

Changing the way
aircraft interiors are made



Decreasing lifetime cost and environmental impact

Divinycell F

DIAB

Divinycell F foam core for aircraft interiors

The key objective in the aerospace industry is to decrease the lifetime cost of a component or system. At the same time, there is a strong demand to reduce any environmental impact. In the aerospace market, meeting both requirements can be a real challenge as they are often difficult to combine. Reducing environmental impact is related to decreasing weight in order to lessen fuel consumption while extending range and payload. However, decreasing weight increases demand on design, manufacturing processes and materials. Furthermore, the quality and safety requirements of the aerospace industry leave no room for errors. From DIAB's experience of looking at these challenges from a holistic point of view, combining design, manufacturing, and quality with the right materials can lead to improvements in all areas.

DIAB's core material solution for aerospace interiors, Divinycell F series, is developed to meet these requirements.



Divinycell F

Changing the way aircraft interiors are made

Divinycell F is developed specifically as an excellent alternative to honeycombs for aircraft interiors. Divinycell F reduces weight and manufacturing cost of interior aircraft parts such as stow bins, sidewall panels and monuments. Further, Divinycell F enhances design freedom and process capability providing excellent surface characteristics suitable for high gloss painting. These unique characteristics enable interior manufacturers **to decrease lifetime cost and environmental impact while providing value for the customer.**

Decreased cost with Divinycell F

Divinycell F can reduce cost for parts. Molded part surfaces are smooth and even due to the micro cell structure of the core. This feature significantly reduces the amount of hours needed for filling and fairing parts for finishing. Divinycell F also eliminates the need for edge filling and hard points. These features, in combination with unique forming capabilities, enable manufacturers to combine part fabrication into fewer steps- saving time and cost.

Decreased environmental impact

Divinycell F reduces the impact on the environment by saving weight. Without edge filling and hard points, Divinycell F cored parts help reduce the aircraft interior weight. Divinycell F comes in a wide range of mechanical properties and densities so designers can optimize the core of their application. Naturally, weight reduction has positive impact on fuel consumption, payload and range.

Divinycell F's unique polymer is recyclable, further reducing environmental impact compared to alternative core materials such as phenolic honeycombs and acrylics.

Improved design

Divinycell F brings a whole new level of design freedom. Unlike honeycombs, Divinycell F does not restrict shaping and finishing. Its fine cellular structure and chemical composition enables aggressive shaping by thermoforming and cold forming. Since Divinycell F has a continuous surface, it provides a smooth finished surface free of honeycomb print and ready for paint or covering with minimal fairing.



Decreasing lifetime cost and environmental impact

Designing and manufacturing aircraft interiors with Divinycell F

Designing and manufacturing interiors with Divinycell F decreases the cost and weight compared to honeycombs. To illustrate this, DIAB conducted an independent study in which three different composite manufacturers fabricated identical parts using honeycombs and Divinycell F. The results show that using Divinycell F reduces weight and cost while improving cosmetic quality.

Design objectives

A number of criteria affect the design process of aircraft interiors. To achieve budgets and design goals in terms of shape and performance, the design objectives must be calibrated with the right core material.

Core material selection

Core material selection is dependant on the component design objectives including mechanical performance (type of applications), FST compliance, acoustic insulation, environmental resistance, manufacturing process and cosmetic value.

Design phase

Divinycell F provides design freedom for interiors. Curved and innovative designs are possible thanks to Divinycell F's chemistry and cellular structure, toughness and forming capabilities.

High impact on:

✓ Quality and finish

Manufacturing

Manufacturing interior parts with Divinycell F requires fewer steps compared to honeycombs, saving time and cost for the manufacturer.

High impact on:

✓ Time and cost

Formability

Divinycell F can be formed into complex shapes in hot or cold temperatures. It can also be precut into kits and labeled according to the print and process. In short, Divinycell F is available in kit form ready for lamination, which saves time and cost.

High impact on:

✓ Quality and finish ✓ Time and cost

Lamination

Divinycell F works exceptionally well with pre-pregs and is compatible with many wet resin systems. (To find out which ones, contact DIAB Technical Services.) Divinycell F's micro cellular structure does not require a film adhesive and bonds readily with most pre-preg systems for excellent peel performance and durability.

