

nidaplast® 8 in MARINE CONSTRUCTION

1 - INTRODUCTION

The **nidaplast® 8** honeycombs have the following mechanical, chemical and physical properties which allow the manufacturing of sandwich panels for marine engineering :

- It is chemical and hydrocarbons resistant
- Its main component PP, makes it hydrophobia
- The **nidaplast®** honeycomb is light, stiff and resistant to delamination
- The material has very good acoustic and sound insulation properties
- Bacterias & fungus cannot affect this material

All these advantages make **nidaplast®** one of the best cores for sandwich panels available on the market today.

nidaplast® is sold in large panels (2500x1200) with various thickness available from 5mm to 130 mm.

nidaplast® is used mainly in two applications :

1. Deck and superstructure in laminated polyester reinforced with glass
2. Inner structure and beams

nidaplast® is very convenient for hand lay up and vacuum techniques.

2 - DECK and SUPERSTRUCTURE

nidaplast® is covered on both sides with a non-woven polyester coating and a plastic film.

nidaplast® panels are suitable for most techniques used for polyester lamination process :

- Hand lay up
- Vacuum pressing or under press
- RTM, prepreg up to 125 °C

nidaplast® honeycomb is well adapted to produce sandwich panels for marine products because :

- It can easily fit in very different shapes
- It is also a light, rigid and stiff material
- It is a shock absorber which resists to delamination
- It is an acoustic and temperature insulator
- It is very competitive compared to other materials
- It cannot rotten

nidaplast® price is very competitive, namely for large thickness panels honeycomb enhances the composition and mechanical properties of panels without needing to oversize skins with glass for instance. The following example proves it :

Hypothesis : 1.5 m long sandwich panel built in and subject to a spreading load.

nidaplast®	Load in daN/m² for a deflection of 1/200			
	Polyester glass skin			
Thickness in mm	Thickness in mm ; modulus Mpa			
	2 ; 10000	2 ; 15000	3 ; 15000	4 ; 15000
5	24	39	56	83
10	63	83	122	160
20	174	220	285	338
28	285	346	430	492

It is clear that to support a particular load with a defined deflection, it is easier, more competitive and simple to increase the thickness of **nidaplast®** rather than the coating skins.

3 - The BULKHEADS

Inside the boat, the bulkhead has to be stiff, light and noise insulating. **nidaplast®** honeycomb owns all this properties and enable the manufacturing of laminated polyester bulkheads, also wood or any other decorative materials.

Laminating polyester skins is very easy ; so is the gluing of wood skins or any other decorative panel. Gluing is made under press with a pressure up to 0.8 bar. We suggest to use the accurate glue in order to match with the selected skin. (for example polyurethanes)

3.1. The LIGHTNESS

The table below shows the different weight/m² ratios for different partitions.

Partitions Thickness in mm	Marine Plywood	Weight/m ²	
		nidaplast® + 2.5 mm Plywood	nidaplast® + 2 mm Polyester
15	10.5	4.7	7.2
20	14	5.1	7.6
30	21	5.9	8.4

Example : For a 50 m² bulkhead with a 20 mm thickness, it is possible to gain 450 kg between a plywood and a **nidaplast®** combined with plywood.

3.2. STIFFNESS

The table below is showing stiffness with lateral pressure under Euler's law. It outlines the level of strength at the partition top in order to bend it :

Hypothesis : 200 cm height, sunk at the two ends K=4, bulkhead length b=100 cm

$$F_c = K * 3,14^2 * D / (L^2 + 3,14^2 * D / U * K)$$

$$U = h * G_c * b$$

Bulkheads Thickness in mm	Euler's critical strength in daN		
	Plywood	nidaplast + 2.5 mm Plywood	nidaplast + 2 mm Polyester
15	1385	869	1570
20	3280	1640	2890
30	11040	3800	6370
30	26000	6600	10715

By increasing the thickness of the partition by approximately 10 mm, we get the same stiffness as a solid partition but with a much lighter material.

3.3. The ACOUSTIC and SOUND INSULATION

Acoustic insulation for a material depends on two main parameters :

- Its mass
- Its properties in conducting vibrations.

The sound is transmitted through waves. One of the usual solutions regarding sound insulation consists in either increasing the mass of the material or producing a multi layer material in order to absorb vibrations.

nidaplast[®] honeycombs make it easy to manufacture sandwich panels with a light structure and increases the absorption level for sound waves.

Under sound waves, the first skin of the **nidaplast**[®] sandwich panel is going to vibrate but its viscoelastic properties will decrease sound waves transmitted through to the other skin. It has the same effect on the air trapped in honeycomb cells.

nidaplast[®] acoustic properties are closely linked to various parameters including the wave type and the nature of skin used on top.

Therefore it is not possible to give intrinsic characteristics of the core, only examples with various skins.

*(You can also have a look to the "acoustic" data sheet to have information about the acoustic advantages of panels made with a **nidaplast**[®] core.)*

The above mentioned information can be used as an application guide but cannot be considered as a guarantee of proper usage
