
NEW SHIPPING TRAY DESIGN SOLVES A MULTITUDE OF PROBLEMS

When properly engineered, shipping trays or dunnage can eliminate costly contamination, improve ergonomics and ultimately save freight costs.

As manufacturing strives to get leaner while maintaining a high level of quality, process workflows are changing in an effort to eliminate waste and improve productivity. Every aspect of the manufacturing process is being examined...or should be. Molded Materials Inc., a designer and manufacturer of engineered material handling solutions for shipping, processing and assembly operations is finding that much of manufacturing is examining more closely the way they move parts around.

Tom Elkington, VP of Operations for Molded Materials, says, “Interest in better engineered solutions to help protect manufactured parts for assembly and shipping operations is a direct result of many companies efforts to implement the concepts of lean manufacturing. To ‘move one, make one’, the efficiencies of workflow are a major consideration in eliminating bottlenecks. That’s where specially-designed material handling is playing a key role.”

“For example”, Elkington explains, “We were recently presented with a material handling problem related to some special dunnage trays used to move automotive throttle bodies from the casting supplier to the automotive component manufacturing plant and eventually to the final automotive assembly plant. Part contamination detected prior to the program launch had become unacceptable and quality was being compromised. The immediate solution was to use trays made from a more stable material. However, the ultimate Molded Material solution provided value-added benefits far beyond meeting the initial need.”

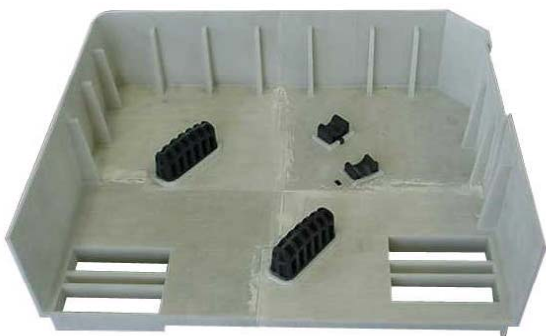


Figure 1: SLA prototype of new Molded Materials, Inc. tray design was produced to prove out the design. The prototype represented only 1/3 of the total tray design as a means of saving time and prototype costs.

Mark Marra, application engineer for Molded Materials, points out, “We’ve been confronted with contamination problems before, particularly when structural foam materials are used in dunnage designs. The original throttle body dunnage tray was made of structural foam, and one of the problems of the structural foam material is the fact that it has a tendency to have small particles ‘shave off’ during use. These particles were

contaminating the product, and for a critical fuel system component, this was unacceptable. In addition, the individual trays were heavy (25 lbs) for operators to physically handle. In the process of producing the final throttle body assembly, the operators were required to lift and remove the trays to expose the next layer of parts. The tray would need to be completely re-designed and re-engineered to eliminate contamination issues and reduce cost. Additionally, timing was a critical issue in this application. The program launch was to take place in six weeks, and we would need to design, prototype and produce the first production tray within a five-week period.”

The new tray design was initially rapid prototyped utilizing the SLA (stereolithography apparatus) process to produce a three dimensional solid model. The SLA process was utilized because it shortens from weeks down to a few hours the time required to construct models and eliminates the need for expensive tooling and fixtures. To save on prototyping costs, approximately one third of the tray was prototyped to prove out the design, Fig. 1. The shipping tray is manufactured from high-pressure injection molded polypropylene and utilizes special “snap-in” thermoplastic urethane (TPU) rest pads to securely nest the cast aluminum throttle bodies enabling it to pass necessary vibration, shaking and impact tests. The tray is approximately 47-inches long, 22-inches wide and 5-1/2-inches deep. Wall thickness is .187-inch. The original structural foam tray had the same dimensions except the wall thickness was .250-inch. The tray contact points for the throttle bodies have been positioned to only contact the aluminum casting and not interfere with any of the attached electronic components, Fig. 2. Thermoplastic urethane is used because it is a very durable material that resists cutting and tearing as well as providing good dampening properties. Additionally, there are TPU contact buttons on the underside of the tray that maintain a constant pressure on each of the assemblies during shipping.

