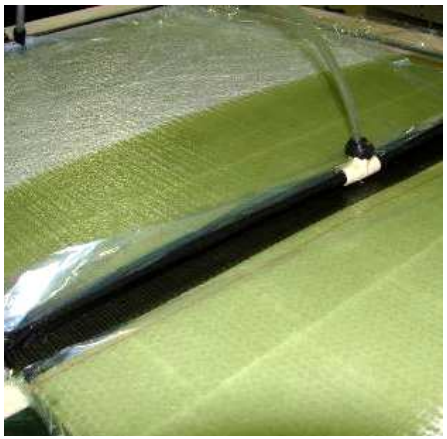
ROVIpan™

ALL IN ONE SANDWICH REINFORCEMENT FOR VACUUM INFUSION



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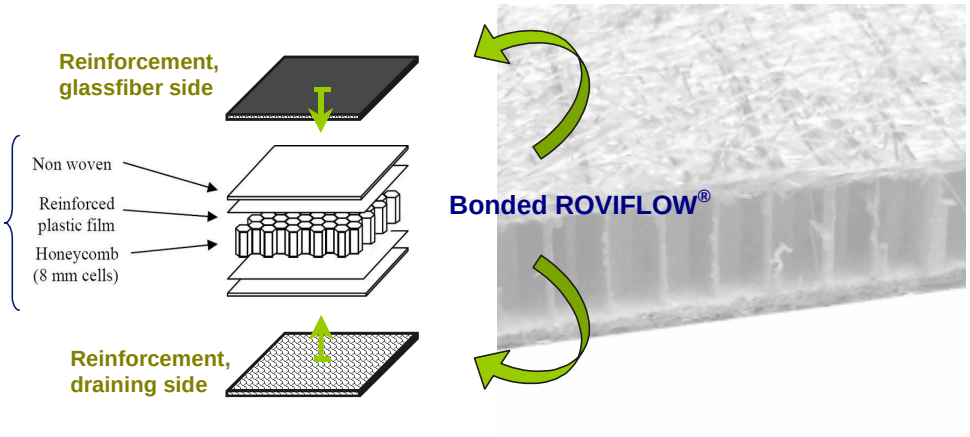
1 – INTRODUCTION

ROVIPAN™ is the combination of a **nidaplast** polypropylene (PP) honeycomb (**nidaplast**®**8RI**) and a glass reinforcement with an integrated flow medium (**ROVIFLOW**®), especially for vacuum infusion.



ROVIPAN™ has been developed with **nidaplast** and **Chomarat** and is particularly dedicated to vacuum infusion processes. It is the most suitable reinforcement for producing large sandwich parts with thicknesses from 5 to 40 millimetres.

There are many applications of **ROVIPAN**™ in building, transport, marine and energy industries. For example: wind turbine nacelles, vehicle floors, boat decks, wall panels, swimming pools…

This technical data sheet describes how to use this new range of sandwich panels for infusion.


Wind turbine


Yachting


Transport

2 – WHY CHOOSE THE INFUSION PROCESS

The main grounds for using the infusion process are as follows:

- **Meet the environmental standards** and **improve the working conditions**, with regard to the decrease in COV emissions
- **Reduce the raw material cost** thanks to a better estimation of raw material quantities. Reduce labour cost
- **Improve quality:** with a better surface appeal, a low porosity and a high fibre rate.
- **Improve cost prices**

This process is particularly well adapted to industrialization and to the production of large sandwich panels.

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3 – Principle of the infusion process

The principle of the infusion process is to impregnate layers of dry resin fibres held between an airtight rigid mould and a flexible sheet sealed to the border of the mould.

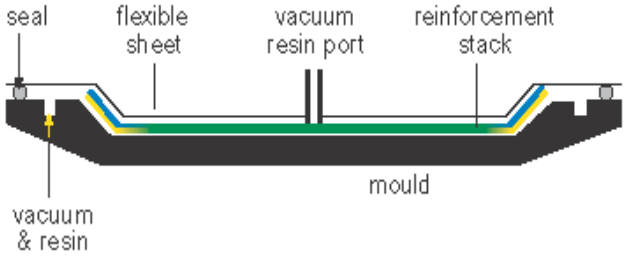
The resin is a thermoset resin usually made of polyester, or epoxy or vinylester. Some formulations are specially elaborated for infusion with a low viscosity and a low exothermic property.

A partial vacuum is created in the cavity of the mould so that the resin can infuse in the fiberglass reinforcements. Vacuum is upheld during resin curing time.

