

Technical Information

Mould Making Guide

– Suggestions for the manufacture of GRP moulds

APP048/REV02

PLUGS

A plug (pattern) determines the quality of a mould which in turn imparts this quality to the final moulding. It is therefore vitally important to make a plug that is as dimensionally stable as possible. Plugs should, be maintained at a temperature of between 18 and 23 °C, not be moved, be held at a constant humidity and never be exposed to direct sunlight. The materials that make up the plug should be styrene resistant and stable at temperatures up to 60 °C. One of the most important aspects of the plug is the surface quality.

High surface quality (lustre) can be achieved through the use of Duratec plug coatings supplied by NCS Resins. Ask NCS Resins for assistance in recommending the most suitable Duratec products for this application.

Some commonly used materials in the manufacture of plugs include GRP, Polyurethane, Polystyrene, Plywood, MDF, Balsa, Polyester fillers and certain adhesives.

The following temperatures provide a guide to the Heat resistance of some materials

- Polyurethane 80 – 100 °C
- Polystyrene 76 °C
- Body filler base resin 40 °C
- Contact adhesive 50 – 60 °C
- Professional wood glue (Alcolin professional) 80 °C

The plug will obviously need to be released with a suitable wax release agent applied according to manufacturers' instructions, before mould making commences. Best results are achieved with the use of Axel XTR sealer followed by Axel Paste Wiz. Ask NCS Resins for specific recommendations on the use of these products.

Once the plug or pattern is complete and ready the mould is made in three steps;

1. Application of the tooling gelcoat
2. Application of a barrier coat
3. Application of the structural layers.

1. APPLICATION OF NORPOL GM TOOLING GELCOAT

BRUSH APPLICATION GELCOAT

Apply by brush approximately 550 – 850 micron thickness. Pigment pastes with a high opacity should be selected so that the quantity of paste added does not exceed 5 phg (parts per hundred gelcoat). The temperature of the plug and the gelcoat should be

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adjusted to 23 to 27°C for the best results.

NOTE: Gelcoat should not be applied at temperatures below 15°C

- i) Apply approximately 650 to 980g/m²(grams per square metre).
- ii) Do not use less than 1.3 phg **BUTANOX M50** / Curox M200 to catalyse the gelcoat (1.3 to 1.8 phg recommended)
- iii) Allow the gelcoat to cure to a tacky feel for a minimum of two hours.

SPRAY APPLICATION OF GELCOAT

Apply by spray through an Advantage Gelcoat Spray Gun (Magnum Venus Plastech) with internal heater set to 35°C and pump pressure set at 30psi.

Use nozzles 518 or 515 and apply in several coats.

- i) Initially three passes of mist coat thickness (Approx 150µm), allowing approximately 4 minutes between passes.
- ii) Build more rapidly to total thickness of 550 to 850 microns.

Allow this gelcoat to cure (approx. 2 hrs – depending on conditions)

2. BARRIERCOAT APPLICATION (EuromereSpraycore FSP1700)

- i) This material is to be stirred thoroughly before being spray applied.
- ii) A standard Advantage Gelcoat Spray Gun (Magnum Venus Plastech) can be used with all filters removed and in conjunction with an adjustable 0.028 inch Titan spraytip, with pump pressure set at approximately 40psi.
- iii) A Pro Ryder Gelcoat Spray Gun (MVP) can be used with an ITD 3500 Reversa-tip gun configuration with a 521 nozzle with pump pressure between 30 and 40psi and no inline filter.
- iv) The use of an ES Cup Gun to dispense barrier coat is possible, although this method is slower, but may be more convenient for smaller parts.
- v) FSP1700 barrier coat is to be catalyzed using a **low activity** catalyst (**BUTANOX LPT** or Curox M100) and should not be less than 0,8phbc (parts per hundred barrier coat).
- vi) Applied at a rate of 425g – 725gm².

The FSP1700 barrier coat should be left to cure overnight before commencing with the structural laminate of the mould.

3. STRUCTURAL LAMINATE USING POLYLITE 33542-50

This resin is supplied pre-mixed and pre-accelerated and only requires the addition of **BUTANOX M50** to initiate cure. Before using this resin it should be thoroughly stirred.



An air motor fitter with a mixing blade should be used to mix the filler back into suspension. This essential step takes about 10 minutes.

Laminate thickness should not be less than 4mm wet on wet to ensure sufficient exotherm for efficient curing (1 x 300g CSM and 3 x 450g CSM).

SPRAY LAY-UP APPLICATION

- i) A standard abrasive resistant MVP Chopper gun is ideal and successful laminates have been made using 436 and 5001 nozzles with pump pressures ranging between 60 and 70psi.
- ii) Resin to Glass ratios should be in the range 4 to 5:1.
- iii) Initially a light laminate (1mm) is applied and consolidated properly before the subsequent laminate is applied to the required 4mm minimum thickness.
- iv) As the resins density is 1,47 and the catalyst pump is volumetric the pump should be set at 1,8% to obtain the required 1,25% catalyst level.

HAND LAY-UP APPLICATION

- i) All the glass for the three layers is prepared and weighed, this is then multiplied by 6 to obtain the resin mass that is required.
- ii) Catalyst addition can range between 0,75phr and 1,25phr according to conditions and requirements for the geltime.
- iii) One 300g CSM can be laminated first to ease the task of achieving a thorough and void free laminate, followed immediately by a minimum of 3 x 450g CSM.



These laminates should change from a brown colour to a creamy colour, indicating the onset of cure. If further thickness is required this may commence once the initial laminate has cooled completely.

Mould laminates should not be demoulded for at least 24 hours but for the best results moulds should remain on the plug (pattern) for three days at a temperature of 35 – 40 degrees.