

Case Study – The Conversion of Metal Components to Plastic

Challenge

Since 1920, the Herff Jones Company has built a longstanding reputation for honoring tradition and rewarding achievement with a diverse product range, including High School and Collegiate Class Rings, Medals and Awards, and Supreme Court Robes. Herff Jones demands the finest materials and the most meticulous designs and artisanship for these treasured remembrances of lifetime achievements, while at the same time remaining cost competitive in the highly competitive marketplace of Academic Class Rings.

The previous Class Ring assemblies, manufactured by Herff Jones, utilized a metal insert that requires numerous secondary manufacturing processes and replacement, if the ring is re-sized. Because of the added manufacturing and replacement costs, Herff Jones believed this component to be a possible candidate for metal to plastic part conversion, and hoped that this conversion would increase design efficiency and decrease manufacturing costs.

There are significant design, material, process, and service use considerations with the conversion of a metal component to its plastic counterpart, requiring considerable research and design. Additionally, Herff Jones designs and manufactures individual customized Class Rings of different geometries and sizes, a potential cost concern, since most plastic manufacturing processes require tooling. Furthermore, the converted plastic part must meet Herff Jones' stringent quality demands and withstand the rigors associated with the harsh environmental and chemical exposure during assembly and resizing. **The challenge**, realize Herff Jones expectations for cost reduction while satisfying the aforementioned prerequisites.

"We've come to think of CPC as more than just consultants to solve problems", said David W. Walker, Manufacturing and Facilities Engineer with Herff Jones, Inc.

Corporate Headquarters

770 Main Street
West Warwick, RI 02893
Tel: 401.828.0820
Fax: 401.828.0840



Corporate Offices

New York, NY
Chicago, IL
Dallas, TX
Los Angeles, CA
Hong Kong, China



“They’ve helped us in the early design stages, to prevent problems, as well as helping us with resin performance, equipment set-up, and operator training. For Herff Jones, CPC is an on-call resource that we can tap into when the need arises. CPC possesses the skill and talent necessary to envision and see projects through to completion”.

Solution

Having limited experience and knowledge of plastics materials, plastic product design, and plastic manufacturing processes, CPC Plastics, Inc. integrated our team of plastics engineers with the design team of Herff Jones Corporation. Effectively, we provided them with an in-house plastic engineering team that could deliver the critical on and off site technical plastics consulting services, including design, materials, training, troubleshooting, etc., required to successfully design, develop, and implement on-site plastics manufacturing at Herff Jones’ Rhode Island Headquarters. Bringing our services directly to their doorstep allowed for a more fluid progression of the project and decrease lead times.

CPC Plastics evaluated the current metal inserts, including an oval and rectangular insert, which measured in ranges from 8mm x 6mm to 12mm x 10mm, each having an overall thickness of 5mm. In total, we evaluated thirty-six (36) individual designs, which acted as the foundation for further customization by Herff Jones’ design engineers. Referred to as a “Vista Vue”, the insert play a dual role in the overall ring assembly, they provide a supporting platform for the gemstone and act as an aesthetic vehicle for customized molded-in graphics, designed specifically for the individual, to be magnified and visible underneath their ring’s gemstone.

Our comprehensive evaluation of their current Vista Vue design incorporated identifying the environmental and chemical impact as it pertains to plastic; we needed to identify a plastic resin that had excellent high and low temperature performance and superior chemical resistance. Identified through our research and testing, ABS, or Acrylonitrile-Butadiene-Styrene, as an engineered thermoplastic resin, which satisfied the established technical specifications, environmental criteria, and allowed for similar decoration techniques, mimicking the “look and feel” of their metal predecessor, was selected for the plastic injection molding of the Vista Vue insert(s).



In parallel with our plastic resin identification and selection process, CPC Plastics began revising Herff Jones existing metal design, using a sophisticated 3D Solid Modeling and state of the art simulated stress analysis and mold flow software, developed for plastic product design and modeling. Through our research, we determined the best process to manufacture the insert, in full view of the technical, quality, and cost specifications previously discussed, would be plastic injection molding, which required specific design characteristics and features.

Though lacking any real complex geometries of major concern, the size of these inserts are relatively small, this poses additional problems when it comes to thermoplastic injection molding, such as molding machine size and accuracy, gate sizing, part ejection and removal, etc. Our plastic Vista Vue insert's design needed to be flexible enough to accommodate individual geometries and sizes, address the need for customization, and facilitate the desired manufacturing process; it was not easy but here is how we achieved our client's goals.

