CLOSED MOULDING RESINS

Infusion, RTM, CIPP, Pultrusion & Hot Press Moulding

Reducing styrene exposure and emissions in the composites industry

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Reducing styrene exposure and emissions in the composites industry

Introduction

The continued push to reduce styrene exposure and emissions in the Composites Industry, has generated increased interest in alternative closed moulding processes such as Vacuum Infusion, Resin Transfer Moulding (RTM), CIPP and Hot Press Moulding.

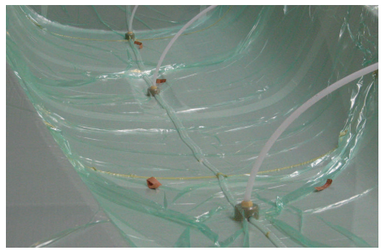
Vacuum Infusion

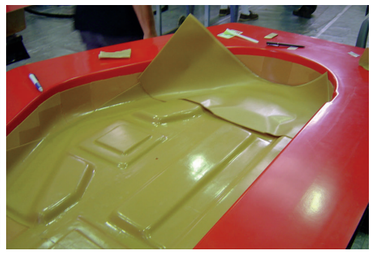
Vacuum Infusion provides a relatively low-cost option for open-mould laminating operations considering conversion to a closed moulding process. With some minor modifications, an existing mould used for hand lay-up or spray-up laminating, can be used for Vacuum Infusion Moulding. **Advantages over Open Moulding processes include:**

- Low workshop styrene emissions, reducing the need for expensive ventilation and extraction systems
- Void-free composites can be produced with higher glass contents, resulting in improved mechanical properties
- Reduced Material wastage
- Suitable for production of large items

Resin Transfer Moulding (RTM)

The RTM process is a method of moulding FRP composite parts in a two-piece matched cavity mould using pressure. Initially, dry fibre-reinforcements are loaded into one of the mould halves (usually the female). The male and female mould halves are then closed and clamped shut. Catalysed resin (typically unsaturated polyester or vinyl ester) is then introduced into the mould cavity by pressure injection. Rapid mould cycle times can be achieved depending on the particular resin and cure system used, and whether heat is employed in the process. Variations of the RTM process include vacuum assisted RTM and RTM-Light. RTM-Light offers lower setup and tooling costs compared with conventional RTM. RTM-Light employs the same cavity mould concept as in traditional RTM, however the top mould construction is typically a lightweight, semi-transparent FRP laminate, based on unsaturated polyester or vinyl ester resin.





Cured in Pipe Process (CIPP)

A cured-in-place pipe (CIPP) is a trenchless rehabilitation method used to repair existing pipelines. It is a jointless, seamless pipe lining within an existing pipe. As one of the most widely used rehabilitation methods, CIPP has applications in sewer, water, gas, chemical and district heating pipelines. The process of CIPP involves inserting and running a felt lining into a pre-existing pipe that is the subject of repair. Resin within the liner is then exposed to a curing element to make it attach to the inner walls of the pipe. Once fully cured, the lining now acts as a new pipeline.

Pultrusion

In the standard pultrusion process the reinforcement materials like fibers or woven or braided strands are impregnated with resin, possibly followed by a separate preforming system, and pulled through a heated stationary die where the resin undergoes polymerization. The impregnation is either done by pulling the reinforcement through a bath or by injecting the resin into an injection chamber which typically is connected to the die. Many resin types may be used in pultrusion including polyester, polyurethane, vinylester and epoxy. Resin provides the resistance to the environment, (i.e., the corrosion resistance, the UV resistance, the impact resistance, etc.) and the glass provides strength, in addition to safety from fire.

Hot Press Moulding

The hot press moulding method is a manufacturing process that involves compression of a moulding compound based on a thermoset resin, such as unsaturated polyester or vinyl ester resin, between two matched metal die surfaces. The moulding compounds are either SMC (Sheet Moulding Compound) or BMC (Bulk Moulding Compound). Cure cycles are very rapid for high production output applications.

