CHAPTERS 1-3: RECAP

In the first of our series of eBook chapters on integrating design and manufacturing with SOLIDWORKS® solutions, we discussed the advantages offered by adopting an integrated design and manufacturing solution. In the second eBook chapter, we discussed the advantages offered by SOLIDWORKS CAD, and in the third, we described how to validate manufacturing to ensure your design is manufacturable. SOLIDWORKS provides a complete design-to-manufacturing process solution that allows you to design, visualize, communicate, validate, cost, manufacture, inspect, compose, and manage—all in one environment. In this fourth chapter of our series of eBooks, we will focus on the Manufacture, Cost, and Inspect portions of the solution.

In this fourth eBook, you will learn how SOLIDWORKS enables you to provide manufacturing with what they need to produce your designs.
THE IMPORTANCE OF CONCURRENT ENGINEERING AND MANUFACTURING

Start your work sooner with SOLIDWORKS manufacturing outputs and gain time for innovation and get to market faster.

As we discussed in Chapter 1, the majority of the decisions that impact cost and quality are made during the design phase. Involving manufacturing sooner enables them to have more influence over those key decisions that drive up cost during manufacturing and hurt quality. However, with traditional sequential processes, where design work is “thrown over the wall,” it is extremely difficult for manufacturing to get any visibility and share insight early enough to make a difference.

With SOLIDWORKS solutions supporting the complete design-to-manufacturing process, collaboration between engineering and manufacturing becomes much easier. This integrated platform means that design and manufacturing data can be exchanged far more easily, with less risk of errors. Any changes to the design are propagated across the platform, ensuring everyone is working with the most up-to-date data. All of this gives manufacturing teams visibility into the work that will impact them and enables them to provide more input. The result: More work is done concurrently, saving time, improving quality, and lowering cost.

With SOLIDWORKS PDM, all of your data and the associated workflow is managed. This way you can better manage your process and never risk working with outdated information.
BOOST PROFITABILITY WITH BETTER INSIGHT INTO COST DRIVERS

Automate manufacturing cost estimation, check your designs against cost targets, and develop more accurate quotes with SOLIDWORKS Costing.

There are many opportunities to lower cost across design and manufacturing. The challenge is identifying the cost drivers so you can make better decisions to remove cost. With SOLIDWORKS as your guide, you can identify exactly those areas of your design that are adding cost, so that you can make design improvements to help you hit cost targets.

Manufacturability problems are one of the biggest sources of added cost. In Chapter 3, we discussed several of the SOLIDWORKS tools that help you identify problems that will impact manufacturability. SOLIDWORKS has tools to check for proper draft, undercuts, interference, tolerance stackup, and Design for Manufacturability (DFM). There are tools for simulating and analyzing the injection molding process. The combination of these tools gives you everything you need to get the design right, before it goes to manufacturing. By catching these problems during design, you avoid the expensive late-stage problems discussed in Chapter 1.

While eliminating manufacturability problems removes a huge source of product cost, more can be done to optimize a design for cost. As we discussed in Chapter 1, engineers are making most of the critical decisions that will determine the cost of a product. However, products are so complex, identifying the source of cost drivers can be very difficult. As we discussed in Chapter 3, engineers typically have far less exposure to production environments, which makes it hard to know what drives cost on the shop floor. Plus, engineers tend not to have the training or access to the resources to properly assess the cost impact of a design decision. Consequently, while they have the most influence over cost, engineers are making most of those decisions blindly.

With SOLIDWORKS Costing, you have a perfect solution. With a click of a button, designers, engineers, and manufacturers get cost estimates in just seconds. SOLIDWORKS Costing uses customizable inputs reflecting actual labor costs, equipment costs, and material costs. It can account for speeds, feeds, and set-up costs, as well as secondary operations such as deburring, painting, and anodizing. After defining your cost target, SOLIDWORKS Costing will guide your design decisions so your products stay on target.