High impact on:

✓ Time and cost



Hard points & edge fills

Divinycell F is a continuous foam core. No edge fill or hard point potting is required, saving the fabricator time and money while decreasing a part's weight. If required, high-density inserts may be added before lay up, providing strength and durability for hinges, fasteners and pulls.

High impact on:

✓ Time and cost ✓ Decreased weight

Surface finish

Divinycell F's continuous micro cell structure fully supports the laminate, reducing the amount of finishing needed to achieve a high quality surface. This along with the reduced need for potting and edge fill, reduces the amount of required post lamination work.

High impact on:

✓ Quality and finish ✓ Time and cost ✓ Decreased weight

Conclusion, Decreasing Cost and Weight

Based on the above process savings, a potential cost saving on a typical overhead stow bin or locker door made of Divinycell F can be approximately 9-19% vs. a honeycomb-cored alternative. Also, comparing the weight of these parts indicates a potential weight savings of approximately 10%.



Optimize your interior application with the Divinycell F product range

Divinycell F40

F40 is an ultra lightweight interior core for parts not exposed to passenger loads, such as ceiling panels and headrests. F40 is used on parts requiring FST compliance, acoustic damping performance and good cosmetic appearance.

Divinycell F50

F50 is a lightweight interior core for components such as sidewalls, galleys, monuments and headrests. F50 is used on parts requiring FST compliance, acoustic damping performance and good cosmetic appearance.

Divinycell F90

F90 is a moderate weight interior core for components subject to heavier loads and impacts, such as dados and stow bin floors. F90 is used on parts requiring toughness and durability, FST compliance, and acoustic damping performance.



Talk with us

Naturally, needs differ between application, part and manufacturer. Talk to us and let us discuss how Divinycell F can improve your aircraft interiors. You can also visit www.diabgroup.com to get detailed information regarding mechanical properties and material performance on our technical datasheet.



Divinycell F Material Characteristics

Regulatory Compliance

Industry regulations for aircraft interiors are among the toughest in the industry. Divinycell F is the only polymer core material that exceeds global industry standards for fire, smoke and toxicity in commercial aircraft interiors. Divinycell F will not burn or produce toxic gases and does not generate smoke.

Fire

Tests for vertical burn and heat release showed a typical result of 21/21 or less than 12.7 mm vs. the regulatory limit of 65/65.

Smoke

The findings from the smoke density performance according to the Smoke Density Test showed an exceptional outcome of nearly 0 out of 200.

Toxicity

The toxicity performance based on the Boeing and Airbus Toxicity standard for Commercial Aircraft Interiors, BSS 7239 and ABD 0031, resulted well. Divinycell F easily passed the requirements at ½ or less the allowable values depending on gas component, CO, CO₂, NO_x, SO₂, HCl, HBr, HCN.



Process

Divinycell F is usable over a wide temperature envelope, making it suitable for pre-preg processes. It is also compatible with many wet resin systems for infusion and open molding methods. (Talk with DIAB Technical Services to select the best means for your application.)

Divinycell F retains its mechanical properties well at elevated temperatures and is not adversely affected by lower temperatures. It is robust and flexible and may be cold-formed into shape. Since Divinycell F is a thermoplastic, it may be formed at elevated temperature.

Environmental resistance

Divinycell F is resistant to most aerospace fluids. Its closed cell structure provides low water absorption and its chemistry is non-hygroscopic.

Service Life

The polymer maintains its mechanical characteristics well over time and the Divinycell F cellular structure outperforms the impact resistance and damage tolerance of honeycomb alternatives. Should the part be damaged, repair is quick and easy.

Integrated Solution

Divinycell F is well integrated within DIAB's offering. It is available in a variety of finishing options as well as pre cut kits. DIAB Technical Services ensures that you use and handle the material correctly while Composites Consulting Group provides a number of services related to information about manufacturing and design of aircraft interiors.



Making you more competitive

DIAB is a world-leading supplier of sandwich composite solutions that make our customers' products stronger, lighter and more competitive. Our extensive experience in providing sandwich composite solutions to customers has made DIAB a leading partner in the sandwich composite industry. DIAB's solutions combine high-performance core materials, value-added kits, engineering and process services.

**Core materials | Knowledge | Kits | Processing | Engineering |
Training | Global presence – local service**

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