HYPETEX®

Guidelines

Section - 1

Processing

HYPETEX®

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Hypetex Processing Guidelines

Hypetex fabrics can be used in several methods including wet layup, prepreg, RTM, RIM, hot melt, resin infusion, vacuum infusion and compression moulding.

It is recommended to use vacuum infusion or prepreg for the best results.

1. Handling

Care must be taken when bending or manipulating the material & avoid stretching as this can warp the weave, show 'zebra lines' and potentially lead to inconsistencies in the colour.

Use of powder-free, non-sterile nitrile handling gloves to eliminate the cross-contamination from human skin and oils to the surface of the material.

2. Tooling

The tools should be constructed from materials that will retain their dimensional stability at the intended processing conditions i.e., curing temperature of the resin, curing pressure, and number of parts made from each tool.

For a perfect finish, the visible surfaces of the tool should avoid any visible damage marks, dents, joints, inserts, or scratches. Any imperfection seen on the surface of the mould will directly translate to the same imperfection on the surface of the part.

There could be ways to improve the surface of the mould, by using surfacing films which will smoothen the small imperfections. The use of surface films should be considered during the part's design stage to compensate for its thickness for dimension-critical parts. Depending on the process chosen for the curing of the part, a vacuum leak test should be performed before applying any material on the surface of the tool.

It is especially important that the cleaning of the mould is done properly before moving forward.

3. Cutting

Cutting carbon fibre may cause fraying of the individual fibres.

This can be minimised by:

- Using flash breaker tape to hold the fibres together. Care should be taken when removing the tape before laying up.
- Fold the frayed edge under itself. This is discussed further in the "Joining" section below.

4. Joining

Cutting lines, weave patterns and joins in the fabric are seen more clearly in Hypetex coloured fabric. Extra attention is needed to create seamless joins in the layup. Weave patterns can be oriented to either have a seamless flow or oriented inversely as a design element.

Below are some recommended variations for joining methods that can be explored depending on the aesthetic required:

a. Dual tone joint

The dual-tone joint variation is used to highlight a design or geometry feature. It uses a 3 part design to use the join as a decorative advantage.

