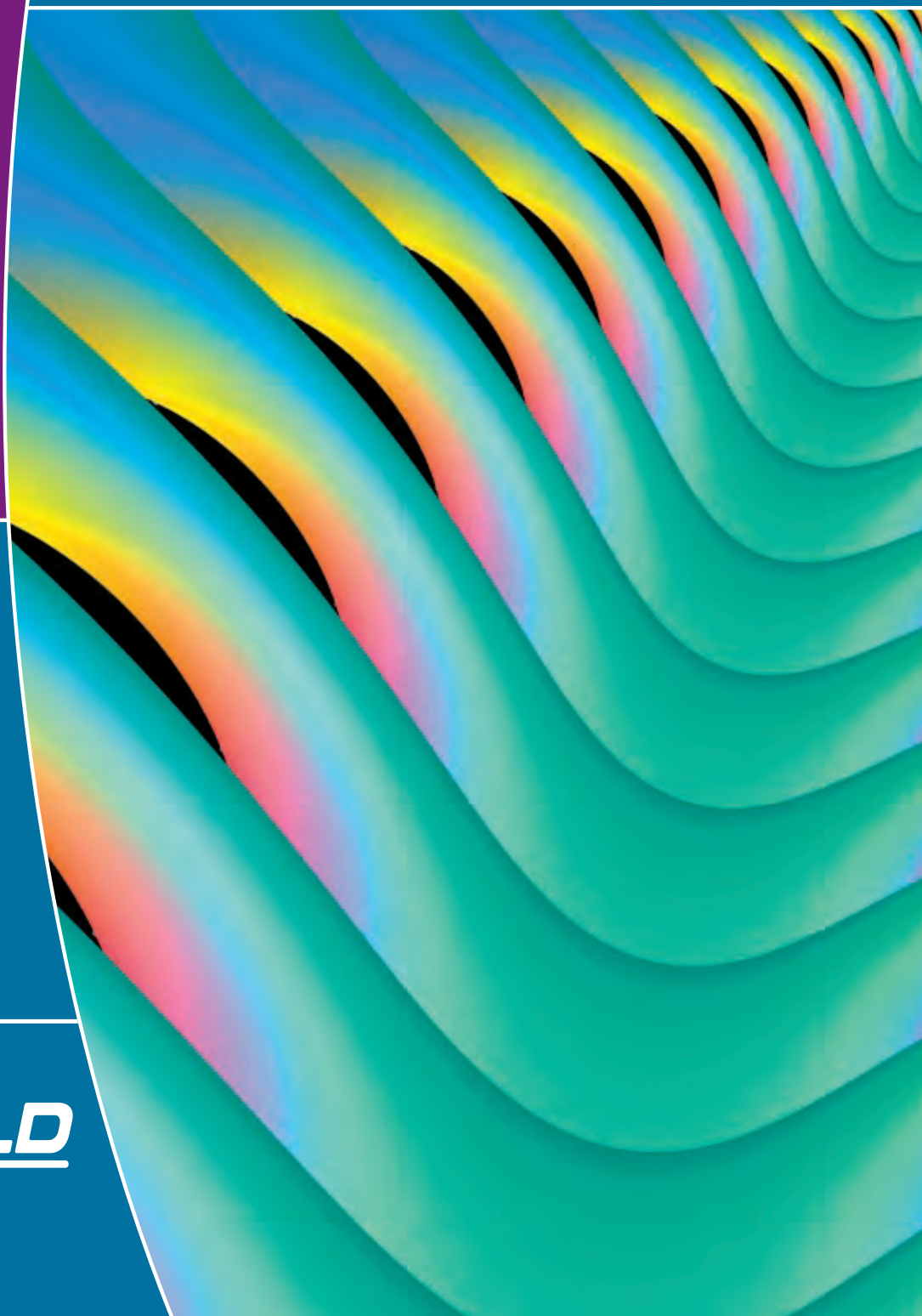
Polylite® Low Profile Tooling System

Create FRP Moulds Better and Faster



REICHHOLD

Unleash your Creativity

In tooling applications it is vital to use quality moulds in order to make quality parts. The unique shape requires a high gloss surface appearance to be reproduced during scale up and commercial manufacturing. Meanwhile the moulds should be robust during in practical use and low in maintenance.

Different tooling solutions are available depending on production series number and anticipated exposure to wear, mechanical stress and elevated temperatures. Depending on the ultimately desired shape and/ or surface quality, these tooling solutions can include steel, aluminium, as well as FRP based on Polyester, Vinyl Ester and Epoxy resin systems. Polyester FRP moulds have gained a wide acceptance in the composite industry because of the versatility of the Polyester material and the attractive overall economics.

