KENSON CASE STUDY

PRECISION PRESSURE FORMED PLASTIC

HIGHLY COMPLEX PART THERMOFORMING FOR A ROLLSCOPE HOUSING REDESIGN

At Kenson Plastics, we utilized thermoforming to redesign the housing of an inspection microscope called the “3DQC Rollscope”. This approach has allowed our customer to meet the demanding quality control requirements of the printing market while creating cost savings over a competitive process. The project’s success hinged upon part consolidation and process change. Kenson collaborated with engineers and designers to incorporate the functional features necessary for part performance while improving the overall aesthetics of the final product.

OVERVIEW

Kenson Plastics collaborated with the customer to redesign and optimize their housing design of their commercial inspection microscope. Commercial printers use the handheld microscope to detect cell volume measurements and photonics in the commercial printing industry. The rollscope measures light waves at a resolution as fine as 0.01 microns and provide ultra-precision white-light interferometry. A common problem with these types of devices is they need to be highly precise while being controlled by hand to ensure consistent quality of graphics from production presses. Below, we discuss the design issues the customer faced using a cnc machined aluminum housing which included EMI shielding for the rollscope’s internal components.

At the beginning of discussions with new customers, Kenson often finds that many customers don’t know the capabilities of the thermoforming process. At Kenson Plastics, we often start a project by collaborating with industrial designers and guiding them by demonstrating what’s possible before they experience that aha moment. For this customer, we went through multiple design iterations that resulted in a much better overall product design without having to compromise on any of the complex functionality and safety features of the rollscope.

“Each unit was ridiculously expensive. Maybe $1,000 per unit was the initial cost. Over six months and with a sketch on a napkin, we could design a new housing and now make a better version – and the part now costs only $150.”

DAVID O’LEARY
Co-Owner & Vice President of Sales and Marketing

THE PROBLEM: HISTORICAL PRODUCT DESIGN CHALLENGES

Some of the main challenges the customer experienced with the previous design stemmed from the use of a billet aluminum housing. As printers use the rollscope by hand, the added weight from the metal housing made it cumbersome to handle expertly, which is something production printers depend on when verifying their results.

THE CUSTOMER ALSO WANTED:

- Improved aesthetics of the housing without compromising any operator safety
- A solution that helped them overcome limitations in the ergonomics, look, shape, fit, and finish
- An economical alternative to the billet aluminum housing, in spite of the relatively low volume of less than 100 units per year

"The process required producing multiple sample parts that we sent to the client to get all of the features included into the design. The critical design elements included overlapping joints, undercuts, and EMI shielding requirements. Through the iterative design process the customer and Kenson were able to get on the same page and ultimately create a great outcome."

DAVID O'LEARY
Co-Owner & Vice President of Sales and Marketing

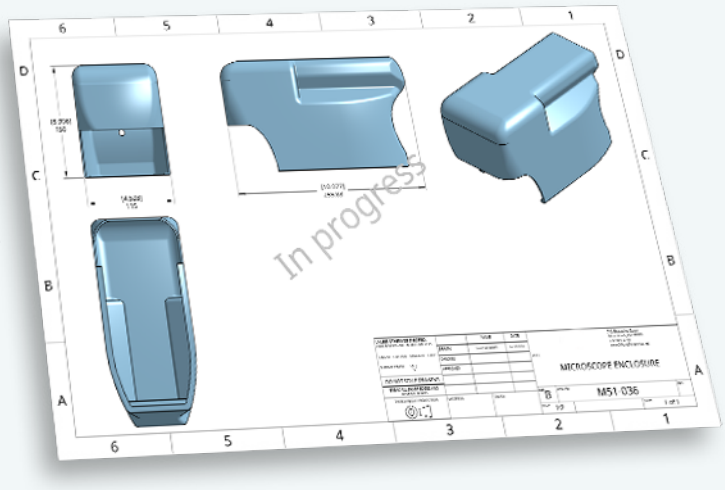
OUR APPROACH

One of the biggest challenges is helping industrial designers understand what thermoforming and pressure forming is capable of. When designers deal with negative drafts and have additional requirements like mounting features, bosses, or extrusions, they naturally think of injection molding. If the project is for a lower volume application it is assumed that a solution like sheet metal or fiberglass is necessary.

