



Society of Plastics Engineers (SPE) 2018 Thermoforming Parts Competition Winners

Photos: Dallager Photography

PEOPLE'S CHOICE AWARD & HEAVY GAUGE PRESSURE FORM GOLD

**Profile Plastics, Lake Bluff, IL
Medical Cart Enclosure**

Overview

The Medical Cart shown is an innovative surgical system providing flexibility during various surgical procedures.



Features and Benefits:

The primary cart unit consists of seven (7) pressure formed enclosure parts, and the secondary cart unit consists of three (3) pressure formed enclosure parts, both utilizing PC-ABS material in order to meet a stringent rigidity, chemical, heat, and highly cosmetic requirements. Customer parameters required zero or minimum mechanical attachment features, which presented many unique forming challenges. As shown, many of the attachment features were innovatively molded-in to meet the customer's requirements. Bonded in fastening features on the non-cosmetic side of the part were also required to be kept at zero or at a minimum.

The final design incorporated numerous movements on each tool to provide fastening features as well as cosmetic finished seams. The primary cart's interaction between the rear top cover and the side covers presented numerous challenges to achieve a hidden fastening system and maintain cosmetic alignment between the parts. Complex core pulls were utilized on the upper cover to incorporate slots for a work surface table. While the secondary cart's large front cover presented numerous challenges with 4-way undercuts due to the extreme draw depth. The final design on this part allowed the elimination of additional side panels and reduced overall tooling cost.

With the application being utilized in a surgical environment, the customer also required stringent and detailed validation and thorough quality procedures and documentation.

ROLL FED CONSUMER - GOLD

Placon, Madison, WI Pokémon Tray

Overview

The trading card game package includes a rigid setup box with printed litho foil paper wrap, with three RPET thermoformed trays inside made with environmentally conscious EcoStar® recycled PET material.



Features and Benefits

The versatile packaging configuration is intended for retail, but also converts into a storage device for players after the content is unpacked. The plastic clamshell in the cover allows for high level promo cards to be displayed in the front of the box for retail presentation, and also allows consumers to change the cards to include their favorite cards to display. The magnetic closure on the front panel helps to keep the outer box closed and the product protected.

Due to the package design, the product resulted in cost savings. The design reduced material thickness, allowing for multiple trays to be stacked together in one box. The result was an overall cost savings for Pokémon which was also passed along to the consumer. The packaging allowed a \$20.00 reduction of the manufacturer's suggested retail price (MSRP).

The Pokémon Premium Trainers XY Collection package design aids product merchandising and motivates purchase. The design highlights the promo cards, which can only be purchased in this box, front and center in a thermoformed tray. This window allows the consumer a "sneak peek" at additional contents in the box, contributing to product image and shelf impact.

ROLL FED INNOVATIVE - GOLD

Placon, Madison, WI Nametag Tray

Overview

Our customer requested a thermoformed tray that would house several shaped name tags and help them reduce freight costs since package delivery companies changed to dimensional weight shipping. We designed a sustainable, thermoformed tray made from Ecostar® recycled PET material used to organize, ship and display name tags for large meeting registrations.



Features and Benefits

A distinctive design innovation of the die cut shape allows for multiple tray configurations to house several name tag shape variations.

- The dual-purpose snap fit closures connect two trays together to house 100 name cards doubling capacity over the existing product.
- Simply unsnap the closures to separate the two trays and you have immediate set-up for two registration lines by alphabetical order.
- Bend the tray along the middle perforation and secure the side tab locks to hold the tray in place. Name tags with identification ribbons attached fit securely in the retention card pocket along the short side for easy display.

The unique perforation allows the tray to fold into a square and the snap fit closure locks securely to hold the square configuration in place for safe storage and easy transit in a shipper box with carrying handle. The retention card pockets hold the name tags snugly in the slot so no tag will slide out of place. The trays were designed with offset card slots for interweaving when the trays are folded into a square.

The tray design allows for company branding with an engraving area along the top perimeter of the tray.

The tray is environmentally friendly made from clear Ecostar recycled material. The Ecostar material is made from post-consumer recycled PET sheet made from curbside collected PET bottles and thermoforms diverted from landfills which reduces waste and is eco-friendly. At the end of useful life, the tray can be separated at the perforations, broken down into smaller components, and recycled again.

ROLL FED INNOVATIVE - SILVER

Knob Creek POP Display Tray CMI Plastics, Inc., Ayden, NC

Overview

This unique tray features a Knob Creek 750ml Bottle, one bitters bottle (50ml), one box of Sugar Cubes (42.5 grams) and one Muddler. The end use is for a value-added promotion in the spirits category.

Features and Benefits

The proposed tray design by the customer was to have a rigid thermoformed tray from HIPS with a printed SBS mask applied. The proposed tray alternative eliminates the need for a printed mask saving both material and assembly cost. The design further enhances the appearance of the final shelf presentation with a realistic representation of wood grain barrel slats used for whisky.