Product	Description	Geltime (minutes)	Viscosity @ 25°C	HDT °C
Infusion				
Hetron 922 Infusion	Low viscosity, promoted epoxy vinyl ester resin designed for manufacture of marine and structural parts	118 minutes 2% CP-50 EAA 22 minutes 2% Butanox M50 Refer TDS for additional geltime data	300-350	105
Nutech 6010 Black Infusion 20	Pre-accelerated, non-thixotropic DCPD modified unsaturated polyester resin specially developed for use in room temperature Vacuum–assisted resin injection moulding (RIVA), resin transfer moulding (RTM) or injection moulding Composite applications	10 -12 minutes 2% Butanox L50	240-280	92
Polyplex 1472 Infusion 25	Pre-promoted, terephthalic polyester resin suitable for vacuum infusion moulding applications	20-25 minutes 1% Butanox M-50	180-220	98
Polyplex DCPD Infusion 25 & 140 minute version	Pre-accelerated, white, non-thixotropic DCPD modified unsaturated polyester resin, which has been specially developed for use in room temperature Vacuum–assisted resin injection moulding (RIVA), resin transfer moulding (RTM) or injection moulding Composite applications.	20-25 minutes 1.5% Curox M340 130-150 minutes 1.5% Curox MCP75	90-110 140-160	75
Polyplex DCPD White Infusion	Pre-accelerated, white, non-thixotropic DCPD modified unsaturated polyester resin, which has been specially developed for use in room temperature Vacuum–assisted resin injection moulding (RIVA), resin transfer moulding (RTM) or injection moulding Composite applications.	36 minutes 1.5% Butanox M50 31 minutes 1.5% Curox M340 25 minutes 1.5% Curox A300	110-130	75
Ultratec Infusion 30, 45 & 60 minute versions	Low viscosity, promoted epoxy vinyl ester resins designed for manufacture of marine and other structural parts using the vacuum infusion moulding process.	30-35 minutes 45-50 minutes 60-65 minutes 1.5% Butanox L50	140-160	130

Product	Description	Geltime (minutes)	Viscosity @ 25°C	HDT °C
RTM				
Polyplex 473E-25	Unsaturated polyester resin based on recycled PET (Polyethylene Terephthalate), containing approximately 25% PET content and specially developed for use in composites infusion applications.	20-25 minutes 1% Butanox M50	180-220	98
CIPP				
Polyplex 916 CIPP	Medium reactivity, pre-promoted, isophthalic, unsaturated polyester resin dissolved in styrene. It has been specifically designed for (CIPP) re-lining applications. The resin contains a mineral filler, and shows a long initiated pot life at room temperature, and rapid cure at elevated temperatures.	13-19 minutes 134g resin + 1.3 g Perkadox 16 + 0.2 g TBPB (SPI Reactivity Test) Refer TDS	4000-6000 LVT 4/60	90.4
PULTRUSION				
Viapal 4838	VIAPAL 4838 is an unpromoted Epoxy-Bisphenol Vinyl Ester resin with good elongation , general toughness and durability properties in the cured state. The resin – when properly formulated – is suitable for use in a range of demanding composite applications where good water, general chemical resistance and mechanical properties are required.	5-14 minutes 0.3% Cobalt (6%) 0.1% DMA, 1.24% Curox M100 MEKP	300-500 LVT 2/30	130
HOT PRESS MOULDING				
SPE44-419	SPE 44-419 ORTHO BASE RESIN is a high reactivity, non-promoted, orthophthalic based unsaturated polyester resin. This resin is suitable for production of Bulk Moulding Compounds (BMC), or Sheet Moulding Compounds (SMC) for use in hot press moulding processes utilizing matched die moulds operating under elevated temperature and pressure. This resin can also be used in Pultrusion and some filament winding applications.	3-7 (1.0% TBPB catalysed at 25°C and placed in a 100°C bath) Time (87 – 107°C)	1100-1500 RVT 50/3	88-92

- For Viscosity Values - Refer to TDS for Test Conditions

Troubleshooting Vacuum Infusion Process

Problem	Possible Causes	Solutions
Dry Spots	Incorrect flow-front where the resin encircles an area	Add or change vacuum injection points
	Glass fibre too compacted	Increase quantity of resin transfer medium
	Overlap of reinforcement	Add/Change vacuum/injection points
Porosity	Air in resin	Allow time before injection for resin to de-aerate
	High resin viscosity	Reduce resin viscosity - refer to resin supplier
	Bridging of reinforcements	Manually compact reinforcements in sharp corners
	Leaky seals, tubes or connections	Locate and repair leaks
	Open cell core materials	Change core material
	High vacuum level	Reduce vacuum
	Incorrect catalyst type	Check with resin supplier for suitable grades
	Dry spot always in same place	Move vent to that area
Warpage	Excessive variation in glass content	Rectify variations of reinforcement layout
	Uneven catalyst mix	Mix properly before injection
	Uneven laminate thickness	Rectify placement of reinforcements
Print Through	Excessive shrinkage	Consider use of print barrier
	Too early demoulding	Leave in mould longer
Poor adhesion to PVC and Balsa Core materials	Core moisture content too high	Store in dry environment before use
	Low moulding temperature	Increase to correct level
	Surface cure inhibition	Change to more suitable grade of core material

For more information please request a Technical Data Sheet, contact your allnex Sales Representative or call our Customer Service Team on 1800 789 607.