SOLIDWORKS Costing also helps with quoting. You can respond to your customers more quickly and with a more accurate price. Because SOLIDWORKS can very quickly let you determine what it will cost you to produce the part, you can confidently respond with a competitive bid that will not hurt your margins. When you are sourcing parts, you will also know if your supplier’s quote is overpriced. Armed with this information, you can reduce the length of the RFQ (Request for Quote) phase because you will know when you have been quoted a good price.
OVERCOME MANUFACTURING KNOWLEDGE GAPS

Drive quality and consistency with the embedded intelligence of SOLIDWORKS CAM.

As we discussed in Chapter 3, engineers have far less opportunity to spend time in a manufacturing environment and tap into that expertise. As a result, it has become much harder to develop a foundation of manufacturing knowledge inside of the engineering department.

Now, some executives find themselves saying, “I wish my people knew how to design products that can be manufactured.”

While this is a challenge for engineering, it is a problem for manufacturing too. In some cases, companies want to increase the amount of production they do themselves. This may be because they have found they can’t get the needed quality or surface finish when they outsource. Lower energy prices have also brought down the cost of manufacturing. In addition, there is a surplus of used production equipment left over from companies that either didn’t survive the recent recession or no longer need it. This means it can be very economical to acquire production equipment. However, it is the cost of developing lost manufacturing knowledge that is the challenge. As manufacturing jobs moved overseas or were lost as a result of the recession or retirements, companies lost a source of highly skilled manufacturing knowledge.

Now with SOLIDWORKS CAM, companies can tap into that knowledge resource again. SOLIDWORKS CAM powered by CAMWorks is a fully integrated, rules-based technology that allows you to integrate design and manufacturing processes in one application. Manufacturing engineers can program toolpaths directly on the SOLIDWORKS model. It recognizes a hole with a certain tolerance and knows which production routine to attach to it. You avoid the tedious process of manually defining all those parameters individually. SOLIDWORKS just takes care of it. This saves time and ensures greater consistency.

Previously there could be many undocumented best practices on the shop floor that people “just knew.” Unfortunately, if those people are no longer available, that knowledge can be lost forever, which can be devastating for a company. With SOLIDWORKS CAM, that knowledge can be captured and reused. What’s especially powerful is that manufacturing knowledge can be enforced as standards to answer questions such as:

• Which toolpath is best for a specific tolerance?
• Which tool would be best for this geometry?
• How deep should the tool go on the first pass?
• What finishing operations are best for this surface finish?
• Should it be milled or drilled?

Even better, as standards evolve, they can be easily updated as needed. The CAM system “learns” how individuals prefer to program toolpaths.

What’s so exciting is that because all of this rich knowledge is embedded directly in the CAD model, you can start evaluating the design for manufacturing much sooner. This means you can catch potential problems earlier and make improvements that will lower production cost and improve quality. Then as the design evolves and changes, your toolpaths update with it!

Learn more about all of the powerful features of SOLIDWORKS CAM.
TAKE ADVANTAGE OF 3D PRINTING
Send models directly to a 3D printer with SOLIDWORKS Print to 3D.

Additive manufacturing, or 3D printing, offers several advantages for manufacturers to consider. Because tooling isn’t required, it can greatly reduce the lead-time for a working prototype. It also makes it possible to create geometry that cannot be machined with traditional manufacturing. For example, strong but lightweight shapes such as lattice structures are now possible with 3D printing.

SOLIDWORKS supports 3D printing by allowing you to send your design model directly to a 3D printer, similarly to how you would print a document to your office printer. Although SOLIDWORKS can output .STL, a widely accepted format for 3D printing, it also supports the 3MF and AMF formats. These formats provide more information about the model. As a result, you do not need to spend time defining things such as the position of your model relative to the selected 3D printer, orientation, color, materials, and so on.
AUTOMATE THE CREATION OF INSPECTION DOCUMENTATION, SAVING 90 PERCENT OF TIME REQUIRED

Create ballooned inspection drawings and inspection sheets for first article inspection (FAI) and in-process inspections using SOLIDWORKS Inspection.

Many industries must adhere to strict safety regulations that require industry-standard reports, including inspection documents such as AS91003 or PPAP forms. To comply with these regulations and requirements, product designers or engineers must inspect their parts. To do so, they must create first article inspections (FAI), inspection reports, and ballooned drawings. This process has traditionally been manual, time-consuming, and error-prone.

