Jeco Thermoforming

Thermoforming involves heating a plastic sheet and then molding it to a specific shape. The process finds use across a wide range of applications—from inexpensive packaging materials to luxury automobile dashboards.

At Jeco, we take the basic thermoforming process to the next level, thermoforming unusual plastics and combining materials with different physical and mechanical characteristics into specialized components for unusual applications. Jeco engineers excel in solving unique problems requiring extreme material strength, dramatic weight reduction, hard-to-form shapes, demanding environments, and severe cost constraints. Jeco thermoforming experts often can replace castings or forged parts with strong composites to reduce weight and cost. Strict tolerances can be achieved without machining.

Jeco processes thermoplastic composites by combining compression molding and pressure forming, rather than using compression and injection molding. The Jeco method involves closely matching heat from a halogen light system to the absorption spectra of engineering resins, resulting in uniform heating of thick or thin sheet stocks, or loose laminates, without degrading the surface.

The proprietary Jeco thermoforming technique permits us to:

- Use more economical tooling
- Make quicker tool changes
- Reduce scrap rates
- Lower machine charges by using shorter cycle times
- Simultaneously laminate and form dissimilar materials
- Incorporate structural elements in laminates, including topologically interlocking materials

Jeco Engineering Design Capability

Unique engineering experience and machine capability are combined at Jeco Plastics to produce thermoformed products unlike those available from traditional thermoformers. Jeco engineers are familiar with single- and twin-sheet products as well as multilayer laminates using a wide variety of materials in various thicknesses. Jeco specializes in molded products with unique capabilities and specific attributes such as impact resistance, structural strength, temperature range, surface finish, purity, friction coefficients, static dissipation, resistance to chemicals, and transparency or opacity with respect to a wide range of the electromagnetic spectrum. Jeco routinely holds tolerances appropriate for aerospace and automotive components. A recent door liner produced by Jeco for NASA required conformance to more than 40 specified dimensions, and tolerances within tenths of a millimeter. Nonthermoplastic materials are readily integrated into design solutions, including steel, aluminum, and thermoset materials.

Jeco design and simulation capabilities include SolidWorks, ABAQUS, and LS DYNA. In addition, Jeco has access to supercomputer facilities at Ohio State University through manufacturing software hubs. Jeco has internal facilities to validate results and a 3D printer producing prototype products and scale models for testing. Jeco engineers use both computerized and manual simulation to design thermoplastic composite molding tools that eliminate unintended wrinkles and webbing. Jeco is a full member of the *Institute for Advanced Composites Manufacturing Innovation* (IACMI), and has received numerous grants for aerospace and defense research from Purdue University, Argonne National Laboratory, and several state and federal government agencies.

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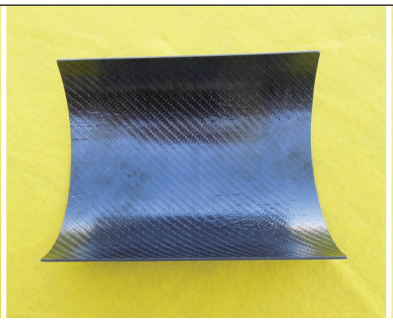
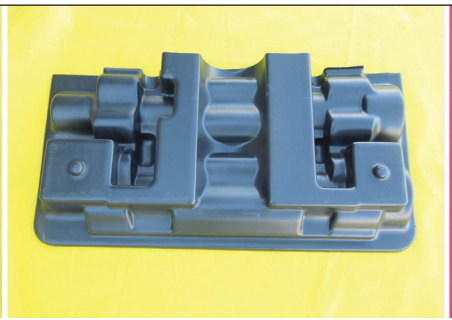
Evonik foam with laminated PP





Jeco Thermoforming Material Expertise

Jeco brings a unique depth of experience in material science to thermoforming problems. Thermoplastic composites, high temperature thermoplastic resins, and specialty foams are among the areas where Jeco engineers have expertise.

Thermoplastic Composites are materials that combine a thermoplastic base resin with continuous fiber reinforcement material such as carbon fiber, fiberglass, polypropylene, or Aramid. The base resins for commercially available materials typically include high-temperature resins such as polyether ether ketone (PEEK), polyether ketone ketone (PEKK), polyamide (PA), polypropylene composites such as Curv (used by Jeco for a recent NASA project), and the full range of TEPEX and Cytec composite materials.

High Temperature Resins available for Jeco advanced thermoforming projects include PEEK, PEKK, polyphenylene sulfide (PPS), polyamide-imide (PAI), and many imidized resins.

Foams employed by Jeco include Rohacell Evonik specialty material and many others.

Metamaterials—combinations of different materials not commercially available—are used by Jeco to impart specific characteristics to finished thermoformed products. Jeco has successfully created HDPE/continuous Hexcell carbon fiber/ HDPE combinations, as well as a Rohacell Hero foam construction with a Curv thermoplastic composite shell, and various combinations of metal and plastic honeycomb structures with high-temperature engineering resins.

Thermoformed/Rotational Combination Structures are unique products from Jeco Plastics, based upon the two different molding technologies under the same roof.

Production Thermoforming at Jeco

Jeco production thermoforming capability derives from a Geiss T8 twin-sheet thermoforming machine with a corresponding full five-axis Geiss CNC machine and matching oven drying capability. With one of only a few such devices in North America, Jeco engineers can combine thermoforming and pressure forming, using different fabrics and plastics to gain rigidity and strength, or to create structures with characteristics such as multilayered laminated products with continuous fibers. In addition, custom forming and machining capabilities enable Jeco engineers to eliminate voids, residual stresses, and surface flaws.

The thermoforming characteristics produced by Jeco often find aerospace application. Boeing and NASA engaged Jeco to produce thermoplastic composites using PEKK with continuous carbon fiber and polypropylene with continuous polypropylene fibers. The NASA project yielded a cryogenic container now orbiting the earth in the International Space Station.

Aerospace applications for Jeco thermoforming capability are increasingly focused on reducing weight while maintaining structural strength. Eliminating metal aerospace structures depends upon Jeco expertise in thermoplastic composites, high temperature thermoplastic resins, and specialty foams—technology areas in which Jeco has years of experience.

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