

Description

EMP160 is an advanced glass-filled epoxy laminating/reinforcement paste used for the production of high temperature composite moulds/tools up to 160°C. EMP160 can be used on its own or can be used to fill in corners or detailed sections on larger or more complex moulds before the main reinforcement is added.

For use with **EG160** High Temp Epoxy Tooling Gelcoat and **EL160** High Temp Epoxy Laminating Resin.

Key Features

- Hand laminated tools up to 125°C
- Suitable for prepreg tooling
- Fast and Easy to use
- Can be used for filleting and filling

Typical Uses

- Reinforcement (backing) on moulds for prepreg manufacture (see service temperature notes below)
- Reinforcement (backing) on moulds for high temperature epoxy infusion
- Filling or filleting tight corners or complex details on moulds before laminating with compatible epoxy resin and reinforcement

Specification

Maximum Service Temperature

Any air voids present within the paste or between the paste and the gelcoat can cause blisters or imperfections on the surface of a mould during post-cure at elevated temperature. For this reason it is very important to minimise void content as far as possible during lamination. The maximum service temperature should also be limited to 120°C when hand laminating with this product.

If the required service temperature exceeds 125°C (up to a maximum of 160°C) then special care and processing must be carried out to ensure that no air voids or air entrapment exist within the paste or between the paste and the gelcoat. Practically this is difficult to achieve when using the EMP160 moulding paste as the main reinforcement for the mould. It is possible however to use small amounts of EMP160 for filleting and filling corners and details on a mould. Then a main reinforcement using EL160 laminating resin and woven reinforcement can be overlaminated and consolidated by vacuum bagging the laminate to eliminate air entrapment.

Compatibility

EMP160 is designed for use with EG160 High Temp Epoxy Tooling Gelcoat. When applying the paste onto the gelcoat, a fresh 'wet' application of EG160 gelcoat should be used to 'couple' the paste to the gelcoat.

If using EMP160 for filleting and filling corners and details on a mould prior to using a traditional fabric reinforcement, the fabric reinforcement should be laminated using EL160 Epoxy Laminating Resin.

Compatibility with other high temperature epoxy gelcoats and resins is possible but not guaranteed. In all cases, resins or pastes used to back-up EG160 gelcoat must have similar high temperature properties in order to result in a completed mould or component which maintains the high temperature stability of EG160.

Finished Mould Compatibility

Moulds/tools made using EG160 gelcoat can be used to produce parts using epoxy, polyester and vinylester resin systems, including prepreps (subject to maximum service temperature). A suitable release agent is required.

How to Use

Mould Preparation

EMP160 should be used to reinforce one or two applications of a suitable epoxy gelcoat such as EG160 High Temp Epoxy Tooling Gelcoat. A coupling coat should be used between these 2 stages to reduce the chance of delamination.

Similarly to the gelcoating schedule, it is essential that the coupling coat is applied to the existing gelcoat application whilst the previous application is still at the 'B-stage' of its cure (where it is firm but still tacky); failure to do so will result in delamination.

Mix Ratio & Technique

EMP160 paste should be mixed with EMP160 hardener at a ratio of 100:8 by weight. Use digital scales and be as accurate as possible.

To mix the epoxy paste and hardener together it is suggested to weigh the required amount of paste into a mixing bucket, make a well in the paste and then weigh-out and pour the correct amount of hardener into the well. Wearing sturdy nitrile (or similar) gloves, thoroughly mix the paste with the hardener to a smooth consistency. Keep mixing (by kneading and blending the mix with your fingers) until there are no lumps.

As soon as the paste has been mixed it will begin to cure and so once mixed it should be applied to the gelcoat immediately.

Application

Using EMP160 as the complete mould reinforcement.

When making a mould where then EMP160 paste will be the mould's only reinforcement, a thin film of 'wet' of EG160 gelcoat should be applied all over the mould surface to act as a coupling coat for the paste. This step is very important and will ensure a good bond between the paste and gelcoat.

The EMP160 paste should be applied directly onto the wet 'coupling' layer of EG160 gelcoat in an even layer of around 10-15mm. Take care to ensure that the paste does not exceed 25mm in thickness (in a single application). At all times, try to avoid any air entrapment by ensuring paste is built-up gradually, starting with any inside corners.

Using EMP160 for Filleting and Filling

When using EMP160 paste to fillet or fill details on a mould before laminating the bulk of the reinforcement using laminating resin and woven reinforcement, the paste should be 'coupled' to the EG160 gelcoat using a wet thin film layer of either EG160 gelcoat or EL160 laminating resin to ensure a good interface.