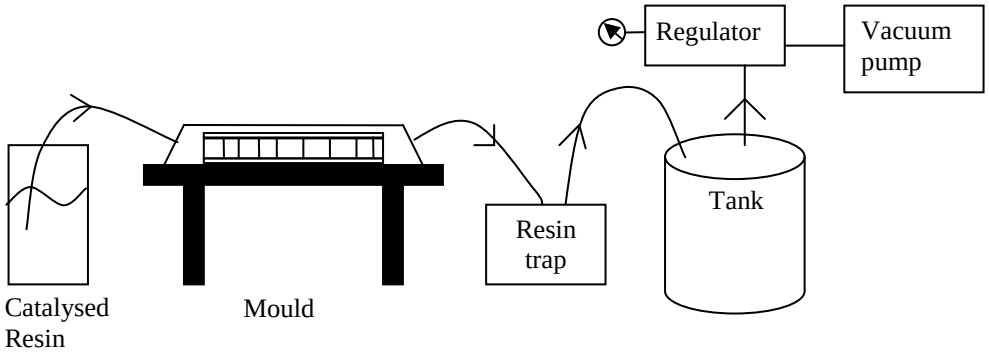
The low cost tooling mainly consists in the vacuum system and the composite mould and can be re-used. Yet some consumables must be taken into account such as breather, peel plies and the vacuum bagging.

The emissions of solvents and particularly styrene are minimized in this closed mould process.

Infusion allows the production of structural parts with high fibre rates (60 – 70 %). More generally the process allows several meter long structures with complex shapes and the possible inclusion of inserts



4 – Material used



The catalysed resin is shut in a semi-watertight barrel, thus reducing the emissions of styrene.

The resin gets into the mould through flexible pipes.

Sealing between the vacuum bagging and the mould is obtained by a vacuum bag sealant tape (tacky tape) specially adapted for this application.

The resin trap consists in a tin on which a lid is fixed to prevent the styrene for evaporating. Pneumatic pipes link the mould to the trap. Should the resin be sucked by the pipes on its way out of the mould, then the resin trap would absorb the extra resin thus separating the resin from the vacuum pump.

A 50 L tank is added for large pieces.

A pressure sensor fixed to the vacuum tank checks the depression in the circuit.

The vacuum pump provides the vacuum in the vacuum bag once watertight sealed.

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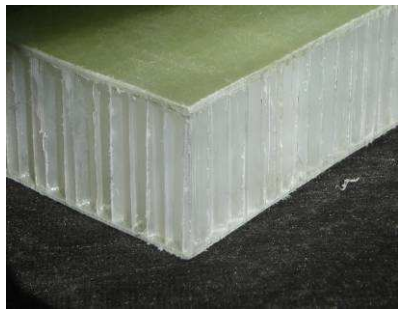
5 – THE PRODUCT

ROVIPAN™ is the combination of a nidaplast polypropylene honeycomb (**nidaplast®8RI**) and a glass reinforcement with an integrated flow medium (**ROVIFLOW®**), especially adapted for vacuum infusion.

nidaplast®8RI is a polypropylene honeycomb core coated with a PP film and a polyester non-woven fabric specially reinforced to resist to the pressure of resin on the core during the infusion process.

It prevents the resin from filling the cells.

Dry **ROVIPAN™**



40 mm **ROVIPAN™** infused

Skins of **ROVIPAN™** sandwich panel are composed of **ROVIFLOW®**, a reinforcement range specially designed for infusion process.
Two types of **ROVIFLOW®** can be used:
♦ **ROVIFLOW® 150N** : 100% glassfiber solution
♦ **ROVIFLOW® NET1** : with a polyester knitted flow medium

Advantages of **ROVIFLOW®** NET1:
• Low compressibility under vacuum
→ Only 0,7mm thick after infusion
• High permeability
→ High flow rate
• Deformability

For **ROVIPAN™** sandwich panel, **ROVIFLOW®** has a specific construction. The layer composition is :
NET1 (or 150N) for the draining of the resin
Woven roving or UD, for mechanical properties
CSM for mechanical properties and surface aspect

ROVIPAN™ is a ready-to-use sandwich panel easy to set up and manipulate.

ROVIPAN™ is available from 5 to 40 mm thick
• The whole range of Roviflow® can be used in ROVIPAN®
• Size: 1.2 x 2.5 meter panels

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6 – INFUSION

GENERAL NATURE

The working principle of a sandwich panel is to have a perfect grip between the core and the rigid skins. Therefore when processing the panel, make sure of:

- a good resin impregnation of both skins
- a good contact and a good grip between the core and the skins, thanks to the pressure of the vacuum bagging on the sandwich.