The tray is comprised of a coextruded ABS which provides better structural properties over the proposed HIPS design. 60% is recycled utility black and the 40% is color match brown. This mix was carefully engineered with the goal of a natural gradient of black and brown colors, giving the tray a natural weathered look. This also provided each tray with a unique finish so that each tray appears slightly different.

The design aspect of the wood grain was achieved through reverse-engineering natural wood to pattern the surface. The master patterns were sculpted and sampled to ensure the proper look and manufacturability using aluminum cast molds.

There were significant challenges with this tray design. The mold design itself required extraordinary detail and testing. It had to provide superior aesthetics while performing under rigorous drop and ship testing parameters. Primarily, designing and forming proper undercuts posed the biggest challenge. The final presentation required no window on the carton. Each cavity not only had to hold the product snugly but had to deter pilferage. The manufacture itself posed challenges due to draw ratio, stress whitening and material distribution and color consistency.

ROLL FED FOOD - GOLD

Global Plastics, Perris, CA Egg Carton

Overview

This 100% recycled PET egg package is an innovative container that will revolutionize the egg packaging industry because it was created with the help of egg farmers for optimal efficiency in high speed automation. Other current PET egg containers fall short as a substitute for styrofoam because of their inability to efficiently flow through the automation equipment which is used by most farms today. This package eliminates that problem as it was designed for exactly this purpose. Stores are demanding recycled PET, but no container until now has been able to give the farms the ability to both provide eggs in PET while simultaneously being cost-conscious and meeting production requirements in the filling stations. This container, which holds four different sizes of eggs and uses a unique design to help keep eggs secure during transportation, will be the packing of choice for egg producers in the future not only because of operating efficiency or environmental benefits, but also because of the price point.



Features and Benefits

The clamshell, hook-locking, package is formed from 18mm x 29.5mm 100% recycled PET sheet rolls to provide an eco-friendly and financially feasible plastic option for egg producers. The package has 12-count, 18-count, and 24-count versions, as well as topper for the 60-count bulk pack for the club stores.

The package is currently offered in Clear PET (made from sodas and water bottles) and green PET (made from 7ups / sprite / mountain dew, etc.) and will soon be rolling out in Amber (made from root beer, Arizona iced tea, etc.)

The innovative final design took nearly five years to craft, as the product was continually altered to make sure that the needs of the egg producer, the store, and consumer were completely met.

One of the most unique parts of the container is that it was designed to stamp the label on the inside of the package, in house at the farm. The reason that this is so important is that it allows egg producers to use the same package for all of its customers and reduce inventory by millions of dollars. Packages can be sent to the farm and then the farm can stamp its own labels on site to fill orders for different stores.

Unlike pulp or styrafoam egg packaging that requires printed on labeling, this package gives egg producers the ability to simply interchange the label to meet the customization needs of their

clients, eliminating the need for them to carry extremely costly inventory that could be scrapped at the slightest chance in customer needs.

The design of the package also ensures that eggs are secured during transportation, drastically lowering the amount of breakage that egg producers had become accustomed to using pulp and cardboard packaging.

With translucent PET, in-store breakage is greatly reduced because no longer are customers opening and feeling the eggs. With a simple glance through the package, one can verify that there are no broken eggs.

HEAVY GAUGE VACUUM FORM - GOLD

Fiber Pad, Tulsa, OK
Bass Boat Driver Console

Overview

This shroud covers boat driver and passenger consoles. It also provides a surface to mount a windshield.

Features and Benefits

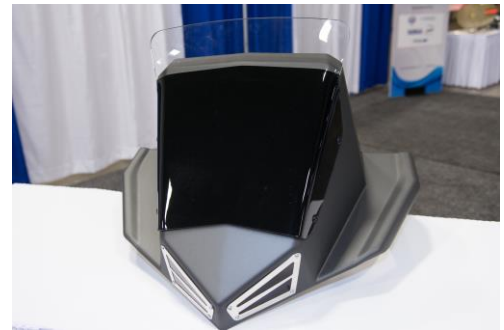
The body of the shroud is vacuum formed with a custom-built machine that uses a “wrapping” method, which provides additional capabilities with larger undercuts than normally permitted with standard vacuum forming machines, and material thickness to the overall part. Then it is trimmed on a 5-axis CNC router.

Material used is an ABS with a decorative laminate that provides UV resistance and texture, starting thickness of .250”.

The innovative design of the “wrap” concept allows for a larger degree of undercuts as well as maintaining a more consistent plastic thickness across the entire part.

Because of the difficult geometry, shrouds like this have been made using fiberglass. In an effort to lower boat weight and reduce carbon footprint, this part, among others, were identified as a candidate for plastic replacement.

The part comes off production tooling, which is cast aluminum with water lines for temperature control. Controlling mold temperature was instrumental in reducing and removing chill marks.



HEAVY GAUGE PRESSURE FORM - SILVER

Ray Products, Ontario, CA Medical Device Cover

Overview:

A medical device manufacturer was ready to move from prototype to mid-scale production. During its prototyping and approval process, it used urethane casting to create the panels for its medical device enclosures. However, it was limited by manufacturing capacity, high per-part costs and issues with part-to-part consistency.



