

MSE-401

COMPOSITE MATERIALS

ADVANTAGES AND MANUFACTURING METHODS

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Advantages of Composites:

- Lower density (20 to 40%)-→Higher strength to weight ratio.
- Higher directional mechanical properties → specific tensile strength (ratio of material strength to density) is four times greater than that of steel and aluminum metals.
- Higher Fatigue endurance.
- Higher toughness than ceramics and glasses.
- Versatility and tailoring by design freedom.
- Easy to machine→good machinability.
- Can combine other properties → damping, corrosion resistance.
- Cost effectiveness.

Manufacturing methods of Composites:

1. Spray Lay-Up

Methodology:

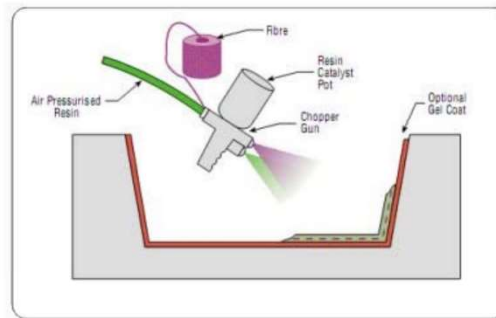
Fibre is chopped in a hand-held gun and fed into a spray of catalyzed resin directed at the mould. The deposited materials are left to cure under standard atmospheric conditions.

Material Options:

- Resins: Primarily polyester

- Fibres: Glass roving only

• Spray Lay-Up



2. Wet/Hand Lay-up

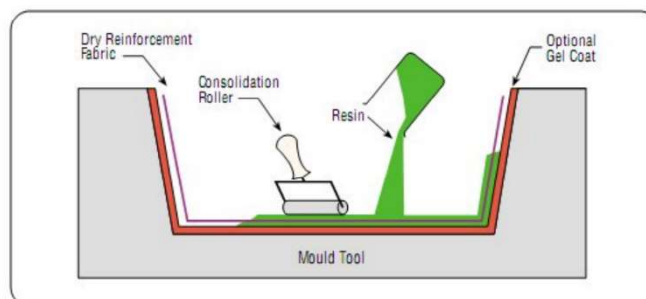
Methodology:

Resins are impregnated by hand into fibres which are in the form of woven, knitted, stitched or bonded fabrics. This is usually accomplished by rollers or brushes, with an increasing use of niproller type impregnators for forcing resin into the fabrics by means of rotating rollers and a bath of resin. Laminates are left to cure under standard atmospheric conditions.

Materials Options:

- Resins: Any, e.g. epoxy, polyester, vinylester, phenolic
- Fibres: Any, although heavy aramid fabrics can be hard to wet-out by hand.

• Wet/Hand Lay-Up



3. Vacuum Bagging:

Methodology:

This is basically an extension of the wet lay-up process described above where pressure is applied to

the laminate once laid-up in order to improve its consolidation. This is achieved by sealing a plastic

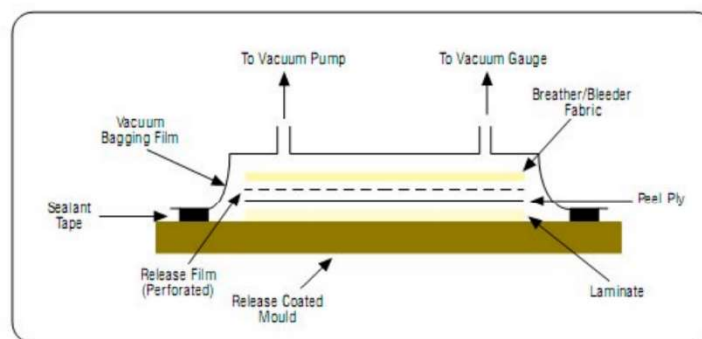
film over the wet laid-up laminate and onto the tool. The air under the bag is extracted by a vacuum

pump and thus up to one atmosphere of pressure can be applied to the laminate to consolidate it.

Materials Options:

- Resins: Primarily epoxy and phenolic. Polyesters and vinyl esters may have problems due to excessive extraction of styrene from the resin by the vacuum pump.
- Fibres: The consolidation pressures mean that a variety of heavy fabrics can be wet-out.

• Vacuum Bagging



Source: <http://www.gurit.com>