The value-added benefits of the new design include four handle grips designed into the bottom of the tray providing an easier method for lifting and removing trays. Moving the handles to the tray interior and reducing the wall thickness allowed room for three parts per tray instead of the two that the current



Figure 2: The same throttle body tray is used to transport castings from the caster to the sub-assembly plant and then to final assembly. Photo shows orange TPU rest points and four handles molded into the tray.

tray permitted. In operation, there are now 14 trays to a pallet; two trays side-by-side, stacked seven levels high. The new tray weighs only 18-lbs compared to the existing 25-lb structural foam design, Fig. 3. The additional part per tray reduced shipping costs by 33%, which offset the development and tooling costs of the new tray. In the final analysis, the new tray design significantly reduced weight, providing better ergonomics, contamination was eliminated and shipping costs were reduced by a third.

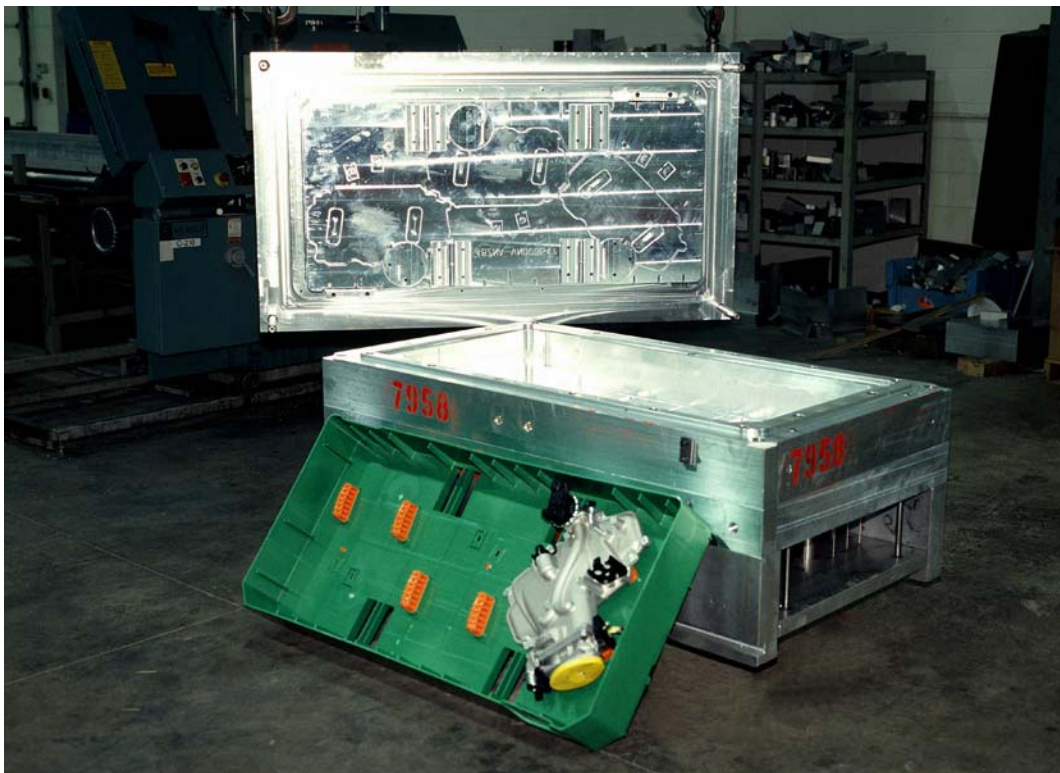


Figure 3: The injection molding die for the throttle body tray is shown with a finished green injection molded tray with one of the three throttle body sub-assemblies located in proper position.

Elkington notes, “In the automotive industry, in particular, more modular assemblies are being moved from suppliers to final assembly plants. In many cases these assemblies have been inspected and tested. They already represent a large investment. Damage in transport is very costly and basically unacceptable. That’s why engineered material handling solutions are becoming a necessity for reducing costs, improving quality and process workflow. With the proper design and efficient use of injection molding techniques, combined with the utilization of the right material for the application, manufacturers can help eliminate transportation as a bottleneck, and move in positive direction towards a truly lean manufacturing work flow.”