The **ROVIPAN™** is design for a direct infusion of thermoset resins like polyester (or others). Knowing the large number of formulations of resins and processing techniques, it is yet highly recommended to check their compatibility with **ROVIPAN™**

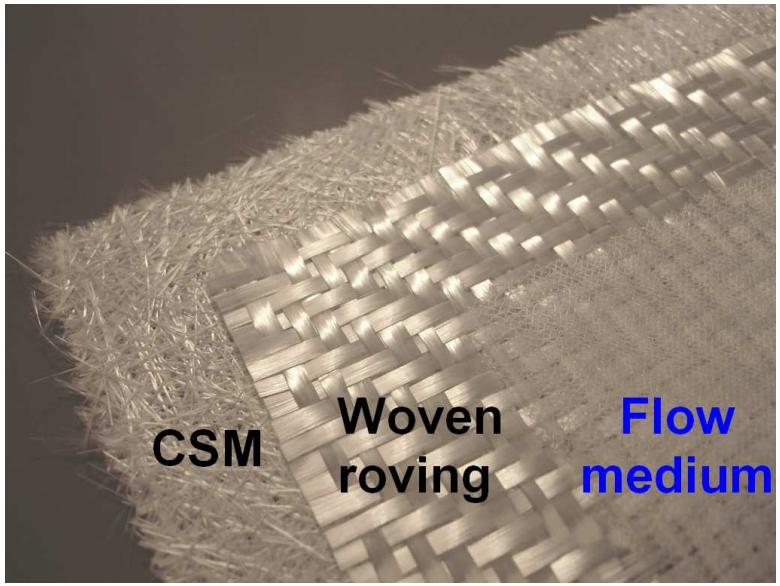
Infusion of thermoset resin is currently carried out with resins with a viscosity under 300 cps and under a pressure between –0.6 and –0.9 bars, following the manufacturer's prescriptions.

RESIN FLOW

The gel time varies according to the resin type. With 1 % catalyst gel times can vary from 90 to 175 min. These times obviously need to be adapted according to the requested piece or to the type of reinforcement used.

The infusion span depends on the viscosity of the resin, on the feeding rate but also on the draining capacity of the reinforcements: porosity.

The **ROVIFLOW®** reinforcements have been designed for the infusion process: the flow media (PET net or continus fibreglass) are positioned closed to the core material to allow a very good delaminating resistance.



Net 1 in contact of the polypropylene honeycomb

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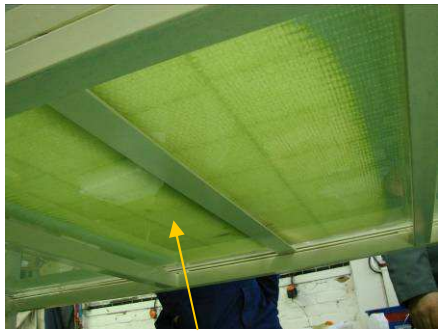
Drainage on the mould side:

It is to be noted that drainage distances depend on the rate of reinforcement of your structure. Therefore it seems wise to make sure beforehand, thanks to small preliminary tests, that drainage on the mould side operates correctly.



Preliminary tests to check drainage of the resin on the mould side

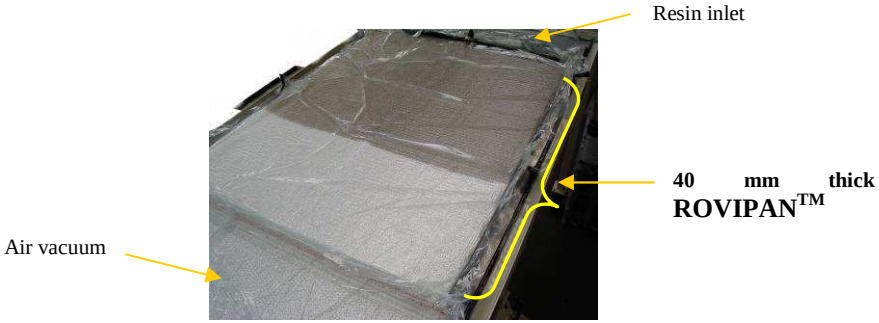
In all cases the use of these flow media and resins has to be carried out according to the prescription of the product suppliers. In the end the quality of the panel achieved has to be checked whether on aesthetics (absence of poorly infused area) or on mechanical values (good grip between fibre reinforcements and **nidaplast®8RI**).

INFUSION STRATEGIES

To impregnate the fibres in contact of the mould, you can use different strategies. The infusion can be done by filling the piece from one edge to the other or by using the junction of the panels.