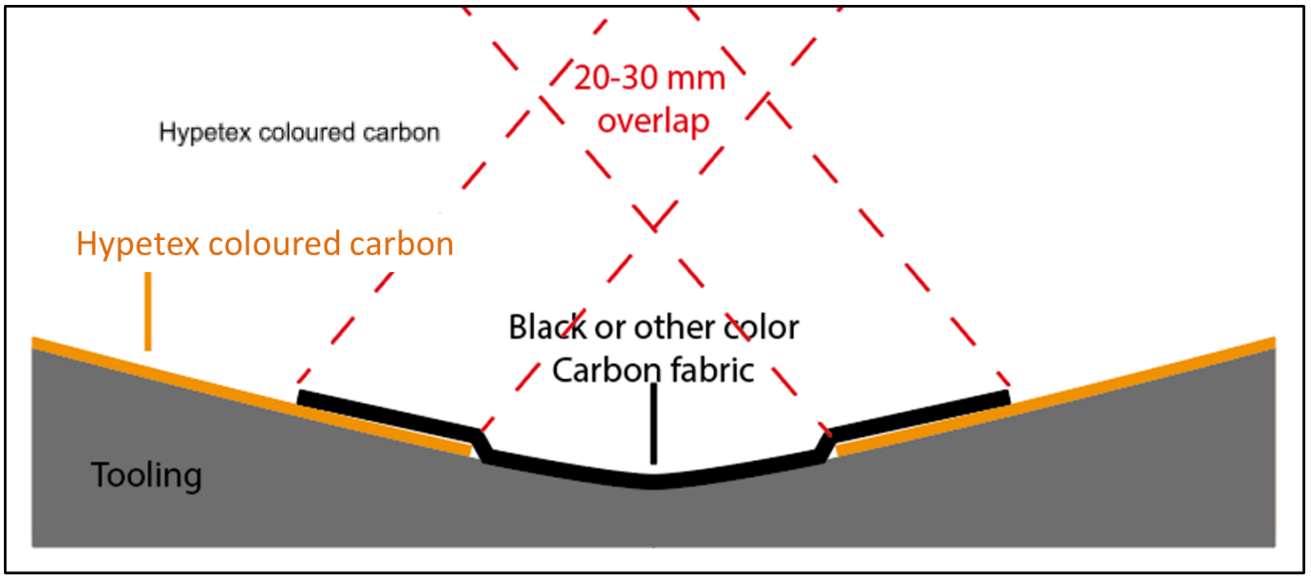

Fig.1

b. Black seam

Showing the seam can be a subtle way to highlight geometries, shapes and/or designs without the need for painting thin lines. At the seam of the Hypetex coloured carbon fabric, a black line appears as it shows the cross-section of the carbon fibre. This can be done by the following method:

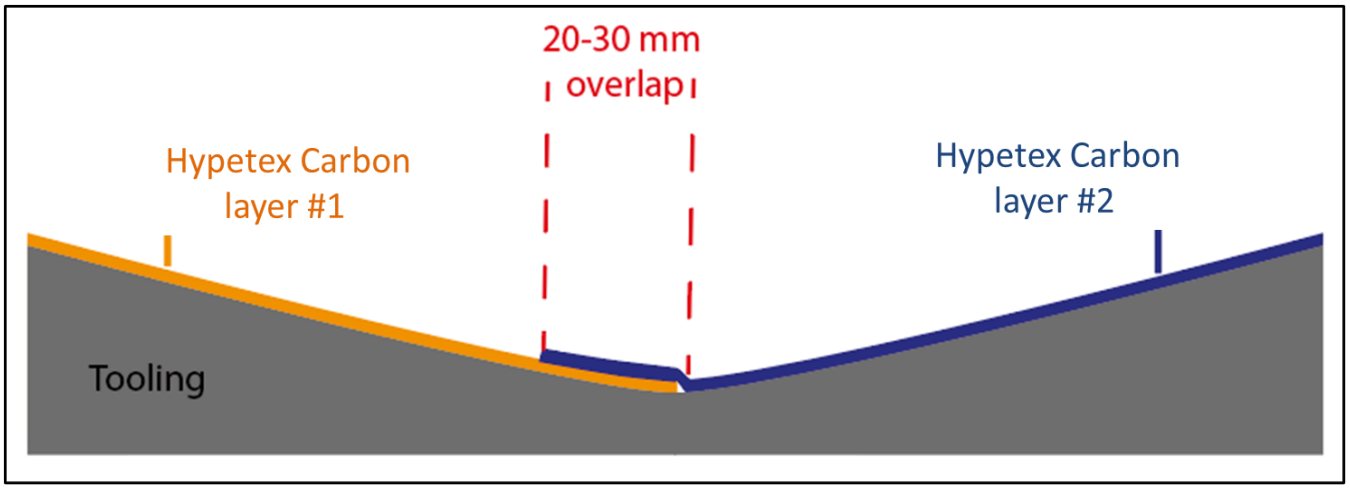

Fig.2

c. Invisible seam

An invisible seam is ideal for a sleek part with no interruptions in the weave and a seamless look. The following method can be used to accomplish the “invisible seam”:

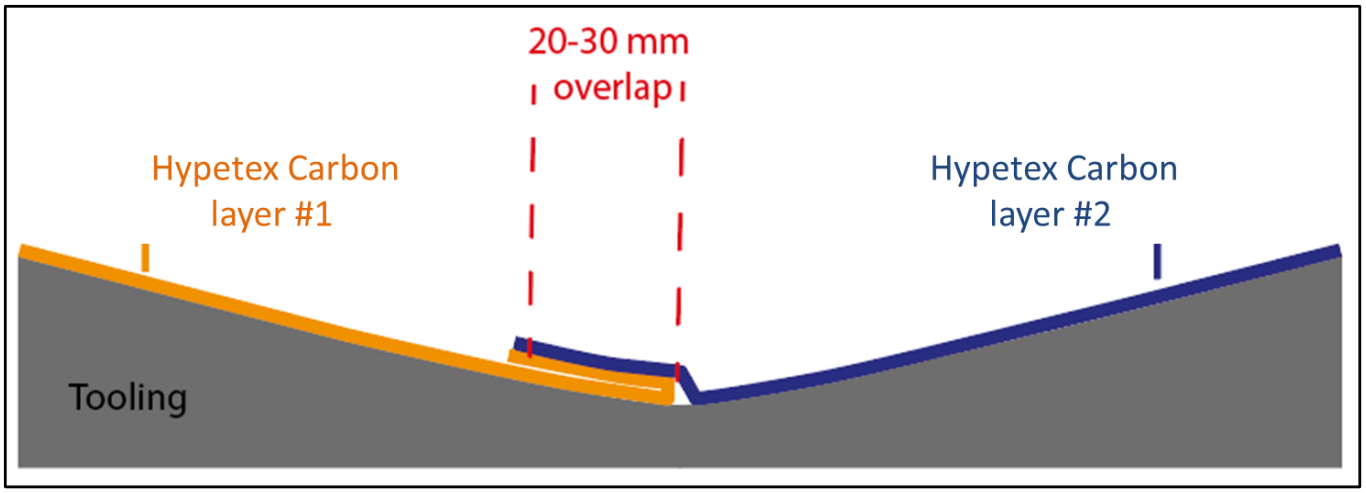

Fig.3

Folding the first layer will prevent any black edge from being visible. It should be performed carefully to avoid fibre distortion. This may also result in fibres breaking at the folding line. Hypetex recommends orienting the fabric 45° to the join to have a clean transition in weave from one layer to the next.

d. Multiple layered joins

For multiple invisible seams, extra care must be taken as the join between 2 axis will cause the join to have a section with 4 plies. Hypetex recommends a “V-cut” as described below to reduce the stack to 3 plies. An “improved V-cut” can be used to further reduce the stack to only 2 plies. All three versions of the joins are shown below:

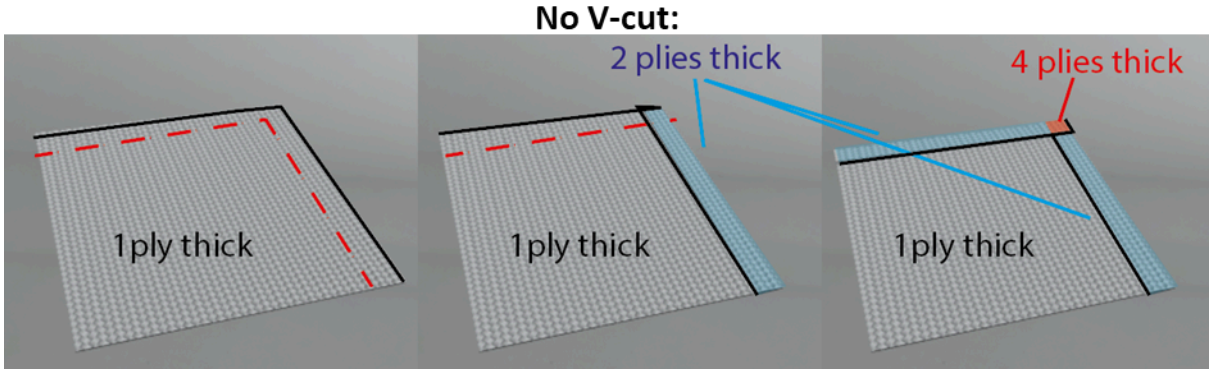

Fig.4

V-cut:

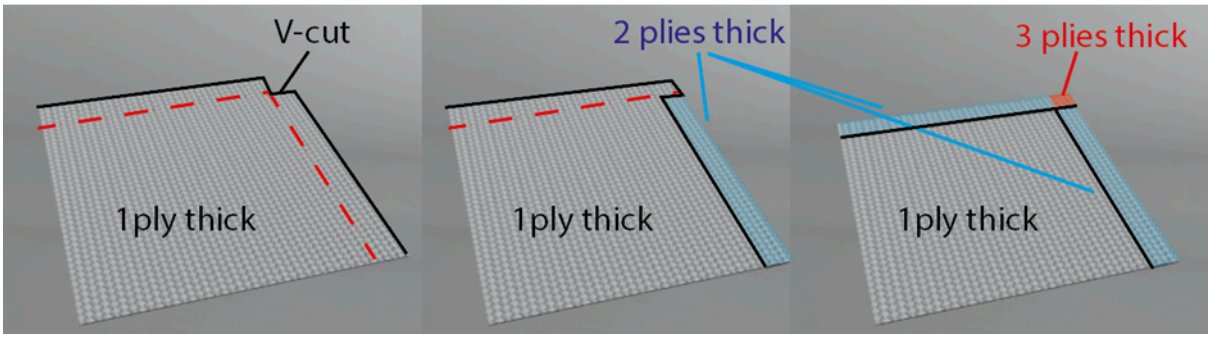

Fig.5

Improved V-cut:

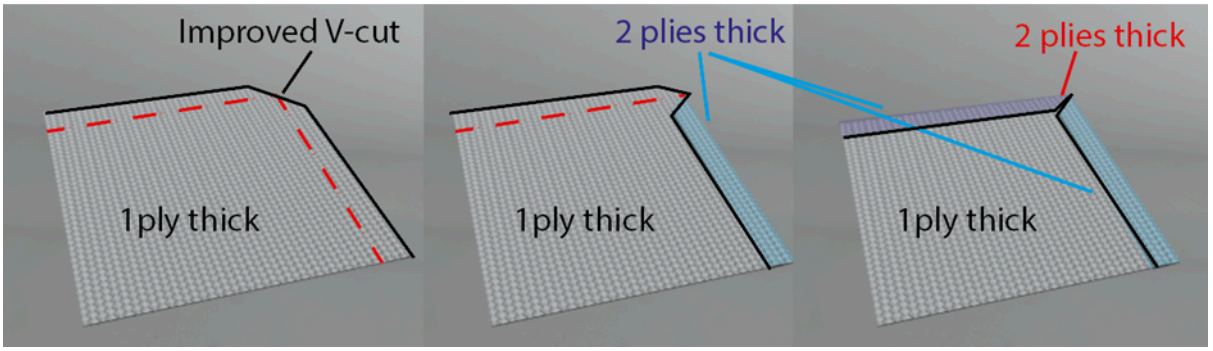

Fig.6

5. Preforming

Preforming enables the user to manufacture complex geometric shapes which would otherwise be difficult to achieve. Hypetex recommends preforming whenever there is difficulty in draping the coloured carbon fibre into complex mould designs with tight radii. A heat gun can be used to make the carbon fibre more pliable.

Hypetex recommends heating the dry fabric up to 70°C and heating the prepreg fabric to 30°C-35°C for better pliability.

N.B: It is not recommended to heat the dry spread tow fabric as this can make the material stiffer.

6. Debulking

Hypetex recommends performing a debulking process of the prepreg layers to guarantee good adhesion to the tooling along with ensuring good adhesion to the layers underneath. This debulking process should be carried out even on flat surfaces to provide an “invisible” seam.

Debulking minimises the risk of wrinkles (folds in the fabric) and bridging (gaps where the fabric doesn’t fully conform to the mould), which can lead to structural weaknesses.

It is recommended that Hypetex-coloured carbon fibre be used as the surface plies and not as backing plies.

7. Perforation

Hypetex recommends perforation of the layup every four layers to limit the amount of air trapped between the layers. Perforating the pre-pregged layer before laying them up can be done to help with air removal, this can be done using the rollers seen below. A link to purchase the spiked roller used for perforation can be found at the end of this document.

The use of these rollers must be taken with care as there is a possibility that the fibres will break.

Ensure all mould surfaces that come into contact with the fibre are cleaned thoroughly. If any imperfections are found in the mould surface consider using a surfacing film to smoothen out any issues with the mould. This can help with any surface bubbling on spread tow or UD materials.

Depending on the process a vacuum leak test must be performed before the commencement of the manufacturing process.

A suitable release agent should be applied to the mould surface to make the separation of the part from the mould easier. Hypetex suggests the use of release films over waxes as these are easier to apply, can be applied to moulds with complex geometry, forms a sufficient barrier between the material and mould and can be used for parts that require a specific finish such as a High gloss or other specific textured finish.

