Polymer Composites

Composites consist of two main parts:

- a binding material
- a reinforcement material

Binding material (the matrix)

Polymer resins are used as the binding material in a polymer composite. Commonly used resins are:

- unsaturated polyester
- vinyl ester
- epoxy resin.

Reinforcement

The reinforcing material in a polymer composite may be:

- chopped strand mat,
- continuous strand mat,
- rovings,
- woven rovings
- woven fabrics
- hybrid fabrics
- multiaxials
- braided fabrics

**Chopped strand mats** consist of a blanket of randomly laid chopped glass strands of between about 35mm and 65mm length, held together by an adhesive binder.

**Continuous strand mats** are made from continuous strands, often in a swirling pattern, held together by an adhesive binder.

**Rovings** are continuous strands (that look like fishing line). Rovings may be chopped, braided, knitted and made into woven and hybrid fabrics.

**Woven fabrics** are made on looms. The strands are bidirectional, i.e. the fill rovings cross over and under the warp rovings (the lengthwise yarn/rovings). In some weaves, the fill rovings cross over and under multiple warp rovings (e.g., over two, under two) making a more flexible fabric.

**Hybrid fabrics** have different types of warp and filler rovings.

For example a hybrid fabric:

- may be made with very strong and costly warp fibres laid lengthwise and less expensive fill fibres laid over and under them
- may be made with one type of fabric stitched to another fabric or mat to create a two layered or multiple layered fabric

**Multiaxial** fabrics are made with fibres are arranged at any angle between 0° and 360°. Two or more layers make up the fabric. The layers are stitched, knitted or held together by a binder.

**Braided fabrics** are made by intertwining three or more rovings/yarns. Braided fabrics may be made flat or in sleeve form. Sleeved braided fabrics may be used as the reinforcing material when making tubular composites.