Infusion by filling from one edge to the other

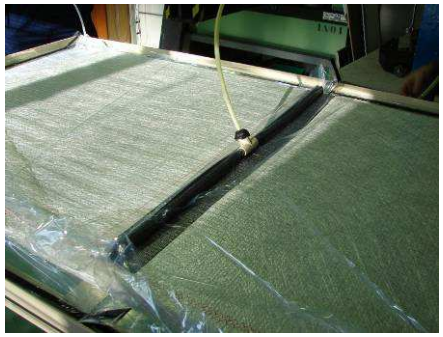
If the resin can flow all the length of the piece with media flow, the strategy of infusion can be to put a resin arrival on one side and to put the air vacuum on the other side.



The resin flows up and down the core thanks to the internal flow media of the **ROVIPAN™**

Infusion using panel junction

If the piece is bigger and need to have a resin arrival on top of the panel, the better strategy to drain the resin each side of the core material is to put the spiral tubing above a panel junction.



Spiral tubing put above a panel junction

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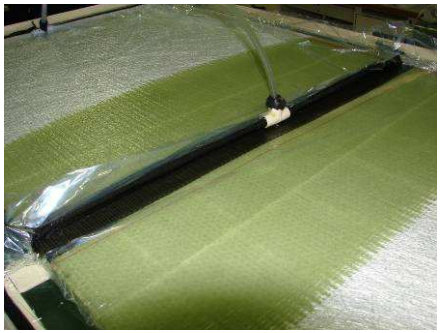
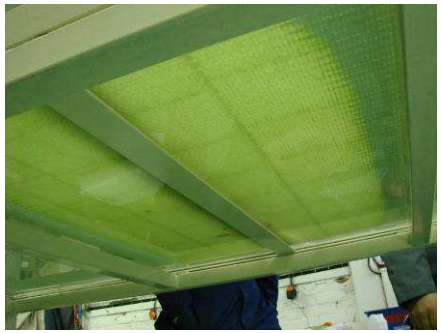
This configuration of infusion is very interesting because the resin line on both sides of the **ROVIPAN™** can be about the same if the sandwich is symmetric.



Drainage on the vacuum bag side



Homogenous impregnation of the fibres on the mould side et the same time

The impregnation of the fibre on the mould side is very homogenous.

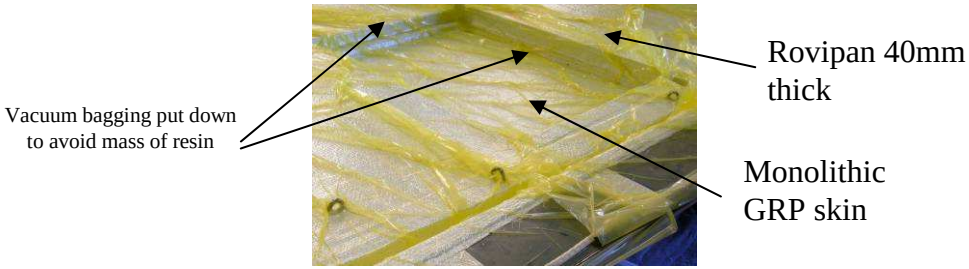
This strategy of infusion needs only to cut the panel or to put the panel junction underneath the spiral tubing of resin infusion.

In all cases the use of these strategies has to be cheeked by preliminary tests. The choice of one of these strategies depends on lots of parameters: viscosity of resin, quantity of fibreglass, piece geometry…

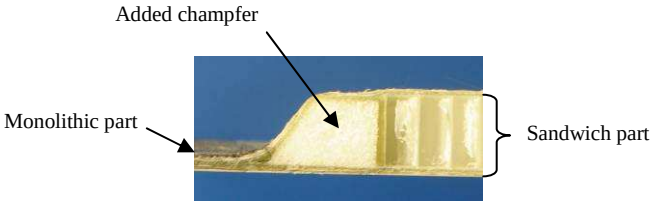
In the end the quality of the panel achieved has to be checked whether on aesthetics (absence of poorly infused area) or on mechanical values (good grip between fibre reinforcements and polypropylene honeycombs).

PANNEL EDGES

When possible, if you want to end the structure with a 90 deg angle (for a flat piece for example), please ensure that the vacuum bagging is well put down to avoid mass of resin.



A softer angle could be preferred and can be obtained by chamfering the outlines of the structure (saw- or knife-cutting, sanding) or by adding foam or wooden parts, for instance.



Also make sure that the edges are well sealed with mastic or an adhesive film.

