Handling Instructions for Infusion

Nidaplast® 8 RI
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Nidaplast® 8 is an extruded Polypropylene honeycomb covered on both faces with a polypropylene film and a non-woven fabric. It is available in 2500 x 1200 mm sheets ready for direct use: lamination, gluing or infusion.

Non woven as a support for lamination or gluing.

Plastic film to prevent resin or glue from filling the cells.

Honeycombs.

These flexible and light sheets enable an easy use in sandwich panels where most usual techniques of cutting, laminating and gluing can be applied. Since it is a thermoplastic product, other additional specific properties make its use even easier.

In order to meet the specific constraints of this technique, Nidaplast has developed a new special polypropylene honeycomb for infusion process: Nidaplast® 8RI

This new range of honeycombs can be used in the following markets for infusion:

- Wind turbine
- Yachting
- Transport

1 - WHY CHOOSE THE INFUSION PROCESS

The main grounds for using the infusion process are the following:

- Meet the environmental standards and improve the working conditions, with regard to the decrease in CO2 emissions
- Reduce the raw material cost thanks to a better estimation of raw material quantities, and reduce labour costs
- 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.

2 - 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, epoxy or vinyl ester. 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.

3 - MATERIAL USED

1. 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.
2. 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.

**5 - Infusion**

**5.1 - 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 non woven polyester on nidaplast® 8RI provides an ideal surface for direct infusion of polyester type thermoset resins (or others). Knowing the large number of formulations of resins and processing techniques, it is yet highly recommended to check their compatibility with nidaplast® 8RI.

Nidaplast® 8RI non woven polyester and plastic film have been specially studied to limit the flow of resin through the cells.

Infusion of thermoset resin is currently carried out with resins with a viscosity under 300 cps and under a pressure between –0.85 and –0.95 bars, following the manufacturer’s prescriptions.

**5.2 - 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. To allow the resin flow, the draining capacity should be eased by the use of either «mat flow» or «flow fabrics with reinforcement effect» or «flow fabrics without reinforcement effect».

It is absolutely necessary to use one of these draining surfaces in contact with nidaplast® 8RI on the mould side of the structure so that the resin impregnates the fibres when in contact with the mould.

**5.3 - Infusion Strategies**

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.

In all cases, the use of these flow media and resins has to be carried out according to the prescription of the product suppliers.

The quality of the achieved panel has to be checked whether on aesthetics (no poorly infused area) or on mechanical values (good grip between fibre reinforcements and nidaplast® 8RI).

To impregnate the fibres in contact of the mould, you can use different strategies. In all cases, it is absolutely necessary to use a draining surface in contact with nidaplast® 8RI on the mould side.

The infusion can be done by filling the piece from one edge to the other, or by using the junction of the panels.
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. The nidaplast® 8RI does not need to be perforated.

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.

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

This strategy of infusion needs to cut nidaplast® 8RI 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 checked by preliminary tests. The choice of one of these strategies depends on lots of parameters: viscosity of resin, quantity of fiberglass, 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).

The traditional operating steps for infusing nidaplast® 8RI:

1. Traditionally prepare the mould, with cleaners, sealers, multishield...
2. Apply gelcoat to obtain a good appeal piece.
3. Let the gelcoat polymerize.
4. Apply the sealant tape around the mould.
5. Place the spiral tubing for the perimeter vacuum.
6. Put the fiberglass reinforcements carefully cut at the right dimensions into the mould.
7. Lay and cut a flow media.
8. Lay the nidaplast® 8RI.
9. Treat the edges of the panel and if necessary make sure of the panel junctions.
10. If you use an interlaminate flow media on the vacuum bag side, put it in contact with nidaplast® 8RI, then lay down the well cut fibreglass reinforcements. If you use a peel ply and PE grid on the vacuum bag side, lay down the fibreglass in contact with nidaplast® 8RI, then traditionnaly lay down the peel ply and the grid.

When possible, if you want to end the structure with a "90° angle" (for a flat piece for example), 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.

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

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

Stop the resin inlet with some pliers.

Put the vacuum on.

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

Once the piece is infused, shut the resin inlet.

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

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

If necessary, do not hesitate to contact us.

### 6 - Mechanical* and Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>nidaplast® 8RI</th>
<th>according to norm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Density</strong></td>
<td>kg/m³</td>
<td>80</td>
</tr>
<tr>
<td><strong>Compressive strength</strong></td>
<td>MPa</td>
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<tr>
<td><strong>Compressive modulus</strong></td>
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<tr>
<td><strong>Perpendicular tensile strength</strong></td>
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<tr>
<td><strong>Shear strength</strong></td>
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<tr>
<td><strong>Shear modulus</strong></td>
<td>MPa</td>
<td>5</td>
</tr>
</tbody>
</table>

*given for 20 mm th. Characteristics depend on thickness.

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

**Behaviour with fire** : Standard quality is flammable, possibility of M/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

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 user and/or the transformer.