

# infusion solutions



Infusion is an evolution from vacuum consolidated wet layup, providing excellent laminates properties and cost control. Infusion provides results close to prepreg layups without the high costs linked to high temperature cure, ovens, cold storage and heat resistant moulds. Resin content as low as 37% is achievable.

Infusion does not release VOCs in the workshop, provides a clean and comfortable working environment, the layup being stacked dry without any hurry. The technology is suitable for polyester, vinylester and epoxy systems.

Infusion is suitable for large and small laminates alike. It is also ideal for RIM pre-production runs.

Several infusion techniques are available: KIS, SCRIMP, SPRINT, Eco-RIM, etc. Resoltech offers solutions for all technologies to ensure quality and cost efficiency.



Closed mould techniques date back to the 1050s. RTM was patented in 1967. The real evolution came in the 1990s when Palmer and Seeman developed the SCRIMP technique. Other variation came about and infusion is now the preferred solution for the future according to hundreds of composite manufacturers.

## What is infusion?

The process is basically to inject a low viscosity resin under vacuum into a laminate. The whole layup is installed dry into a mould fitted with a rather simple but airtight vacuum bag. Applying vacuum to the layup will compact the fibre reinforcements and allow for the operators to check for air leaks. The pre-mixed resin is then allowed to migrate through the layup until the whole part is wetted out.

Different techniques show some variations, mostly in the resin-transfer medium (net, line, central or peripheral supply, etc).

## Problems linked to the process

Infusion relies on two physical phenomena: permeability and pressure difference. Should the reinforcement not be porous or the pressure be even, there would be no resin migration. These aspects are quite difficult to simulate or work out without wasting time, materials and money.

Permeability of the reinforcements is critical. It is twofold: macroscopic permeability (the space between fibres allowing the resin to flow) and microscopic permeability (also called capillarity).

Macroscopic permeability varies with the compression of the reinforcing fabrics. Microscopic permeability or capillarity follows the surface tension of the resin system. A high surface tension of the matrix system will reduce the impregnation of fibres by capillarity while a low tension increases the capillarity effect.

Resin viscosity is also very important. The lower the viscosity, the faster the infusion will occur.

Other parameters include thixotropy, fibres sizing, mould permeability & core properties.

## Solutions

There are several solutions available. First, choosing an infusion process. A system like KIS does not require any resin transfer medium as infusion occurs through the laminate. SCRIMP requires a resin transfer net which will increase waste resin. The DIAB process infuses through grooves in the core which will fill with resin.

The first step is to engineer the infusion process using a computer simulation service. This will accurately predict the results and ensure you do not risk to waste a whole laminate.

Choosing the right materials is critical for the success of the operation: Resoltech provides a range of infusion resin systems, constant porosity reinforcements and related materials.

1800	Epoxy infusion system. TG 130°C.
1050	Epoxy infusion system. TG 75°C.
VI5050	Vinylester infusion system.
9040PX	Polyester gelcoat (epoxy compatible).
3010T	Epoxy undercoat.
7060	Epoxy gelcoat.
WOVEN FABRICS	Large range in glass, aramid & carbon.
UNIDIRECTIONALS	Large range in glass, aramid & carbon.
MULTIAXIALS	Double-bias, bi-axial, tri-axial & quadriaxial.
PVC CORE	Various densities available with specific infusion grooves.

## Hardware

A limited range of hardware is required: a vacuum pump, a resin trap, feed and vacuum lines, quality vacuum fittings, a resin mixing device (although manual mixing is acceptable for small parts).

## Advantages

### • Infusion is superior to wet layup:

It is cleaner, the laminate can be stacked without any rush and be perfectly applied into the mould. Quality and weight are constant. No voids. The human factor is greatly reduced and the result predictable. Resin content is as low as 37%. The entire laminate can be infused at once (both skins, core and even the internal structure).

### • Infusion is cost-effective against prepregs:

Easy storage of materials (no freezing), no high temperature cure (90 to 140°C), lower tooling cost (no high temperature moulds), no limitations on cores and gelcoats. Better production flexibility.

For more information, log on **[www.resoltech.com](http://www.resoltech.com)** or email **[export@resoltech.com](mailto:export@resoltech.com)**.

The above list of products and services is not exhaustive. Please check with the sales department should you be unable to find the product or service you need. Resoltech reserves the right to amend this list without prior notice.

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**TECHNOTES**



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