OPERATING STEPS

In order to help if this is the first time you carry out infusion with our **ROVIPAN™**, here are the traditional operating steps:

1) Traditionally prepare the mould, with cleaners, sealers, multishield...

2) Apply gelcoat to obtain a good appeal piece
3) Let the gelcoat polymerize

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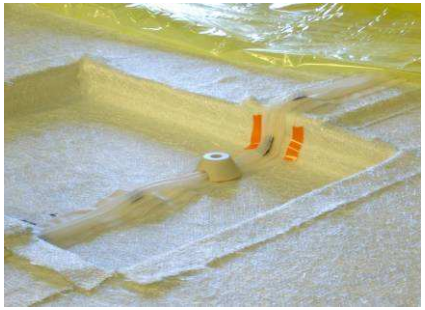
4) Apply the sealant tape around the mould

5) Place the spiral tubing for the perimeter vacuum

6) Put the **ROVIPAN™** carefully cut at the right dimensions into the mould.



7) Treat the edges of the panel and if necessary make sure of the panel junctions (§4)

9) Likewise, according to the prescriptions of the resin supplier and to your infusion sequence, distribute the vacuum and resin inlet spiral tubings and fix them with cellotape or mastic.

On a sequential infusion the resin inlet tubings can be placed every 50 to 70 cm, for example, according to the resin viscosity, reinforcement rates...

10) Put and glue the vacuum bagging with some sealant tape while leaving way to feeding drains

11) Stop the resin inlet with some pliers

12) Put the vacuum on

13) Add the catalyst, stir and open the pliers to start infusion. If need be, delay when opening the pliers following your infusion scheme.

14) Once the piece is infused, shut the resin inlet

15) Once totally hardened (at least 2 hours), stop vacuum, take off the sealant tape and the peel ply.

16) Unmould the part, use compressed air if you meet any difficulties.

If necessary, do not hesitate to contact us.

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7 – MECANICAL AND PHYSICAL PROPRIETIES

Mechanical properties*

	Units	nidaplast® 8RI	according to
Density	kg/m3	80	ISO 845
Compressive strength (at break, at 20°C)	Mpa	1,2	ISO 844
Compressive modulus	Mpa	30	ISO 844
Ultimate perpendicular tensile strength (at break)	Mpa	0,5	NF T56-130
Shear strength	Mpa	0,4	ISO 1922
Shear modulus	Mpa	5	ISO 1922

** given for a 20mm thickness. Characteristics depend on thickness. Contact us for more information.*

Other characteristics :

Thermal insulation
Thickness 20 mm : R = 0,3 m².°C/W (λ = 0,067 W/m.°C)
Thickness 90 mm : R = 0,6 m².°C/W (λ = 0,14 W/m.°C)

Behaviour with fire
Standard quality is flammable
Possibility of M1/F0 classification on the sandwich panel depending on the faces of the panel

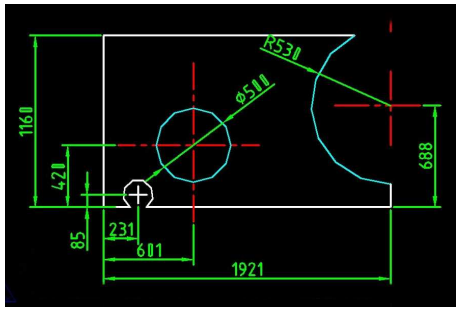
Chemical resistance
Very good resistance to most acids, bases and salts.
Very low water incorporation (lower than 0,2 %)

U.V. resistance
Low for standard quality (UV protection is ensured by the skins of the sandwich panel)
Possibility of reinforced grades.

For more information on nidaplast 8RI properties, ask for nidaplast technical data sheet

8 – ROVIPAN PRE-CUT KITS

We provide also kit operations starting from drawing, layouting, cutting of the **ROVIPAN™** panels



Lots of applications in marine and wind energy are taking advantage of the use of pre-cut kit sets.

nidaplast and **Chomarat** offer an entire technical support to best fit to your applications. Each project is managed in a closed collaboration with the customer: Technical exchange, Drafting of a technical specification, **ROVIPAN™** solution package proposal, kit prototype, technical support for working up…

Pre cut kits allow having full control about the material cost, avoiding waste material, save labour cost and do not occupy floor space with additional cutting equipment. The pre-cut kits speed up the lay up of the piece and help you to win time and money.
For all questions on this step, do not hesitate to contact us.

Nota : The indicated directions can serve as a guide to use the product but cannot be considered as a guarantee of a good working up. Additionally application, utilization and/or transformation of the products escape our control possibilities. As a consequence, they exclusively remain the responsibility of the applicator and/or the user and/or the transformer.

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