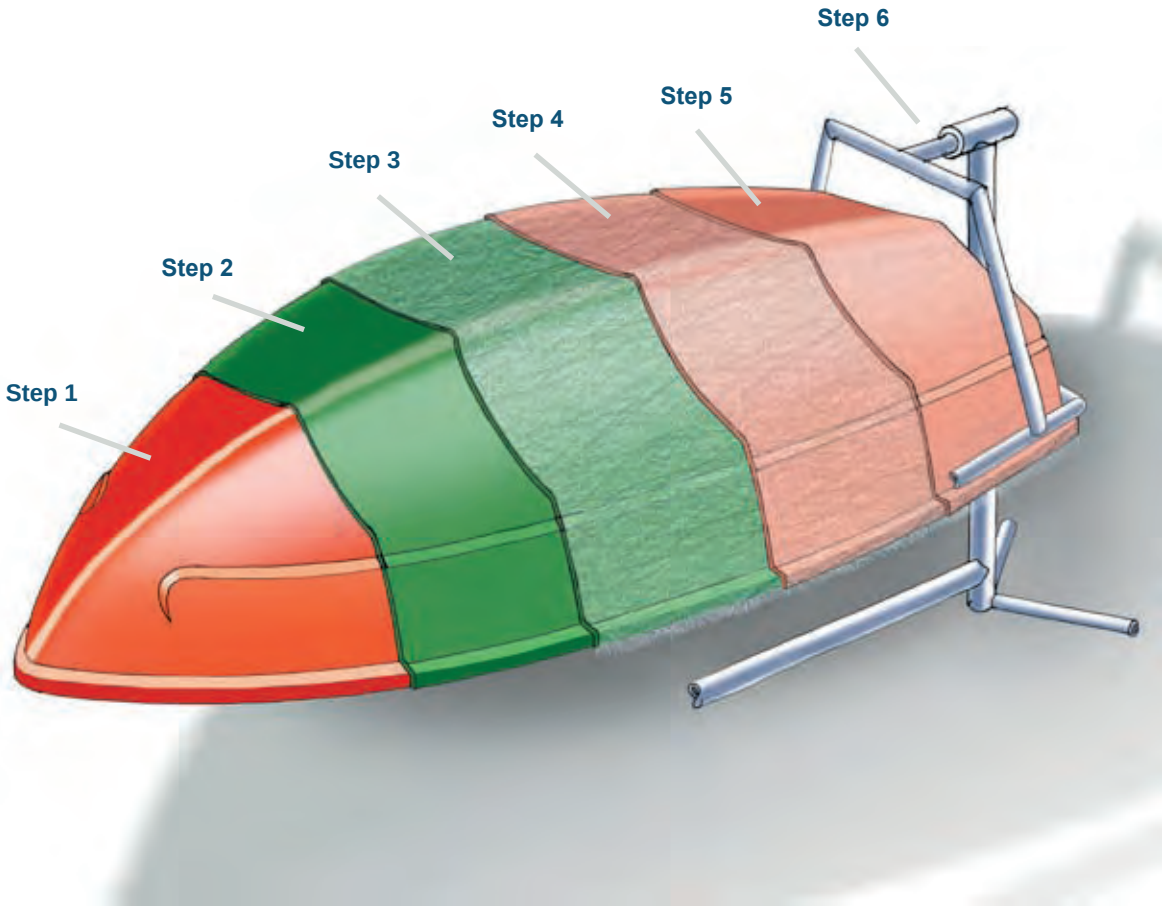
Benefits of the Reichhold Profile Tooling System

Making a mould can be a lengthy exercise, therefore its essential the FRP tool is made right the first time.

Using the Polylite® Profile Tooling System offers the following features and benefits:

Features	Benefits
Available as a one-pack solution (filled resin, pre-promoted, thixotropic)	- No hassle in preparation
Easy application in conventional spray-up and hand lay-up processes	- Easy material handling during tool production
Quick curing whilst using standard MEKP peroxides	- Tools ready in days not weeks - Significant reduction in labour costs
Better overall cure	- Allows greater laminate build-up in one step
Close–to–zero shrinkage through fine-tuned filler loading and the low profile package	- Good reproducibility of plug dimensions - Elimination of surface defects - Excellent dimensional accuracy and laminate stiffness
Increased shelf-life	- Less waste, increased flexibility

Tool Manufacturing of Quality Moulds



NOTE:
In order to make the process easy to follow, the same example will be used throughout the whole procedure. Even though the tool produced is for a Marine part, the tooling system is equally suitable for moulds in all segments including Industrial, Automotive and Building and Construction.