The reality is that thermoforming can be a very good alternative to injection molding, especially when working with small volume product runs. Once the customer understands this, the conversation shifts from what is possible to "Okay, we can do this." We can make it sleeker, lighter, and more functional. Working with our team of experts in the tech center, we can start iterating on the design to find an optimized solution.

Design Iteration

Although the customer already had a CAD design of the previous housing, we needed to align the process requirements and understand the features that were most important to the customer. Kenson Plastics was then able to deliver a more polished design for the housing at a greatly reduced price.



In spite of the customer's low volume requirements (approximately 75 units per year) a pressure forming process could achieve all of the design requirements and provide an economical alternative to injection molding. In the redesign process, the customer requested our involvement early, and this enabled us to work through their current design constraints to find a new, optimized manufacturing solution.

"These lower volume applications have traditionally had a series of design sacrifices. That's no longer true, if you can be creative, you can get a higher quality outcome."

CHRIS O'LEARY
Co-owner & Vice President of Operations and Finance

Tooling Intricacies and Molding

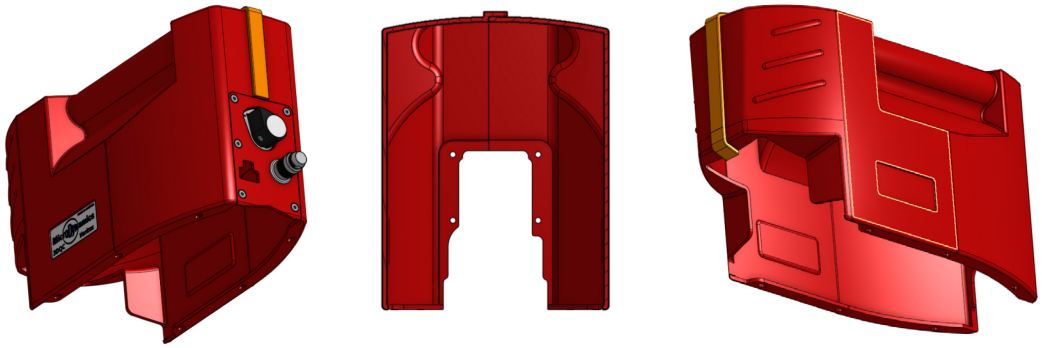
Once the design was finalized, we needed to optimize the thermoforming process to make the manufacturing as cost-effective as possible. Ultimately, Kenson worked with the customer to design a pressure-formed mold that included all three parts required for the housing.

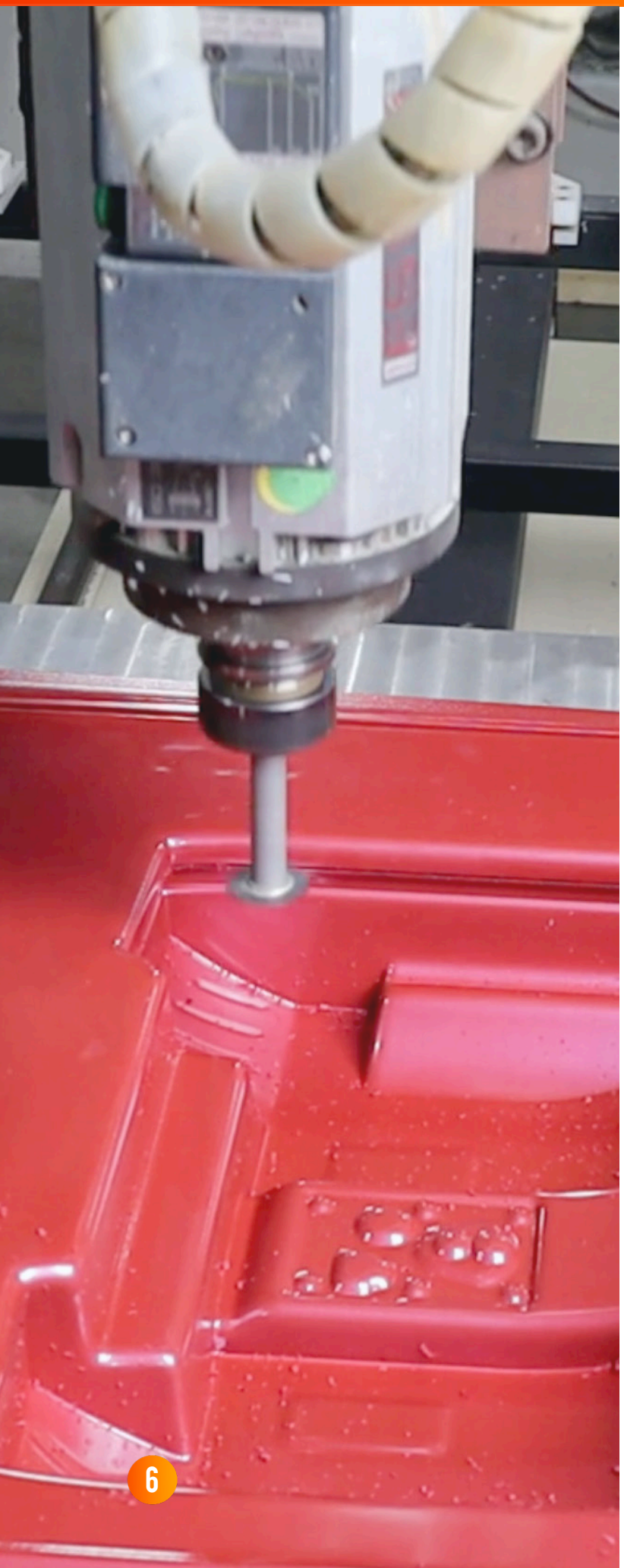
Compared to the previous machined billet aluminum design, we easily achieved a lower cost solution. This was always a primary design goal for our engineers. The prior enclosure increased the product unit cost, and our process needed a more economical design that still catered for all the safety and aesthetics that the customer desired. We also needed to consider the finish and texture of certain design elements when designing the mold.