By switching from urethane casting to pressure forming, the medical device manufacturer was able to significantly lower costs, improve manufacturing speed, increase durability and guarantee part-to-part repeatability while planning for future increases in demand and capacity.

Overview

During medical device development, it is common to use prototyping processes that allow for quick, one-off changes during the product development and certification process. But, after its product earned certification, one Southern California medical device manufacturer came up against the limitations of the manufacturing process it had used during prototyping.

Urethane casting has significant limitations that can keep it from being a good option for even mid-sized production runs. The process uses soft, silicone molds that have to be remade after about 25 pieces, and production speed can be a significant bottleneck.

Urethane's soft molds can also cause issues with part-to-part repeatability. Because the molds can shift during the production process, it's not unusual to see significant variance from part to part. In addition, urethane's reduced durability can cause issues in any sort of a demanding operating environment.

The design company worked closely with the thermoforming company's manufacturing team and the medical device manufacturer's engineering team to make sure they were getting the most out of the process. This meant reducing the total number of bosses, designing in undercut features for rigidity and improved fit and working in other attachment points to lower the total manufacturing and assembly costs, while improving aesthetics.

In order to achieve the undercuts and tight tolerance parts required, the thermoformer used machined aluminum tooling that is temperature controlled with actuating slides. High quality tooling also allows for the tools to be textured when the time comes for molded in color opportunities. Starting with tooling that will achieve part-to-part repeatability is important when you are using 6 axis robotic trim centers to complete your production parts.

The thermoformer worked to develop a scalable manufacturing process. At the medical device manufacturer's lower initial quantities, painting the finished parts was the most cost-effective option. However, as the customer ramps up volume, the program will move into a molded-in color process that will reduce costs and still maintain aesthetics and quality.

Today, the medical devices are in production, delivering aesthetics, durability, precision and cost-effectiveness that wasn't possible with its original process.

HEAVY GAUGE TWIN SHEET - GOLD

Therma-Hexx
Portsmouth, NH
Hydronic Heat Transfer Panel

Overview

ThermaPANEL is a hydronic, modular heat transfer system for heating and cooling exterior and interior environments and surfaces. It is primarily used for highly efficient snow melting of pedestal and ground mounted pavements and for collecting solar energy to heat swimming pools while cooling the pool patio, not achievable with tube-based systems.



Features and Benefits

The ThermaPANEL units are twin sheet thermoformed using PE-RT plastic on a shuttle type thermoformer with production molds allowing for the creation of a multi-channel panel with flow turbulation stanchions and inlets that allow for even, turbulent flow of the hydronic fluid throughout the modular panel. The result is an enhanced, conductive or radiant heat transfer, between the panel and any surface that it is in contact with.

The .110" material is extruded into individual sheets and is corona treated on one side to allow for better adhesion of the PSA adhesive that holds 1" of EPS insulation to the bottom of the panel.

The temperature-controlled tooling forms an inlet and outlet near the center of each panel allowing for the secondary process of the socket fusion connection of 1/2" PE-RT "S" shaped tubes between the panels which in turn create foldable rows of pre-assembled panels up to 50' long. The socket fusion process rounds out the imperfectly thermoformed inlets.

After forming, the panels are cooled to a specific temperature allowing for a pre-determined shrink and then trimmed on a 30-ton stamping press with a 3D die. The design

of the cutting die was critical for trimming around the inlets while allowing for a variance in size due to shrink.

A proprietary pressurized testing unit had to be created in order to be attached and sealed to the roughly-formed inlets. After trimming, the panels are immediately pressure and heat tested in ovens providing the thermoformer with immediate results for QC.

The thermoforming, cooling, stamping, testing and re-grind process are performed by one person.

An automatic loading double end thermoformer is being built to cut production cycle time by more than 60%.

HEAVY GAUGE TWIN SHEET - SILVER

Allied Plastics, Twin Lakes, WI
Bear-Resistant Lid for Roll Out Cart

Overview

Designers created this custom lid to keep bears from gaining access to the contents of roll-out carts.

Features and Benefits

The lid is twin-sheet formed to provide a highly aesthetic, structurally rigid assembly for the enclosure of a 95-gallon garbage can cart. The existing cart lids in the field were constructed with a single sheet and then reinforced with metal angle or brackets and rivets to try and keep bears from gaining entry to the cart. By using the twin sheet process, the design team was able to make a much stronger lid but also have some flexibility when the bear would try and get into the cart. Upon release, the plastic immediately returns back to its formed state, not allowing the bears to gain access to the contents inside. By using the twin sheet process, the design team was able create a functional product, that is both aesthetically pleasing, robust, as well as being able to be produced in large quantities.

Tested on actual bears, the lid and cart have passed multiple certifications, including the Interagency Grizzly Bear Committee.

The twin sheet lid is formed from .125"/.156" HMWPE. The tool is a 2-cavity water-cooled, cast over-sized, 100% machined aluminum mold with a chemically etched texture.