Step by Step

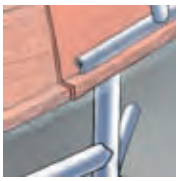
Step 1:
Preparation/ Master Plug

Step 2:
Special Tooling Gelcoat

Step 3:
High Quality Skin Laminate

Step 4:
Polylite® 33542 Profile Tooling System

Step 5:
Repetition of Step 4 upto the recommended thickness



Step 6:
Support frame and De-moulding

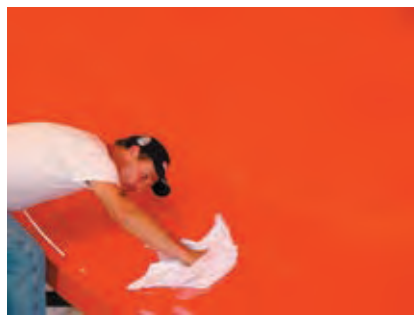
STEP 1:
Preparation/ Master Plug

Good preparation is vital for a good end result

- Work only at room temperature
- Make sure that all needed materials are at ambient temperature between 20-23ºC
- Ensure stability of all products before use

Master plug:

- Ensure that the Master plug is free from dust, and the workshop is dust-free as much as possible
- The Master plug needs to be styrene resistant to avoid any chemical attack on the surface so as to retain high gloss
- During production and post curing of the mould some heat build-up will occur, therefore a specific heat resistance is required
- To create an optimum surface finish, it is essential to produce initially a mould with an optimum surface than to rework the mould
- Make sure that the designed shape can be released
- Use a standard mould wax as the release system



STEP 2:
Norpol® GM Tooling Gelcoat

Product types:

Norpol® GM 60014 H/S (green)
Norpol® GM 90000 H/S (black)
Norpol® GM 100 H/S (transparent)

High Gloss Tooling Surface

Norpol® GM is a tooling gelcoat based on Vinyl Ester which provides maximum resistance to chemicals and solvents.

Norpol® GM produces a mould with a lasting high gloss finish. This will stand up to a relatively large number of lifts between each waxing and polishing step provided the tooling gelcoat is properly cured.

Owing to its high deformation temperature and flexibility, Norpol® GM is a robust quality and consequently less susceptible to crack formation and dull patches.

Application

- **Film Thickness minimum 600 microns (cured)**
- **Ambient room temperature and gelcoat temperature both between 20 - 23ºC**
- **Air humidity should be between 50 - 70%**

Brush

- Use a soft, broad brush (bristle length 5-7cm)
- First coat 500 - 700 microns (wet)
- Second coat 300-400 microns (wet). Two coats are normally required to avoid problems.

or

Spray

- Use spray equipment recommended for gelcoats (must be able to spray a very fine spray pattern with a low gelcoat flow rate)
- Apply gelcoat in 4 layers, 150-200 microns each pass, with 4-8 minute intervals.

STEP 3:
High Quality Skin Laminate

Product Types:
Polylite® 410-900
DION® 9100-700/710

The Use of Tooling Skin Laminates

Tooling skin laminates (the reinforced laminate layer behind the gelcoat) are typically used for improved surface aesthetics; avoidance of air entrapment behind the tooling gelcoat; optimum adhesion and easier repairability from the gelcoat side after damage.

In order to obtain a good quality skin laminate, selecting both a suitable grade of resin as well as ensuring good curing of the laminate are important.

Recommended Skin Laminate Resins

Polylite® 410-900

Orthophthalic Polyester resin with high heat distortion temperature combined with good mechanical strength in the cured state

Polylite® 410-900 is thixotropic and pre-accellerated

or

DION® 9100-700/710

Bisphenol-A Epoxy based Vinyl Ester resin with outstanding adhesion properties, toughness and good mechanical properties

DION® 9100-700/710 are thixotropic and pre-accelerated

Application

It is recommended to produce skin laminates with a minimum: 1 X 225 g/m^2 + 1 X 450 g/m^2 powder bonded glass mat, or 2 x 300 g/m^2. This is to ensure optimum curing and avoidance of air entrapments. Cure overnight.

Note: contact your local technical Reichhold representative for optimum curing advice.