THE NEW TOOLING DESIGN NEEDED TO ALLOW FOR:

- A single mold for all three main parts of the housing
- An intricately patterned laser etched texture for the handle
- Designing an actuated mold to accommodate the undercut features
- Including custom color material with the in-mold texture

The mold also needed to incorporate defined edges and sharp features with tight tolerances. Kenson Plastics could go straight to a hard tool once the design was finalized and we defined all the feature requirements. Only then were we ready for molding the parts using our pressure forming process.





Machining and Finishing

After the parts are thermoformed (pressure formed), the next step of the process requires machining in the finer details and matching the bonded features into the molded part. This component of the part design was critical in order to create a seamless look and feel. All three components associated with the assembly were formed in a single mold allowing for a more economical and faster manufacturing process.

Due to the creative solutions that were implemented into the mold design, Kenson was able to create the most detailed features (like overlapping joints) during a secondary trimming process. For fasteners, we also included heat sunk inserts for proper alignment and fitment.

Finally, the finishing of the part included painting a stripe for aesthetics, but also we were able to add EMI copper and nickel shielding, as per the design requirements. Kenson Plastics added this to the inside of the parts in order to maintain compliance with the safety requirements for EMI shielding. Once these steps are complete, all that is left is to bond the three parts together to form the complete housing for the rollscope.

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KEY TAKEAWAYS ABOUT THERMOFORMING COMPLEX PARTS

Kenson Plastics regularly deals with customers who simply don't know what is possible in the modern thermoforming context. Our technique and approach remain flexible while giving industrial designers a wealth of options to achieve their goals – at a cost-effective price, and with all the required detail and features that you'd expect from injection molding.

Results

For this customer, the redesign of the rollscope housing reduced the unit cost while delivering a sleeker, sexier product. We could start the process with a simple sketch and deliver an economical alternative to injection molding for low volumes, without compromising on any of the safety requirements that were part of the overall design.

"We believe it's about quality tooling of CNC fixtures and quality CNC practices. We are willing and able to do more complex machining than most. It's about how we set up the machines and how we tune the machines that allow us to deliver a far superior part. And again, we're not talking about a 10th of an inch, rather a 1000th of an inch to get the desired tolerance stacking that customers expect with a highly complex part used in their expensive, sophisticated products."

DAVID O'LEARY
Co-Owner & Vice President of Sales and Marketing

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For any industrial engineer that needs to know more about the capabilities available from thermoforming and precision machining of complex parts, get our latest ebook on the latest tips and tricks.

Our engineers are always just a phone call or email away if you have any specific questions. We are here to help with any design and vacuum or pressure forming requirement you have.

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