Technical Datasheet

SYNTAC® 351

A Pre-blended Castable Syntactic Composite Material for Thermoforming

Introduction

Trelleborg Emerson & Cuming, Inc. pioneered the development and introduction of the first syntactic foam thermoforming material in 1981 and through a process of continuous investment and product development are recognised as leaders in the field.

Syntac® 351 is a castable syntactic composite material made from epoxy resin and high performance hollow glass microspheres designed specifically for molding thermoforming plugs and other associated tooling.

Supplied pre-blended, Syntac® 351 is prepared by a simple process of warming, deairing, casting, curing and post curing – with no weighing or mixing involved. On curing it is a rigid, high strength material that exhibits the same properties as shapes machined from Syntac® 350, the corresponding material supplied in block, sheet and rod form.

Features & Benefits

Syntac® 351 is engineered to address problems inherent in traditional thermoforming tooling, such as sticking, deformation and failure.

- **Simple and fast plug preparation**
  Syntac® 351 can be easily cast from a pre-blend.
- **Low thermal conductivity and Specific Heat**
  Reduced warm up times, and elimination of plug sticking or fouling.
- **Excellent Dimensional Stability and Temperature Resistance**
  Maintains shape and temperature at elevated temperatures.
  Consistent and reliable performance.
  Long plug life, proven by long service history in application.
- **Lightweight**
  Reduces wear and tear on moving machinery parts.
- **Versatile**
  Poured and cast in a variety of shapes and sizes.
- **Repair kit**
  Available for plug repair of syntactic materials.

Major cost saving benefits

- No plug sticking or fouling.
- Reduced warm up time.
- No plug heaters.
- Long plug life.
- Consistent performance.
- Simple plug preparation.
- Fast plug production.

Typical Properties

Syntac® 351	Metric	Imperial
Colour	White	White
Density	672kg/m^3	42lb/ft^3
Service temperature	177°C	350°F
Thermal conductivity	0.12W/m°K	0.07 BTU/hr-ft-°F
Specific heat	2090 J/kg°K	0.50 BTU/lb°F
Coefficient of thermal expansion	31x10^{-6}cm/cm/°C	17x10^{-6} in/in/°F
Compressive strength	45MPa	6,500psi
Compressive modulus	2337MPa	339,000psi
Shore D hardness	55°D@177°C	55°D@350°F

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Applications

Syntac® 351 can be used to form a wide range of polymer sheet materials, such as PS, PE and PVC. It is ideal for thermoforming on a wide range of inline, sheet or rotary fed systems, such as component manufacture within the food and medical packaging, aerospace and automotive sectors. Available in 5 and 1 gallon containers, both large and small plugs can be molded.

The material's versatility also makes it ideal for prototype tooling in many other plastic processes.

Syntac® 351 can be used as a direct replacement for Hytac®-C.

Safety

The components of the Syntac® 351 kit do not present any unusual safety hazards. Normal precautions should be used when handling the material to prevent unnecessary contact with the skin or eyes. Always wear safety glasses and protective gloves. When Syntac® cures, it does not pose any health hazards if handled correctly. Please consult the MSDS for information on storage, personal protection, spill procedures, recommended first aid and waste disposal.

Machining

For optimum performance when machining we recommend the use of 2-3 flutes in order to minimise potential breakout.

Technical Assistance

Trelleborg Emerson & Cuming, Inc. provide information and assistance to help users achieve maximum benefits from Syntac® 351.

Casting

1. Clean the mold thoroughly, using solvent if necessary. Apply release agent compatible with anhydride cured epoxy resin. Follow release agent manufacturers instruction, which may include pre-heating the mold.
2. Syntac® 351 must be heated to between 49-60°C (120-140°F). Warming is necessary to thin the material, permitting complete deairing and ease of pouring. Check the temperature to ensure the material reaches the correct range and does not overheat. After warming the pot life is two hours.

   Do not warm more material than required. If only a small amount is needed, it can be removed from the container stored at 4°C (40°F). The material will be thick, but small amounts can be scooped out. If the entire container is going to be used over a period of between one and four days, it can be left at room temperature. If the entire container is to be used at one time, it can be placed directly in the warming oven after removal from cold storage. Be sure to return any unused portions to 4°C (40°F) storage to provide maximum shelf life.
3. When the material is going to be de-aired under vacuum, it should be warmed in a container that will allow for a volume expansion of between 3 to 5 times. Deair the warm material under a vacuum of 29.5 in Hg minimum to ensure complete air removal. The material will foam as air is removed, then collapse as the last air is withdrawn. When almost back to its original volume, the vacuum can be released. Make sure the foam does not overflow from the container.
4. Pour the warm, deaired material slowly into the molds. Pour down the side of the mold to minimise air entrapment. It is recommended to vibrate for about ten minutes to help the material flow and pack along the mold surface.

Curing

1. Cure castings at 65-70°C (150-160°F) for four to six hours. Small castings less than 0.8lb (0.36kg) may require a higher temperature of between 93-104°C (200-220°F) to cure them. The initial curing period is designed to heat the foam at a low enough temperature to avoid a high exotherm and to allow the heat from the exothermic reaction to dissipate. After curing, the castings may be demolded and post-cured or they may be left in the molds for post-curing.
2. Post-cure for between four and six hours at 132-138°C (270-280°F). Cure exceptionally large pieces even longer to ensure they are heated throughout. We recommend gradual cooling to minimise thermal stress by leaving them in the oven until the casting cools to less than 65°C (150°F). Demolding may be easier when the casting is still warm.

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