RESIN FILM INFUSION

A composite manufacturing technology, Resin Film Infusion (RFI), has been developed as a cost effective alternative for autoclave based processes. This innovative process is the first of its kind in the country, and is ideally suited for manufacture of large composite structures. Products manufactured by RFI process have excellent structural properties comparable with autoclave cured parts with added advantage of excellent drapability and near-zero void content.

In the RFI process, epoxy resin is cast in film form and sandwiched between two reinforcement layers. These layers are cut to shape, laid on the tool, and vacuum bagged. The rest is a standard vacuum bagging process at ambient pressure and elevated temperature thus doing away with the necessity of an autoclave. The resin film needs to be stored at -18 °C, similar to prepreg materials usually used in autoclave processing. However, since sandwiching can be done on demand, only the resin films need to be stored at lower temperatures. Thus, exceeding shelf life results in the loss of only resin films.

The resin formulation for RFI has been developed from commercially available epoxies. Consisting of a solid and a liquid resin, a latent hardener and a cure accelerator, this resin formulation has the capability of forming films with appropriate tackiness to stick to the fabric, and appropriate flow characteristics for an easy infusion during the subsequent composite fabrication. Shelf life of this formulation is more than two years at sub-zero temperatures. This resin cures at 120 °C in 1 h and results in a glass transition temperature as high as 118 °C and can be tailored to cure at temperatures of up to 175 °C resulting in better thermal performances.

World over, there is a thrust on developing out-of-autoclave processes, and RFI developed at Research and Development Establishment (Engineers) can be a prime choice for composite manufacturers within India and abroad. The resin system has been synthesised *ab-initio* at R&DE(E) from commercially available components. Indigenisation of all components has also been done. Machine for film casting and sandwiching was designed in house and manufactured locally. Thus the complete know-how of this process resides with R&DE(E).