SOLIDWORKS Inspection accelerates this process by automating the creation of these inspection documents. In fact, it reduces the time to create inspection documentation by up to 90 percent.

It extracts part numbers, notes, and other critical information directly from the drawing. It also pulls critical inspection and reference dimensions. This eliminates the need to manually copy the information into the inspection documentation, saving time and eliminating a source for errors.

It also makes recording and analyzing the inspection results easier because dimensions can be color-coded for comparison. In addition, it imports results from a coordinate measuring machine (CMM) or digital caliper, eliminating another tedious process.

The software works with SOLIDWORKS drawing files, PDFs, or TIFFs. Resulting reports can be exported to Excel spreadsheets using standard templates or customized templates using the Template Editor to comply with company or industry standards.

Learn more about SOLIDWORKS Inspection and how it can save you time.

VIDEO: SOLIDWORKS Inspection

Remove tedious manual work, and reduce the risk of errors, by automating your creation of inspection reports using SOLIDWORKS Inspection.
AVOID COMMON PROBLEMS IN PLASTIC PARTS

Improve quality and eliminate costly mold rework using SOLIDWORKS Plastic and Cast Part Design and Mold Design tools.

Designing and producing plastic parts is an especially complex process. You have to design the part, design the mold for that part, order the mold base, and send the mold design to be manufactured. When all of that is finally done, you can start producing parts. Even then, there are usually problems found during the mold trial and even more time is needed to find solutions.

The numerous steps required create extremely long lead-times. If the supply chain uses different CAD systems, additional complications arise because, with each handoff/handoffs, CAD data has to be imported, cleaned up, and repaired. This makes the hand-offs especially tedious and time-consuming. Unfortunately, if you order the mold too far in advance to compensate for that long lead-time, the mold designer will need to deal with the numerous changes the part will likely go through. With each change, you have to go through that painful process of importing, cleaning, and repairing CAD data. The alternative is waiting even longer for the mold, but that isn’t a good option either, as it just adds to time-to-market.

SOLIDWORKS mold design capabilities take care of this. With these, you can design the mold on the same platform as the part. Because SOLIDWORKS is associative, as the part changes, the model design and all associated references update, including the NC toolpaths to machine the mold. By taking out that painful process of cleaning imported data, you can start the mold design sooner, and produce parts that much faster. In addition to plastic, the software can be used for cast, stamped, formed, and forged designs. Mold designers working with customers who design their parts in something other than SOLIDWORKS can still benefit. SOLIDWORKS 3D Interconnect will maintain the link to native multi-CAD data so part changes will still update in the mold.

“SOLIDWORKS has allowed us to reduce design cycle times significantly, which saves time and money, while simultaneously improving quality.”

— Mike Derus, Lead Engineer, THE OUTDOOR GROUP LLC

VIDEO: Plastic Part Design
Designing plastic parts is not straightforward. Unless you are extremely knowledgeable about plastics, what you design may not necessarily be what comes out of the mold. If your design lacks proper draft angles or undercuts are not sized properly, the part will not eject from the mold. Shrinkage must be accounted for as well. It is hard to predict exactly what will happen without years and years of experience working with plastics. SOLIDWORKS Plastic and Cast Part Design solves this problem by doing the analysis for you and letting you know where your design may have problem areas. It can check draft angles, analyze undercuts, assess part thickness, and empower you to avoid other common problems with plastic parts. It can even guide you to adjust your design to locate the parting line in an optimal, less conspicuous area.

Discover the numerous advantages of SOLIDWORKS Plastic and Cast Part Design and Mold Design. The power of these combined solutions will help you reduce the lead-time of your plastic parts and improve their quality.

“I was attracted to SOLIDWORKS because I felt that using a feature-based parametric platform would be the most productive way to get my job done.”

— John Kreutzberger, Owner, JK MOLD DESIGN
ENSURE THE MANUFACTURABILITY OF SHEET METAL PARTS

SOLIDWORKS sheet metal capabilities provide everything you need for design-to-manufacturing.

