A world of composite technologies

HEXCEL®

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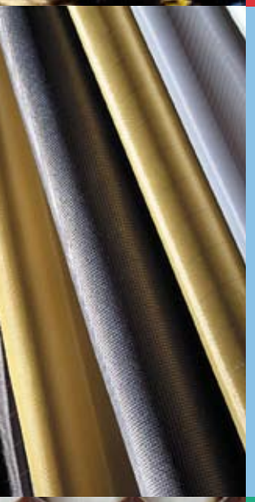

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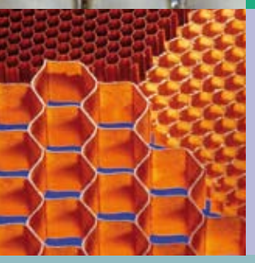


Engineered Products:

A world of composite technologies

Hexcel has been at the forefront of composites technology for 60 years, working as a proactive partner with our customers to create innovative high performance solutions. We draw strength from our heritage – and continue the pioneering spirit by developing new and improved products to support and anticipate customer requirements.

When a customer selects a Hexcel product – from fiber to fabric or adhesive, prepreg, tooling material or composite part – the technologies allow them to achieve a number of benefits. They may wish to save weight in an aircraft structure; to reduce the sound emitted from an aircraft engine; produce a repairable composite mold that doesn't lose any of its structural properties when machined; achieve a Class A finish in an automotive body panel; or even produce a strong, sturdy and durable wind turbine blade of giant proportions that wouldn't be possible in any other technology.

Hexcel has the solution for all these challenges – and many more.

As the leading manufacturer of premium carbon fiber, Hexcel is the most integrated composite solutions provider in the industry, experienced at all stages in the composites chain, from fiber to fabrics and resin formulation to thermosetting prepregs, new solutions for out of autoclave processing, molding materials, composite tooling, honeycomb and machined core. Hexcel also produces structural parts, particularly for aerospace customers and has joint ventures for part manufacturing in Asia.

Hexcel was recently reorganized into a single focused operating unit to improve our ability to develop integrated systems solutions, speed the pace of innovation and simplify our customer interface. We serve customers from our sales and manufacturing locations in the USA and Europe and from our sales offices in the Asia Pacific region.

HEXCEL 60 YEARS OF STRENGTH 1948-2008

HexTow® carbon fibers

carbon fiber is stronger than steel, lighter than aluminum and as stiff as titanium

Photo: Lockheed Martin

Carbon fiber is the essential ingredient in the highest performing composite materials.

High strength created by the production process means that HexTow® carbon fiber, when combined with a resin matrix, offers a superior lightweight alternative to metal for a broad range of applications. A number of sectors already benefit, including space, defense, commercial aircraft, wind energy, recreation, motorsport and industrial.

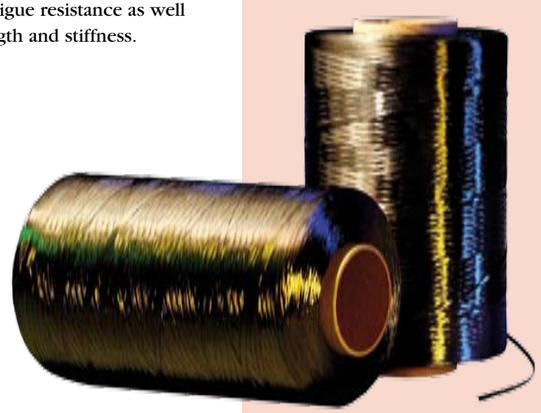
With over 30 years of carbon fiber manufacturing experience, Hexcel produces two forms of carbon fiber: continuous fiber and chopped fibers.

Continuous fiber can be combined with virtually all thermoset and thermoplastic resin systems and is used for weaving, braiding, filament winding, unidirectional tapes and fiber placement. Hexcel manufactures two kinds of continuous fiber: Intermediate Modulus (IM) of which it is the largest producer worldwide and High Strength (AS). High performance IM fiber is particularly suitable for the aerospace industry; AS fiber is ideal for a range of aerospace and industrial applications.

Chopped fibers are used in compression and injection molding compounds to produce machine parts, gears and chemical valves which have excellent corrosion, creep and fatigue resistance as well as high strength and stiffness.

Carbon fibers are produced in a continuous operation, during which the polyacrylonitrile (PAN) precursor undergoes a series of precisely controlled processes. By exposing the precursor to extremely high temperatures, chemical changes occur which create high strength and stiffness to weight ratios through oxidation, carbonization and graphitization.

Subjecting the precursor to successive heat treatment and sizing stages makes for easier handling and improved bonding, resulting in a material that is stronger than steel, lighter than aluminum and as stiff as titanium.



HexForce® fabrics, multiaxials, NC2®

reinforcements – giving composites stiffness and strength

©Vestas Wind Systems A/S

Hexcel is a leading manufacturer of woven and multiaxial reinforcements for composites, in glass, carbon, aramid and quartz fibers.