Apply the EMP160 paste as required, typically focussing on the inside of tight corners or other detailed areas of the mould. The paste can be used to completely 'smooth out' the shape of the mould before the woven reinforcement is applied.

The EL160 laminating resin and woven reinforcement can be applied 'wet on wet' onto uncured EMP160 paste. Always pay attention to ensure no air entrapment or voiding between the paste and gelcoat or the woven reinforcement



Cure and Post-Cure

Before components or moulds made using EMP160 Paste can be used at elevated temperature, they must be allowed to cure for a minimum of 24hrs at room temperature and then undergo a ramped (or stepped) post-cure to at least 5°C above the required service temperature.

The EMP160 can be cured to a demouldable state in 24hrs at 25°C, but at this stage, it can be brittle and prone to cracking during demoulding of more complex mould shapes. Therefore, in most cases, it is recommended to conduct the initial cure at 40°C (whereby the cure time can be reduced to 12hrs). Conducting the initial cure at 40°C is low enough to avoid distortion of the pattern whilst still curing the resin to an adequately non-brittle state to demould without risk of damage.

Recommended: 12hrs @ 40°C

Alternative: 24hrs (min) @ 25°C - Warning: Resin will be very brittle before post-cure

To minimise the risk of distortion, an initial cure should be undertaken still on the mould (or pattern). This is to allow the resin system to cure enough to ensure that, during the main post-cure, the mould will not deform or distort as the temperature rises.

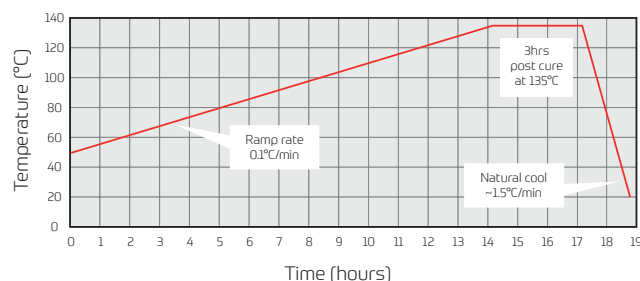
Once the initial cure is complete, the piece can then be demoulded ready for the full post-cure.

Suggested Post-Cure Cycle for Prepreg Tools

After initial cure, the new mould should be removed from the pattern and then post-cured - using a very gradual ramp rate to avoid distortion - up to its full service temperature.

Step	Start Temp	Ramp Rate	Duration	End Temp	Elapsed Time
1	50°C	0.1°C/min	14:10	135°C	14:10
2	135°C	Soak	3:00	135°C	17:10
3	135°C	Natural Cool	45:00	~20°C	18:40

The recommended post-cure cycle (above) calls for a temperature ramp from 50°C to 135°C. If a temperature controller with programmable ramp rate is not available then the oven temperature can be increased by 12°C every 2hours until 135°C is reached.



Technical Specifications

Material Properties and Cure Time

Property	Units	Value
Material Composition		Epoxy Aluminium Powder Glass Fibre
Viscosity		Paste
Aluminium Filled?		Yes
Colour		Grey
Density at 25°C	g/cm ³	1.17-1.27
Pot-Life (200g at 25°C)	Minutes	120
Demould Time (200g at 25°C)	Hours	24

Cured Mechanical Properties

Property	Units	Value
Hardness	Shore D	75 - 85
Heat Distortion Temperature	°C	160
Linear Shrinkage (500 x 50 x 10mm)	%	<0.05
Tensile Strength	MPa	5.5 - 7.5
Elongation at Break	%	2.0 - 3.0
Flexural Strength	MPa	40.0 - 50.0
Flexural Modulus	MPa	5150 - 5750
Coefficient of Thermal Expansion (CTE)	°C -1	6 -10 x 10 ⁻⁶

Transport and Storage

EMP160 and hardener should be kept in tightly seal containers during transport and storage. Both the resin and hardener should be stored in ambient conditions of between 15°C (59°F) and 25°C (77°F).

When stored correctly, the resin and hardener will have a shelf-life of 12 months. Pay particular attention to ensuring that containers are kept tightly sealed. Epoxy hardeners especially will deteriorate quickly when exposed to air.

Disclaimer

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Leaders in materials, equipment and training for advanced composites

Easy Composites Ltd
Unit 39, Park Hall Business Village
Stoke-on-Trent, ST3 5XA
United Kingdom

Easy Composites Ltd
Beneluxbaan 16
Rijen, 5121 DC
Netherlands

W: www.easycomposites.com
E: sales@easycomposites.com
T: +44 (0) 1782 454499

Version 1.1
Revised 03/12/2024

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