

Enclosure Maker, Allied Moulded Products, Opts for Corrosion-Fighting, Low-Cost Composites

Paul Rhodes, vice president of marketing, IDI Composites International
Bob Rauhley, vice president of operations, Allied Moulded Products, Inc.

Many enclosures that house electrical and electronic equipment are exposed to highly corrosive environments in facilities such as chemical and wastewater-treatment plants, as well as golf courses and other outdoor locations. The original industry standards for these boxes were developed for metals, but most metals are problematic alternatives for corrosive environments. Stainless steel provides more corrosion resistance than other metals, but its high cost drives up the price of enclosures.

To avoid these metal-related problems, Allied Moulded Products, Inc. is making enclosures out of special materials produced by IDI Composites International, a formulator and manufacturer of thermoset composite bulk molding compound (BMC) and sheet molding compound (SMC). Allied has found that BMC and SMC hold up well in the most corrosive environments, and are much less expensive than stainless steel.

Besides high corrosion resistance and low cost, BMC and SMC offer good electrical insulation properties, which is important when the enclosures house electrical equipment. In addition, the mechanical properties of BMC and SMC help them meet a number of stringent NEMA strength requirements developed for metal enclosures. These include ballistic requirements meant to ensure that enclosures can withstand attacks by armed vandals and the chance impacts of stones, golf balls and other hard objects traveling at high speeds. Thermoset enclosures are also up to 35 percent lighter than steel units of equal strength, so manufacturers who switch from steel to composites can reduce product weight without sacrificing key mechanical properties.



To avoid common problems associated with the use of metals in enclosures such as corrosion and denting, Allied Moulded Products is using BMC and SMC for its electrical and electronic enclosures.

Unlike metal enclosures, thermoset boxes won't become dented over time by random impacts, due to the memory characteristics of BMC and SMC. In addition, thermosets feature UV resistance, important for outdoor enclosures. They also offer molded-in color, which eliminates the need to paint enclosures to give them a more pleasing appearance and makes them less conspicuous in places where aesthetics matter.

Thermoset composites consist of fiber reinforcement in a polymer resin. The fiber provides strength and stiffness, while the resin protects the fibers and gives the material its shape.

Thermoset resins change from liquids to solids during the molding process. Exposure to thermal energy causes the formation of three-dimensional covalent bonds between the molecules. This process, known as crosslinking, is irreversible. Since crosslinking permanently solidifies the materials, they are known as thermosets.



Thermoset composites consist of fiber reinforcement in a polymer resin.

Crosslinking creates a rigid molecular structure that allows thermosets to maintain good physical and electrical properties during prolonged exposure to high temperatures. This characteristic distinguishes thermosets from thermoplastics, which are generally unusable in high-temperature environments because they can be melted again after solidification.

Both BMC and SMC are suitable for compression, transfer and injection molding. In BMC, plastic resin, fiber reinforcement and several other ingredients blend to form a viscous, putty-like material. By weight, BMC normally includes 5 to 25 percent reinforcement, which typically consists of short glass fibers.

SMC is more expensive than BMC, but it offers higher mechanical strength, making it well suited for Allied's larger electrical enclosures. Made of the same ingredients as BMC, SMC normally includes 10 to 65 percent reinforcement, which consists of longer glass fibers than those found in BMC.

Other Key BMC and SMC Benefits Include:

- **Design flexibility:** Composite molding allows the creation of complex shapes and intricate details that are impractical or even impossible to produce when using metal shaping techniques.
- **No machining:** By using BMC, manufacturers can mold complex parts in a single step, which shortens production time. Metal parts must be machined into required shapes.
- **Dimensional stability:** Their crosslinked molecules make BMC and SMC far less susceptible to relaxation or creep failure than thermoplastics in high-temperature environments. Thermosets also shrink less than thermoplastics, which helps ensure close tolerances in molded parts and eliminates the need for secondary machining operations.
- **Lower manufacturing costs:** Open molding of composites costs much less than thermoplastic injection molding, which requires a multimillion-dollar investment in equipment and molds. In addition, composite tooling costs less than half as much as steel stamping tooling.
- **Durability:** Thermoset composite products have very long life spans. Many composite structures built in the 1950s are still in use.

These advantages and others make thermoset composites an attractive option for designers and manufacturers in many industries, including:

- **Automotive and Heavy Truck:** Thermosets provide a high strength-to-weight ratio, dimensional stability, and excellent surface quality for many exterior and interior vehicle parts.
- **Appliance:** Dimensional stability and stain and corrosion resistance make thermosets a popular choice for a wide variety of appliance components.
- **Electrical:** Thermosets provide excellent electrical resistance even during prolonged exposure to elevated temperatures.
- **Lighting:** Components in this industry benefit from thermoset advantages such as light weight, structural rigidity, UV stability and superior dielectric properties.
- **Food Service:** In various commercial kitchen applications, thermosets withstand heat and exposure to corrosive food ingredients and cleaning solutions.
- **Alternate Energy:** In solar and wind power applications, thermosets won't warp or deteriorate during long-term exposure to the sun and other natural elements.



BMC and SMC are capable and cost-effective material options for electrical and electronic enclosures that are exposed to harsh environments. These thermoset composite materials provide corrosion resistance but are also less expensive than stainless steel. In addition, BMC and SMC provide many other attractive properties including light weight, high strength and electrical resistance. These properties and others are making BMC and SMC an increasingly popular material choice for products in a wide variety of industries.



Your wish is our command center

Optima can bring your vision of the ideal mobile command & communications center to life. Our vast modular line of cabinet and console options provide a wealth of configuration possibilities. This saves you time, effort and money. Our rugged design includes several levels of reinforcement for even the roughest environments. Plus, our experienced team of design engineers can apply creative ergonomics and logistics. With Optima, your future looks bright.



Cabinet Enclosures - Mobile



Command/Communications Consoles - Mobile



Desk Consoles - Mobile

Optima EPS
Cabinets & Enclosures
An ELMA company

Phone: 770-496-1000 Web: www.optimeps.com
Email: sales@optimeps.com

ELMA
Your Solution Partner