

Container Packaging

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Introduction:

Abstract: MAKO lighting products are manufactured in Shenzhen, China. The products must be packaged and shipped in cargo shipping containers to the United States. Shipping and packaging were expensive, and not sustainable. The original packaging contained 500 modules, 500 clamps, & 160 distribution mounts. Each part was individually packaged.

Objective: Design a packaging system that would fit the largest number of light parts in a 40' shipping container. Packaging should be minimal but protect the product.

Proposed Solution:

Create packaging that holds multiple parts per box, instead of individually boxed parts. Molded pulp can be used as an alternative to foam. Modules and spines can be packaged vertically for easy removal.

Calculations:

Stack Load: After performing a box crush test on a sample package, it is calculated that the packages can withstand 2,540 lbs. stacked on them without any deformation. The stack load of the heatsink packaging is 1,100 lbs.

Cost Savings: The original design had a cost of \$15 per unit. One unit is one heatsink, one clamp, and 0.25 mounts. The new design reduced the unit cost down to \$8.97, bringing the total cost of the packaging down to \$10,764 per container. M3 Innovation now saves \$7,236 per shipment on packaging.



Heatsink (x20)

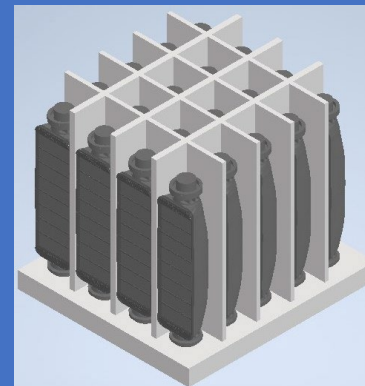


Fig. 2: 20 Heatsinks placed in package (paper carton not shown)

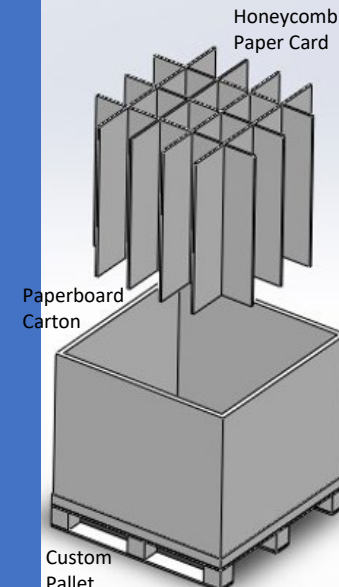


Fig. 3: Exploded view of the heatsink packaging

Volume Comparison of Old & New Packaging



Fig. 4: Difference in volume of packaging components per one heatsink. The total volume saved is 1,328 cubic ft.

Conclusion:

The new container arrangement holds 1200 modules, 1200 clamps, & 400 distribution mounts. There are 60 module boxes, 6 clamp boxes, and 9 distribution mount boxes per shipping container.

The new packaging allows for a 140% increase of product per container. By reducing the amount of foam used and increasing use of reusable materials, the carbon footprint from packaging has significantly declined. Due to the reduced volume of this packaging, M3 Innovation is able to save 40% on packaging costs.

Acknowledgements & References:

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References:

1. Fundamentals of Packaging Technology, fifth edition
2. Huadian LED Lighting

Compression Strength

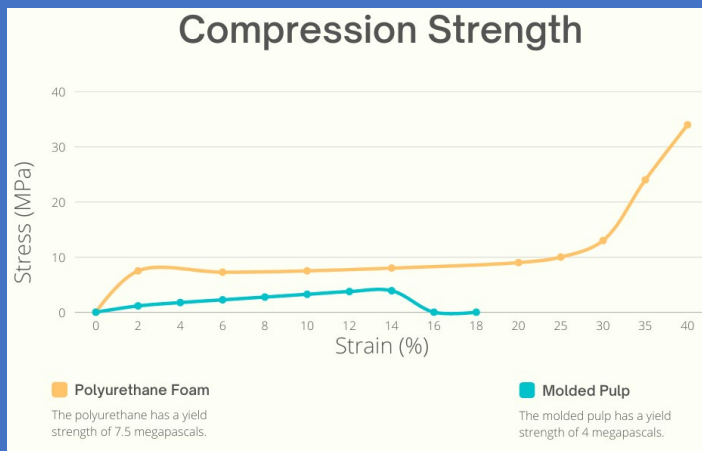


Fig. 1: Compressive strength of protective packaging materials.

Final Design:

The interior contains a honeycomb paper card that sits between each module to protect and keep them separated. Polyurethane foam caps cover both ends of each module for extra protection. Modules are placed vertically for easy removal from the package. Each package holds 20 modules. (38.19" x 35.04" x 31.69")