STEP 4/ 5:
Profile Tooling Resin

Product Type:
Polylite® 33542

Construction Laminate

- Good reproducibility of plug dimensions through close-to-zero resin shrinkage
- No hassle in preparation - a one-pack solution (filled, pre-accelerated, thixotropic)
- Ease of application in conventional spray up and hand lay up processes
- Quick curing whilst using standard MEK peroxides

Application

For optimum cure the thickness of the laminate should be at least 4mm wet-on-wet (3 x 450 g/m^2).
When laminate thickness is below 4 mm the reactivity can be too low and an improper cure may occur.
Maximum layer thickness is 6-8 mm (wet-on-wet).

Continue above steps until the required thickness, or stiffness, has been reached.

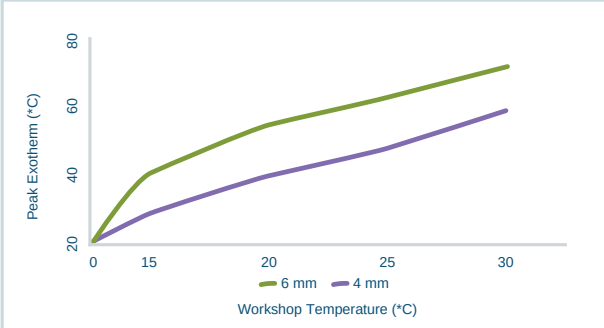
General information

The Polylite® 33542 Profile Tooling System has a high filler content:

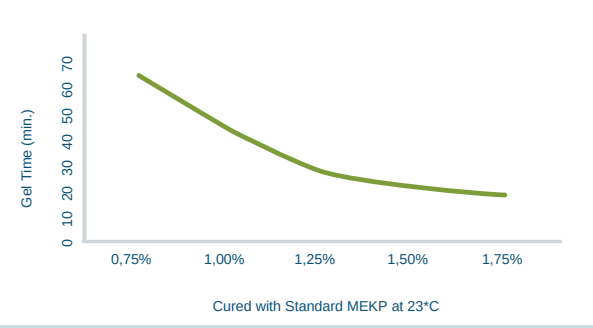
Stir the resin well before use as some filler settling and separation may occur during transport and storage.
For application through spray-up processes, ensure equipment used is capable of handling high filler contents.

STEP 4/ 5:
Profile Tooling Resin: Performance Indicators

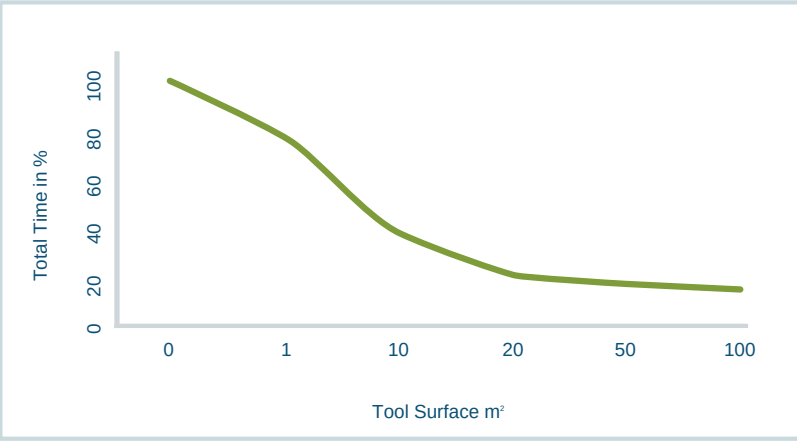
Indication: Peak Exotherm with Polylite® 33542 Profile Tooling System as a function of Laminate



Gel time of Polylite® 33542 Profile Tooling System at Different Peroxide Levels



Tools ready in days not weeks



Compared to conventional tooling resins, the Polylite® Low Profile Tooling System allows manufacturing time to be reduced by up to 80% (depending on the tool surface involved).

STEP 6:
Support Frame and De-moulding

Support Frame

- After the desired thickness is achieved, a support frame can be laid in a wet laminate or glued to the surface after the laminate is cured.
- When the glue is cured, the frame should be laminated to the mould with a further 3 x 450 g/m^2 layer.
- Cores can be used in the mould laminate, they need to be laid in the wet laminate or glued to the surface.

De-moulding

- Time for de-moulding from the plug is typically 24 hours at room temperature.
- For improved tool curing and plug de-moulding, curing times of 2-3 days are recommended at 35-40ºC (whilst the mould is still on the plug).
- Please check Barcol Hardness (BHH 943-1) 40 - 50 before use, in order to confirm final cure.

The new generation of Polylite® Low Profile Tooling System allows for easy tool manufacturing and excellent performance during practical use.

In case you need advice on application and layout, feel free to contact your Reichhold representative.