easycomposites™ share the knowledge

composites evolution

Biotex Flax/PP and Flax/PLA
Processing Guide
November 2012

Introduction

Biotex Flax/PP and Flax/PLA are commingled textiles made from natural flax fibre and thermoplastic polymer and are suitable for producing fibre-reinforced thermoplastic composite parts. The fabrics are moulded into rigid components by simply applying heat and pressure to melt the thermoplastic, wet-out the flax and consolidate the composite material. Suitable processes include press moulding, vacuum bagging and autoclave. The intimate blend of flax and thermoplastic ensures fast wet-out and low porosity, even with relatively low pressure processes.

Biotex natural reinforcements and intermediates provide the high performance and easy processing normally associated with glass fibre composites but with lower weight and environmental impact. They are suitable for semi-structural and decorative applications in sectors such as automotive, construction, marine, sports and consumer goods. Biotex uses a unique Twistless Technology to ensure a high degree of fibre alignment, impregnation and performance.

Vacuum Bag Moulding

Vacuum bag moulding allows composite parts to be produced from Biotex commingled flax/thermoplastic fabrics using a single-sided tool. The process is suitable for small or large components produced in low and medium volumes due to the relatively low investment costs. It is a clean process which does not require the use of solvents or hazardous chemicals.

The fabric is laid into the mould and covered with a vacuum bag, in a similar way to conventional prepregs, and a vacuum is applied to remove trapped air and exert pressure on the material. The assembly is heated to the melting temperature of the thermoplastic (the precise temperature depends on the product grade being used) which allows the molten thermoplastic matrix to flow and impregnates the flax fibers. Then the assembly is cooled and the part is demoulded. It is possible to incorporate lightweight core materials and gelcoats as required.

Step-by-step process description:

1. Place the fabric into/over the mould (use multiple layers to achieve thicker parts).
2. Place release film, breather/bleeder cloth and vacuum bagging film (or reusable silicone membrane) over the material and seal the vacuum bag.
3. Apply a vacuum (ideally >0.95bar) to remove the air from the bag and exert pressure on the material.
4. Heat the mould to achieve a material temperature of 180-200°C (e.g. using an oven or direct mould heating).
5. Hold at temperature for 10-20 minutes.
6. Cool the mould to below 50°C.
7. Release the vacuum and remove the vacuum bag/films.
8. Demould the part and trim/finish as necessary.

Additional notes:

- The temperature and time at temperature should be minimised to avoid thermal degradation of the flax fibre, e.g. by heating up and cooling down as quickly as possible.
- The mould and all vacuum consumables should be capable of withstanding the processing temperature.

Composites Evolution Ltd, 4A Broom Business Park, Bridge Way, Chesterfield, S41 9QG, UK
■ Tel: +44(0)1246 266248 ■ Fax: +44(0)1246 266249 ■ Email: info@compositesevolution.com ■ www.compositesevolution.com
Company Registration No: 07024132

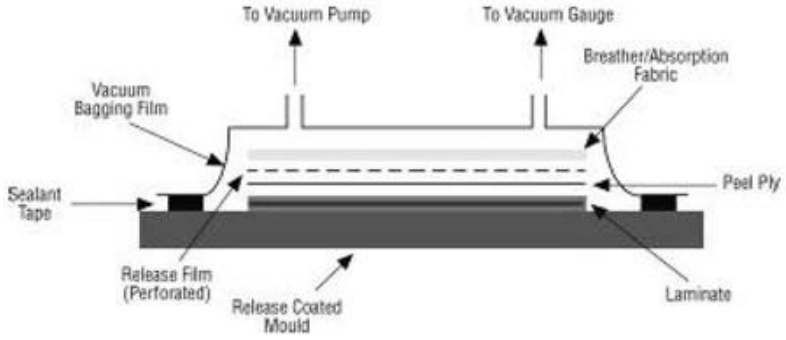

Figure 1. Vacuum bag moulding.

Thermoforming/Stamp Forming

The thermoforming (or stamp forming) process can be used to produce high quality, complex parts from Biotex commingled flax/thermoplastic fabrics and preconsolidated sheets. This process is suitable for producing small-medium sized parts in medium-high volumes and can be highly automated. The cycle time is typically 15-60 seconds and the investment cost is relatively high.

The process uses matched 'male' and 'female' moulds/tools and a fast closing press and is similar to sheet metal forming. The moulds are normally made from steel or aluminium, although a more even pressuire distribution, and hence improved consolidation, can be obtained by using a rubber 'male' tool. To avoid wrinkling during deep-drawing, the material should be clamped/controlled by a special 'blank holder' device. It is possible to incorporate lightweight core materials and in-mould finishes (films, textiles etc.) as required.

Step-by-step process description:

1. Preheat the mould to approximately 50°C (can use a cold mould but the material may solidify before forming).
2. Heat the material to 180-200°C in an infrared or convection oven (the fabric should be held in a frame to prevent shrinkage and make handling easier).
3. Transfer from oven to press/mould as quickly as possible (e.g. 10 seconds).
4. Close the press/mould rapidly to form and consolidate the material (e.g. 10-50 bar on part).
5. Hold under pressure until cooled (e.g. 60 seconds).
6. Open the press and demould the part.

Additional notes:

- The temperature and time at temperature should be minimised to avoid thermal degradation of the flax fibre, e.g. by heating up and cooling down as quickily as possible.
- Some benefit may be achieved from predrying the materials, especially in the case of PLA which can degrade by hydrolysis during processing.

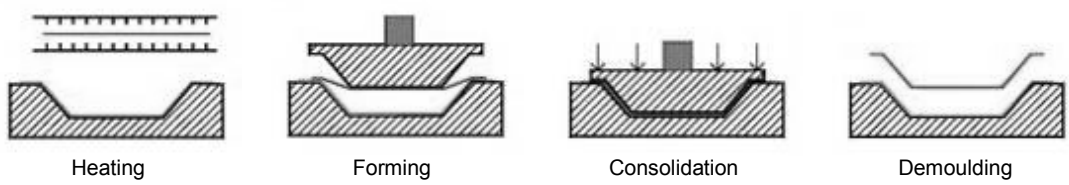

Figure 2. Thermoforming/stamp forming.

Safety

Flax fibre is a naturally occurring, non-hazardous material, but typical precautions should be taken when handling the material including using appropriate PPE and adequate ventilation. See MSDS for details.

Disclaimer

The information provided here is believed to be accurate but should be considered indicative only. It is the responsibility of the customer to check the suitability of the product for their specific application prior to use.