Maysteel®

Design for Manufacturability in Sheet Metal Enclosures

Proactively Addressing the Knowledge Gap

The Maysteel Advantage

By Bob Kuenzi
Director of Technical Services
Maysteel, LLC

IDEAS MADE IN METAL

It is a familiar industry story: In order to keep costs down, sheet metal components are sourced to a low-bid supplier. The supplier either struggles to produce a quality level product or is unable to meet the demand. Consequently, end product delivery is delayed and it injures the manufacturer's revenue stream. This is all for one part—a sheet metal component that would increase a project's overall cost.

Today, manufacturers face significant technical and business risks when sourcing sheet metal components. Enclosures and other sheet metal components are viewed as commodities, and companies from all aspects of the industry are reducing internal design engineering staffs. As a result, on-staff engineers handle a larger number of projects with tighter time-to-market schedules making it difficult to complete a project optimally designed for manufacturability (DFM).

These trends are rising, creating a knowledge gap that results in sheet metal components that companies find increasingly difficult to manufacture. While today's mechanical engineering programs produce engineers with high aptitudes, typically the programs neglect to teach sheet metal design for manufacturability altogether. This knowledge gap has created consequences for even the largest of manufacturers, because the engineered components are too costly to successfully enter production.

Filling the Knowledge Gap

Maysteel's Technical Design Center, referred to as its Tech Center, was established in 1994 specifically to help customers mitigate the risks associated with precision sheet metal enclosure sourcing. The Tech Center focuses on optimizing product design for functionality and manufacturability, helping customers produce higher quality products at a lower total cost, all while meeting strict time-to-market requirements. Staffed by over 30 mechanical, industrial and manufacturing engineers, this state-of-the-art research and development facility designs and prototypes custom engineered sheet metal fabrications enclosures. The Tech Center staff works with customers to develop efficient designs and robust production processes that easily scale to meet product demand. When needed, Maysteel's Tech Center has been known to work around the clock to provide customer support, and assist customers in times of crisis.

Simplifying the Component and the Process

When designing for manufacturability, the Maysteel team seeks to reduce the number of parts that comprise the assembled component. Separate parts are redesigned into a single piece, reducing the number of pieces to a fraction of the original design. This translates into a lower cost of materials, fewer manufacturing steps, and considerably reduces the chance of defects. Sheet metal components are often joined with rivets, an error-prone method during mass production. When producing a component at high volume, rivets may be missed or poorly applied, affecting the quality of the product as a whole. Because of this, Maysteel uses techniques less prone to such problems including welding, self-clinching joints—even high-tech adhesives. The team simplifies component design to create a manufacturing process that easily responds to changes in demand. With an optimized design, a robust process is developed to eliminate variation ensures the part is made correctly on time, every time.

Another example is looking to sheet metal itself. Many products use plated sheet metal to resist corrosion and provide electrical conductivity. However, applying the plating after the component is assembled (post-plating) creates potential for defects. When plating is required, the Maysteel design team recommends using pre-coated materials. Maysteel's DFM approach also avoids manufacturing enclosures made of proprietary materials to ensure production schedules are not put at risk.

Getting It Right the First Time

When customers experience Maysteel's innovative and reliable solutions, their engineers often invite the team to consult on their other products. Clients quickly realize that when it comes to design and engineering for the lowest total cost, the sooner Maysteel gets involved, the better. Customers often supply their vision of the product, and the Maysteel design team leads a collaborative development process. With a concept approved, a three-dimensional CAD model is the first step towards creating a functional prototype. During this development process, the design

DFM Drivers in Sheet Metal

An emphasis on Design for Manufacturability results in significant savings in overall production time and cost.

- Part count reduction
- Process step reduction
- Fastener elimination
- Secondary operation avoidance
- Focus on readily available materials

DFM Benefits

- Less material
- Fewer labor steps
- Higher quality and repeatability
- Faster cycle time
- Lower cost

team conducts meetings with the customer to accurately gauge if project goals and cost objectives are being met.