Like plastic, sheet metal parts are also very common in many products, especially for enclosures, covers, and guards. As such, sheet metal design should be a part of an integrated design and manufacturing platform. The solution should help you avoid scrap so you can manage costs. It should also ensure manufacturing can produce the sheet metal part as designed, so you avoid quality issues.

With SOLIDWORKS sheet metal design capabilities, you can easily convert a part to sheet metal. SOLIDWORKS will then automatically flatten it and generate flat patterns with bend allowance for manufacturing. This provides an excellent check for manufacturability.

Then, because the design and manufacturing information is integrated, manufacturability problems can be corrected in the design, and the manufacturing information will automatically update.

In addition, if you need to make a change to the components enclosed by the sheet metal part, you can easily see the impact on the enclosure and update it as needed. The change will automatically propagate to all impacted punch, hole, bend, and weld tables, avoiding any errors due to outdated information.

Explore the numerous features SOLIDWORKS offers that simplify the process of designing sheet metal parts and providing manufacturing with everything needed to produce cost-effective, high-quality sheet metal parts.
ACCELERATE THE DESIGN AND MANUFACTURE OF WELDMENTS

Save design time and automate the creation of manufacturing information with SOLIDWORKS weldments.

When designing weldment structures, frames, and bases, you need the design process to be as efficient as possible. You also need to make sure the information handed off to manufacturing is accurate, so that you manage costs, avoid duplication of efforts, and order the right stock.

SOLIDWORKS allows you to streamline the design and manufacture of welded structures. Libraries of predefined structural shapes save design time and allow you to quickly design your frames. SOLIDWORKS then automatically generates the cut lists, bills of materials (BOMs), and other documentation needed for manufacturing. Not only does this save time, but since the design model drives the manufacturing information, you can ensure its accuracy. This means you avoid expensive errors and scrap. As with all SOLIDWORKS functionality, any change to the design model automatically updates the manufacturing information so you never have to worry about outdated information. With SOLIDWORKS Costing functionality, you can also automatically estimate welded structure manufacturing costs and create automatic quotes, helping you boost profitability.

Discover the many features available with SOLIDWORKS weldment functionality that will streamline your process.
PREVENT ERRORS AND SAVE TIME WITH AUTOMATION FOR PIPING AND TUBING DESIGN

Autoroute piping and automatically generate manufacturing output using SOLIDWORKS piping and tubing design.

Designing piping and tubing routes can be extremely complex, which makes it very easy to make mistakes. Getting accurate information to manufacturing can be even harder. With complex systems, mistakes can be very costly. Problems such as incorrectly sized fittings, short pipes, and inadequate piping clearance can completely blow the project budget. Complicating matters further, any change can be extremely painful. Identifying everything that is impacted and ensuring all documents are up-to-date can be very difficult. Even missing one update can mean very expensive delays at the job site.

SOLIDWORKS piping and tubing design simplifies the design process. A library of piping and tubing components makes design placement quick and easy. Auto-routing functionality creates and updates the piping path, so changes are painless. To get accurate information to manufacturing, SOLIDWORKS automatically creates the bill of materials (BOM), cut lists, bend tables, and other manufacturing documentation, all based on the design model. Then any change to the design model will automatically update in the manufacturing deliverables.

Learn more about how SOLIDWORKS piping and tubing design can save you time, minimize errors, and lower costs.

By integrating piping and tubing during the design process, designers can help ensure efficient assembly, operation, and serviceability, avoiding rework, delays, and extra cost.

VIDEO: Design Complex Piping and Tubing Systems
CHAPTER 5

GREAT SHOP FLOOR AND CUSTOMER-FACING CONTENT, READY ON TIME

Download the next chapter in our series of eBooks, which will cover everything you need to support the complete product lifecycle.

The next eBook chapter will cover these topics:

• Create demand for your products before they ship.
• Leave a lasting impression during sales meetings.
• Give your customers a great experience and win their loyalty with impressive support resources.

Learn more about how SOLIDWORKS solutions can take you from design to manufacturing by visiting http://launch.solidworks.com.