

GRP Manufacturing Process

Hand Lay-up:

The next step in the contact molding process is the lay-up of the glass fiber reinforcement with polyester resin. Laying up can be started as soon as the gel coat has hardened sufficiently to withstand solvent attack from the laminating resin. Chopped strand glass fiber mat is the most usual reinforcement for contact molding. The amount of resin required can be calculated by weighing the glass fiber to be used for the molding. For chopped strand mat the resin: glass ratio should be between 2.5:1 and 2:1 weight (29-33% glass by weight).

Spraying:

Simultaneous depositing of polyester resin and chopped glass fiber by spray molding equipment. Although much of the manual labor of hand lay-up is eliminated by using a spray process, thorough rolling is still necessary not only to consolidate the deposited glass/resin mixture, but also to ensure that the accelerated and catalyzed portions of resins are adequately mixed. Considerable skill is required to control the thickness of the laminate when using a glass/resin depositor and to maintain a consistent glass/resin ratio. The spraying of gel coats can be carried out either by catalyst injection system or the one pot system. Spraying reduces labor costs and when the volume of production is large enough to keep the equipment in constant use, spray techniques are fully justified. Spraying is now widely used throughout the world and in the hands of an experienced operator most types of spray equipment will significantly increase output compared with application by brushing.

Trimming and Finishing:

It will save much time if the laminate can be trimmed while the resin is still in the "green" stage. This can be carried out with a Sharpe trimming knife held at right angles to the laminate. Great care should be taken not to disturb or distort the molding at this stage. Fully Cured GRP is not an easy material to Cut or machine, since it will quickly blunt most ordinary steel tools. Abrasive discs or wheels are recommended for cutting wherever possible. Portable hand tools are often used for awkwardly shaped laminates, and portable reciprocating electric saws have proved useful for trimming and slotting, especially if high grade saw blades are used. It is essential that the resin is fully cured before any finishing operations are undertaken. Even when the pigmented gel coat has been used and subsequent painting is not required. The molding can then be buffed or polished with any of the normal cutting compounds.

If the molding is to be painted, extra care must be taken to ensure that all traces of release agent are removed from the molding. The surface to be clean and dry and it is advisable to first rub the surface with a fine abrasive to obtain efficient keying. Most paint systems can be used on GRP laminates.

COSTS:

The cost of a finished laminate depends not only on the cost of materials but also on the method of fabrication. Speed of production, investment in equipment, amount of waste

and labor costs have all to be taken into consideration, and these will be different for each fabrication technique.

PERFORMANCE:

One of the most important design considerations is the expected performance of the GRP in the environment in which it is to operate in practice. How well does GRP withstand normal weathering processes? What is the effect of various chemicals, and at varying temperatures? What is the likely loss of strength after constant immersion in water?

The performance of GRP is so dependent on the actual composition of the laminate, the type of polyester resin used, the surface finish and, above all the degree of cure that it is impossible to provide detailed information covering every variable. The weather and water resistance of GRP laminates is largely a function of the gel coat since in most applications it is the gel coat surface which is exposed to attack. For optimum chemical resistance combined with high structural performance a resin-rich surface is essential on the face of the molding which is exposed to the hostile environment. The resin gives high mechanical strength and excellent strength retention in many chemical environments at temperatures up to about 95oc.