Thermoset Composites Solutions

DESIGN
CUSTOM-MOLDING
INSULATORS

Net shape moldings add value

Do you have complicated assemblies, painted, or machined metal parts? Do you have thermoplastic parts that fail?

STERIS®, a manufacturer of stretchers, turned to Bo-Witt to replace a PVC component that was the single largest warranty liability for the firm. In addition to the great improved structural performance of BMC versus PVC, Bo-Witt was able to reduce the number of parts the OEM had to manage from 72 to 4.94% fewer parts, less assembly, handling, space, planning, and no warranty claims or headaches deliver performance and value.

This part is shown to the right under a load. This extreme test (holding a 6 foot, 4 inch, 240 pound man and only restrained at two points versus five) demonstrates the strength of this cosmetic grade material. This specialized BMC was developed exclusively for this customer's need.

The strenght of Thermoset Composites is evident in this extreme test.

One piece molding delivers a 94% reduction in part numbers to manage.

What is the right material for your demanding application?

Thermosets Composites are complicated. We know Thermoset Composites, and we will work with you to understand your specific need. The choice of material and process is a balancing act. Perhaps your need is to replace a thermoplastic part that fails or a cast and machined metal component. But, what kind of load does the part experience in use? Is the part in a cosmetically sensitive area?

These questions, and more, must be taken into consideration when selecting the material and process for your demanding application.

Working with your team, Bo-Witt's engineers will develop a robust set of design inputs and outputs, establish test and validation criteria, and work to deliver a solution that performs, creates value and helps your company deliver a world class solution to its customers.

BOWITT®
PRODUCTS INC

500 North Walnut Street
Edinburgh, Indiana 46124

tel : 812.526.5561
fax: 888.526.5564

toll free: 1.877.BOWITT-1
1.877.269.4881

www.bowitt.com

ISO 9001
QMI REGISTERED

In Detail

$3K\left(\frac{1}{3}E_{ij}\delta_{ij}\right)+2G\left(E_{ij}-\frac{1}{3}E_{ij}\delta_{ij}\right)$

More about the material used in this application:

Bo-Witt material number 9300 is an extruded, custom colored, shrink controlled, unsaturated polyester bulk molding compound that is reinforced with glass fiber. This material exhibits good cosmetic finish, resistance to oils and solvents, and above average scratch resistance.

The applications of this material are varied, but generally this material is used when there is a need for dimensional stability, color matching, and durability in cosmetically sensitive molded part applications.

Important Note:

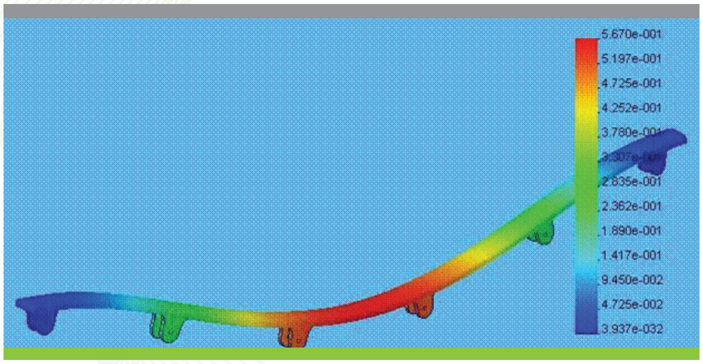
The data presented herein is for comparison purposes only and should be considered as "typical values". Users should conduct sufficient testing and validation of any material or design in order to prove its suitability for any particular application. NO WARRANTY OR FITNESS FOR USE IN ANY SPECIFIC APPLICATION IS EXPRESSED OR IMPLIED.

Properties	ASTM test Method	Typical Values
Compressive Strength, kPSI	D695	18-22
Flexure Strength, kPSI	D790	10-23
Tensile Strength, kPSI	D638	5-10
Impact Strength, Ft Lbs./In.	D250	2-12
Liquid Absorption , % Gain	D570	.2 max
Barcol Hardness	D2583	40-50
Specific Gravity	D792	1.9-1.95
HDT, F @ 264 PSI	D648	425-500

The Power of Solid Models and Finite Element Analysis (FEA)

Since the beginning of modern engineering, drawings have been the way for designers to communicate how a product is to be constructed, what tolerances are to be held, and how individual parts are to fit together into a functioning machine. Going on simple rules of thumb, engineers have developed many design guidelines to help prevent failure of a product in the future.

Now, with the help of solid models, engineers can conduct rough cut failure testing right from their desks. This mathematical analysis is called Finite Element Analysis. In order to conduct a FEA, a computer must create thousands (if not millions) of individual points. Then, using vector calculus and linear algebra, the effect of a pressure or force is calculated for every point on the model. These results are then compared to the material properties and a stress and deformation diagram can be generated like the one below.



Computer generated displacement model from an FEA analysis of the STERIS® part.

The final result of an FEA is generally a factor of safety rating for the model that can be analyzed to determine where any potential failure may occur.

In order for an FEA analysis to yield results that are realistic:

-The model file must be solid, not a surface model;

-The material and its properties must be properly inputted into the software; and,

-The actual conditions of use must be properly understood and applied.

FEA can be conducted on forces, pressure, or thermal loading. Often, a simple "quick pass" is sufficient to confirm that the factor of safety is sufficient for a product without undertaking the expense of generating many models. Furthermore, only the most expensive programs and robust computers are capable of conducting FEA on nonlinear materials and complex vibration and fatigue analysis.

FEA creates value by eliminating many design mistakes before tooling dollars are spent.

While FEA will never fully replace prototype and lifecycle testing, it does provide a mathematical procedure to aid in Design Failure Mode and Effect Analysis and should be considered when developing a complex product where design corrections will be expensive.