Fig.7

8. Layup

The same best practices apply when using Hypetex carbon in its pre-impregnated form. It is important as mentioned in the handling section that higher temperature will increase the flexibility and tackiness of the prepreg, while lower temperature will increase the fabric's stiffness and lower its stickiness.

The use of a fine-weave peel-ply can be used on the A-surface to avoid the need for sanding the part to improve adhesion for lacquering.

The use of a light sacrificial glass fibre veil on the A-surface ply is recommended if sanding and lacquering are to be conducted. More information on the sacrificial glass fibre veil is discussed in the finishing guidelines.

It is important to keep in mind that the addition of this fibreglass layer may show yellowing of the part more prominently.

To avoid any air entrapment leading to high void content of the part and low mechanical results, it is recommended to work with the lowest tackiness possible still allowing good lamination and workable adhesion to the tooling or adjacent layers.

9. Resin systems

Hypetex carbon fibre fabric is compatible with all epoxy-based resins. Please reach out to our technical team if specific resin compatibility information is required.

Hypetex recommends the use of low-viscosity resins which can flow into and through the fabric.

Required resin weighting for Hypetex carbon fabric may be slightly different. If any dryness or delamination is observed using standard resin weighting, the resin weighting can be increased by 5-10% for the Hypetex ply to ensure thorough consolidation and a cleaner surface.

Hypetex recommends 42% resin weighting for prepreg Carbon fibre.

10. Curing

Users should follow the instructions of the laminate resin TDS as recommended by the supplier. It is suggested to cure at nominal temperatures as mentioned in the resin TDS, this will provide better quality in terms of finishing thanks to the lower thermal distortion of fibres, and a smaller yellowing of the resin system.

Please note that the over-curing of the part will potentially show yellowing more prominently on Hypetex coloured-carbon fibre due to the brightness of the material.

IMPORTANT:

DO NOT use Hypetex Coloured carbon fibre as backing material.

DO NOT apply any solvent-based cleaning agent onto the finished part to clean it.

DO NOT overcure as yellowing will appear worse on coloured carbon fibre.

DO NOT use any chemicals to clean the dry fabric. If required, use pressurised air to remove any foreign contaminants.

DO NOT increase the curing temperature above 180℃ as this may degrade the fabric.

11. Recommended products (but not limited to)

a. Resins

i. SHD MTC 510

https://shdcomposites.com/assets/prepregs/mtc510-tds-1.pdf

ii. SHD VTC 401

https://shdcomposites.com/assets/prepregs/vtc401-tds-1.pdf

iii. Simcas EVOPREG EPC200

https://static1.squarespace.com/static/65c3ff24c2b2f6053dc93e6f/t/66d1d760b34a7d6898c6f087/1725028192869/Evopreg%C2%AE+EPC300+Technical+Data+Sheet.pdf

iv. Simcas EVOPREG EPC300

https://static1.squarespace.com/static/65c3ff24c2b2f6053dc93e6f/t/66d1d760b34a7d6898c6f087/1725028192869/Evopreg%C2%AE+EPC300+Technical+Data+Sheet.pdf

b. Mould cleaner

i. Easy Composites MC1 Mould cleaner:

https://www.easycomposites.co.uk/composites-mould-cleaner

c. Tooling Sealer

i. Marbocote HP2002 Tool Sealer:

https://www.dtc-uk.com/marbocote-hp2002-mould-tool-sealer/

d. Release Agent(s)

i. Chem Trend Chemlease 255:

https://vacinnovation.co.uk/products/chemlease-255/

ii. Easy Composites CR1 Easy-Lease Chemical Release Agent:

https://www.easycomposites.co.uk/easylease-chemical-release-agent

iii. Marbocote HP7 Release agent:

https://www.marbocote.co.uk/products/mould-release-agents-for-composite-components/

e. Spiked roller:

i. https://www.dtc-uk.com/spike-roller-150mm-150mm/?cn-reloaded=1

f. Gloves:

i. https://www.amazon.co.uk/Unigloves-UCN1203-Medium-Nitrile-Powder/dp/B009H0KB30

Please contact technicals@hypetex.com for further technical information.