CPC Plastics utilized a M.U.D. or Master Unit Die configuration for several key factors, the tooling design would facilitate rapid product changeovers, given their relatively small production runs, and permitting multiple tooling configurations, and since only one tool base is required, our system significantly decreased tooling cost and lead times. In addition to our inimitable approach with this project's tooling design, we incorporated a proprietary process for the manufacture of the core side inserts, using a revolutionary process that allowed Herff Jones to move from design to plastic injection molding manufacturing in record time.

In contrast to conventional methods, where new product design is followed by a tooling lead time of an average of four to six weeks for hardened tool steel inserts, and unconventional methods, such as 3D Printing Technologies, machining, and rapid prototyping, which are incapable of producing the production quality inserts that we required, we needed to think "outside the box". CPC Plastics researched, designed, and subsequently developed recyclable core inserts made from custom metal alloy blend, capable of being customized and able of withstanding the intense plastic injection molding process, manufactured using a relatively inexpensive casting process, again in full view of quality, time, and money.



However, a customized tooling solution is worthless, without an injection-molding machine to produce it with, you need a machine that can facilitate this method of manufacture, and it has to be consistent, we are working with very small parts, magnified greatly, any discrepancy are essentially highlighted. Again, having researched, identified, and selected the raw materials, designed and built the tooling and proprietary inserts, and subsequent to our review of suitable plastic injection molding machines, CPC Plastics selected a Battenfeld model BA 250/50 Horizontal Injection Molding Machine for a variety of reasons, including machine design, construction, performance, and of course price.

Following our injection molding machine selection, CPC Plastics arranged for, and facilitated, machine rigging, transportation, and set-up of the twenty-five (25) ton machine, which included supervising the manufacturing layout, design, and construction, electrical and plumbing design and construction, employee training, process development, and pre-production molding trials. Consider that while not only is engaging in plastic injection molding manufacturing requires a significant investment in time and money in facilities alone, a more noteworthy investment must be made in regards to employee training.

Additionally, in this particular instance, CPC Plastics is working with a client that has no real working knowledge of plastics, and until now, their employees have worked solely with metals. We trained the design engineers to think like plastic engineers, we trained their production employees in the science of plastic manufacturing, and we worked hands-on with their team, to hone their skills and manufacture plastic products, with the quality and precision, expected by their employer, the Herff Jones Corporation.

Result

Since 1998, and ongoing, CPC Plastics, Inc. has worked with Herff Jones Corporation to refine their plastic manufacturing processes, enhance employee training and awareness, act as their in-house technical plastic engineering department. This ongoing relationship has resulted in hundreds of thousands of dollars in savings each year for Herff Jones but more importantly, this relationship has allowed our client to expand its offerings in way of timeliness, increase its competitiveness, increase value



added customization, while realizing design and manufacturing efficiency and enjoying decreased cost and lead times.

For Herff Jones, CPC Plastics redefined "art to part", what once took weeks now took hours, and what once cost dollars, now cost cents, our research, education, and experience had paid off, in a huge way. We can now produce a part that costs USD\$ 13.42 per/part to a part that could performed better, be more easily customizable, and at a cost of just under USD\$0.03 per/part. Our innovative approach to product and tooling design, coupled with our unparalleled plastics knowledge and expertise, ultimately saved Herff Jones Corporation millions of dollars, in efficiency, product design costs, and manufacturing costs.

Regardless of how you do the math, CPC's plastic experts have the knowledge, experience, and resources to realize your metal to plastic part conversions in a way that no one else can, on time, on budget, and CPC Plastics accomplished it all with a focus on excellence and the dedication that you would expect from a plastics expert.

If you would like the experience of plastic experts that have the technical knowledge and real world experience of working on all-encompassing projects, "call on the experts that those within the industry turn to with their toughest problems"™, **Toll Free: 866.828.0820.**

For more information, please contact us:

CPC Plastics, Inc.
770 Main Street
West Warwick, RI 02893

Tel: (+011) 401.828.0820
Fax: (+011) 401.828.0840
Toll Free: 1+ 866.828.0820 (U.S. Only)
Online: <http://www.cpcplastics.com>