 800 693 9000 or 1 781 810 5011.

Our 3DEXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE®** Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 220,000 customers of all sizes in all industries in more than 140 countries. For more information, visit **www.3ds.com**.

3DEXPERIENCE®

DASSAULT SYSTEMES | The 3DEXPERIENCE® Company

Americas
Dassault Systèmes
175 Wyman Street
Waltham, Massachusetts
02451-1223
USA

Europe/Middle East/Africa
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
Japan