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Fibre composite manufacturing

Resin infusion and vacuum bagging

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Eco-efficiency for the Marine Industry Fact Sheet

Do you want to

- achieve higher production rates?
- improve product performance (e.g. low weight, greater strength and stiffness)?
- save time and labour?
- reduce waste?
- reduce emissions that impact upon human health and the environment?

Resin infusion

Resin infusion involves laying reinforcement materials up dry in a mould (existing moulds can be used). The reinforcement is then covered with a membrane and sealed around the mould edge until it is airtight. A vacuum is then applied and draws the resin through the mould.

Advantages^[1]

- Highly reduced emissions—resins are confined beneath the membrane for the entire process (except during mixing)
- No direct worker contact with resins
- Less waste—resin use is consistent and predictable
- Secure bonding between the skin and the core
- Products with higher strength and stiffness and lower weight
- Smooth surface finish on all exposed surfaces
- Labour and time savings
- Existing moulds can be used
- Complex geometric parts are possible

Disadvantages

- Longer set-up times
- Relatively long trial periods or training required
- Careful planning, set-up and training is required to avoid rework or leaks

Case study: Infusion technology saves production time and resin.

Perry Catamarans on the Gold Coast produces luxury motor yachts and blue water sailing catamarans. The company is successfully using infusion technology to produce parts for its boats, and is currently trialling its use for hull production. Infusion technology saves about 30% in time and 65% in resin compared to manual methods, which were used previously.

“Training and trials have been an important aspect to the successful use of this technology. Infusion produces a stronger and lighter product with no styrene emissions, as opposed to a chopper gun. This makes the working environment cleaner and more productive. We have also found that infusion technology is particularly suited to Queensland’s warm climate, as the resin flows better in the warm weather.”

- Peter Schwarzel, Technology Manager, Perry Catamarans.



Reinforcement materials are sealed with a membrane until airtight

Infusion trials—time and labour savings and improved quality and performance^[2]

DIAB Core Infusion Technology has been developing composite materials for over 50 years, and is one of the world's largest manufacturers of structural core materials. It specialises in sandwich infusion cores to make structures lighter and stronger. The tables below highlight some of the production benefits of vacuum infusion technology using sandwich cores, when compared to open moulding techniques.

Table 1: Time and labour savings of vacuum compared to open moulding

Size	Time savings (%)	Labour savings (%)
30' – 40' hull	> 50	20
40' – 50' hull	30	25
50' hull and decks	45	30

Table 2: Quality and performance benefits of infusion vacuum infusion compared to open moulding

Feature	Improvement (%)
Strength	+ 45
Stiffness	+ 100
Weight	- 46

Vacuum bagging

During vacuum bagging, reinforcement is placed in a mould and catalysed resin is sprayed, poured or pumped over the mould, which is then covered with plastic and sealed. A vacuum is applied to remove air and forces excess resin from the system.

Advantages^[1]

- Emissions reduced by confining the resins in the mould until curing is complete. If pumped or poured, emissions and waste are further reduced.
- Reduced amounts of resin and reinforcement used.
- Low costs for low volume production.
- Enhanced physical properties.
- Quality consistent.
- Tooling costs relatively low.

Disadvantages

- Generates solid waste through the removal of excess resin and bagging material.
- Can be difficult to bag complex parts.
- Operator skill is important.



A vacuum bagged mould

Useful websites

www.rtmcomposites.com/rtm.html, www.plastech.co.uk/frame.asp, www.grpguru.com/vipupdate.asp, www.fibreglast.com/documents/361.pdf, www.diabgroup.com/aao/a_services/a_infuse_1.html, www.spsystems.com, www.marinecomposites.com

Emerging fibre composite technologies

The Queensland Department of State Development, Trade and Innovation has released a Technology Roadmap for Recreational Boat Builders that provides useful information on emerging fibre composite technologies. Contact the Marine Industries Sectoral Development Team at www.sdi.qld.gov.au for more information.

References

1. ACMA (2004) Controlled Spraying Handbook, American Composites Manufacturers Association, Arlington, VA, USA.
2. DIAB (2004) DIAB Core Infusion Technology - CDROM Presentation Version 2.0, DIAB Group, Sydney.

For further information

EcoBiz can assist you to reduce costs and improve eco-efficiency in your business Call 1300 369 388 for further information.

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