Maysteel's involvement during the development process ensures timely feedback on manufacturability. Avoiding re-work by designing for cost-effectiveness and ease the first time around, Maysteel saves customers both time and money. Engineering representatives from each production facility are involved with initial design concept and prototyping through pre-production, which means they can hit the ground running when production begins. The process begins in the Tech Center where Maysteel develops the products and processes, and most importantly proves them successful. Subsequently, all tooling and associated manufacturing components are prepared for production in-house.

Manufacturers Moving to a New Concept of Cost

Customers have stressed that the cost of sheet metal components can affect their long-term product. Finished products that cannot ship because of sheet metal defects or equipment integrity problems in the field clearly point out the high impact of poorly designed components.

Today, customers focus on the total cost of project ownership rather than the lowest initial pre-production cost. Without a solid product design, repeatable and robust manufacturing process and reliable delivery, it is impossible for companies to calculate the true total cost of a project because so many variables are left unanswered. Maysteel customers see the value of performing full and proper optimization up front rather than to pay unforeseen costs in the end.

Training Opportunities for Customers

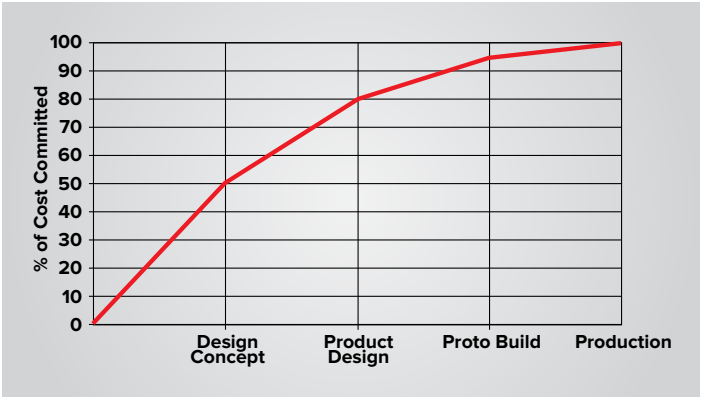
Many Maysteel customers send their engineer teams to Maysteel for "Sheet Metal 101" to educate them to the latest techniques in sheet metal manufacturing. The main takeaway for participants? Engineering teams leave with an understanding of how to optimize design at the beginning of the product life cycle and accelerate time to market. In addition, Maysteel presents forums at customer sites to help engineering and procurement teams understand DFM principles and the total cost drivers of their products. Customer teams are often surprised to learn how sheet metal can make or break their supply chain, and they come to realize the value of a professional sheet metal partner.

DFM Example
Hard Drive Bay

- Eleven-part assembly reduced to just two parts
- Thirteen separate spot welds replaced by 12 projection welds done in a single step
- Separate sealing process required for air-flow control eliminated

DFM Example
Rack Server Chassis

- Initial design required more than 80 joining cycles and 21 secondary hardware standoffs
- Final design joined in seven steps with self-clinching joints
- Integral bridge features with cold form thread screws replaced many standoffs
- Six projection weld steps replaced 53 individual spot welds



"Maysteel has proven its expertise in engineering original product designs that significantly reduce the lead time from product conception to manufacturing. They do this by improving manufacturability of a product, creating critical enhancements of quality, and improving cost-effectiveness from start to finish creating revolutionary products that are easily manufacturable."

Norman Bandler Jr
Project Quality Engineer
Rockwell Automation

About Maysteel

Maysteel LLC specializes in designing, engineering and manufacturing custom, precision, OEM sheet metal enclosures, electrical cabinets and metal fabricated assemblies. The company's product solutions are widely used in the banking, computing, telecom, kiosk, security monitoring, utility, harsh environment electrical equipment, and self-serve/vending machine industries and are also found in a variety of other applications. Maysteel specializes in providing the lowest total product cost by employing design for manufacturability (DFM) solutions throughout the product lifecycle. Maysteel was founded in 1936 and today has manufacturing locations in Allenton, Wisconsin and Monterrey, Mexico. Maysteel is owned by the U.S.-based Everett Smith Group, Ltd.

For specific information on Maysteel's precision sheet metal capabilities, contact:

Bob Kuenzi
262-832-9350
bkuenzi@maysteel.com