Woven Fabrics are the result of at least two threads which are interlaced at 0° (the warp) and 90° (the weft), with the weave style varied according to the required performance. Fabrics are available in a wide range of weights from 20 to 1,000g/m² (0.58 to 29.50oz/yd²). There are three main weave styles: plain weave, twill weave and satin weave and the style selected depends on several criteria including the required mechanical properties, the visual effect, drapeability and resin impregnation. Low crimp gives better mechanical performance because straighter fibers carry greater loads. A drapeable fabric is easier to lay up over complex forms.

Woven fabrics provide strength and stiffness in two directions, resulting in excellent handling characteristics and good drape. It is also possible to mix fibers to provide hybrid fabrics.

For carbon fabrics, a complete range of High Strength (HS), Intermediate Modulus (IM) and High Modulus (HM) woven reinforcements is available. Hexcel has developed a unique patented technology to make light flat tow 12K carbon fabrics of high surface quality. This technology is also available for cosmetic 3K woven carbon fabrics and a range of plain and twill fabrics is on offer in 200 and 300g/m² (5.90 and 8.85oz/yd²) areal weights. The fabrics can be supplied in powdered form to add stabilization and anti-fraying properties.

Multiaxial Fabrics, also known as Non-Crimp Fabrics, are layers of unidirectional fibers (usually glass or carbon) that are assembled and stitched together. They provide strength and stiffness in multiple directions depending on the controlled orientation of the fibers. The weight distribution in the fabric is optimized and it is possible to mix fiber types. The non-crimp concept allows in-plane mechanical properties to be enhanced, such as tension and flexion. Complex lay-ups result in less waste and lay up time is reduced by using thicker materials. This cost-effective technology means lower processing costs and high tow count fibers can be used. The HexForce® range includes biaxial, triaxial and quadriaxial reinforcements.

Hexcel's HexForce® NC2® multiaxial reinforcements are a new concept non-crimp technology for industrial applications that provide strength and stiffness exactly where required, as a result of the pre-placement of oriented unidirectional tapes joined by a novel stitching technology.

NC2® allows great flexibility of fiber orientation with previously unknown and still unmatched width adjustment capabilities. Thick materials can be manufactured using thin plies, providing customers with a cost-effective solution that reduces production time. This new technology can accommodate a broad range of fibers, with total freedom regarding ply stack sequence and orientation. Using NC2® technology Hexcel is able to make light single ply reinforcements (from 80g/m² (2.36oz/yd²) with large tow carbon fiber) that are balanced and provide full fiber coverage, at competitive prices.

Redux® adhesives

the ultimate bonding solution

Could your products benefit from a range of adhesives that provide a permanent join which strengthens the structure of materials without adding unnecessary weight?

That's what Redux® adhesives can achieve for you with tried and tested technology offering the most effective way to join metals, composites and honeycombs.

Bonding is a perfect solution for applications that demand strength and durability and are weight critical, such as aircraft, racing cars, building panels, wind turbines and sports equipment.

Redux® adhesives have been a proven success in the aerospace industry for over 60 years and yet Hexcel is constantly improving the product offering. Recent developments include a new shimming adhesive paste that cures at room temperature. Redux® pastes are ideal for use with Hexcel's honeycomb sandwich panels in meeting all bonding needs including inserts, fasteners and for edge filling.

The Redux® film adhesive range includes epoxy, phenolic and bismaleimide adhesives, supplied in film form on a roll. Once cured, the adhesives form a permanent structural bond which is able to withstand harsh environments, including elevated temperatures. The range includes adhesives for metal to metal and composite bonding which find wide application in transportation, recreation and construction industries.

Redux® pastes are a new range of one and two-part room temperature curing epoxy adhesives. They can also be cured at elevated temperature to achieve even higher levels of mechanical performance. Supplied in convenient sized cans or cartridges they are easy to work with and to apply into small gaps and awkward spaces. The newest addition to the range is Redux® 870, a two-component liquid shim adhesive for gap filling, developed to aerospace qualification requirements for future aircraft programs.

Redux® foaming film adhesives use a traditional technology to expand when cured to fill gaps between surfaces, particularly in honeycomb constructions. They bond well to many surfaces providing support and strength in the most difficult locations.

Redux® primers are used to pretreat surfaces to provide protection and improve bonding for optimum effectiveness.

HexPly® prepregs

optimum strength to weight performance with exceptional toughness

©Alfa Romeo

Hexcel's range of HexPly® prepregs is second to none, providing a tougher, lighter and stiffer alternative to conventional materials for load-bearing structures. Over 30 years of development work means that customers receive the optimum high performance solutions.

Prepregs are specially formulated resin matrix systems that are reinforced with man-made fibers such as carbon, glass and aramid. Hexcel has its own in-house supply of carbon fiber and world class weaving facilities for the development of optimum reinforcement technologies to complement the prepreg resin formulations.

Prepreg is the ultimate composite material. The thermoset resin cures at elevated temperature, undergoing a chemical reaction that transforms the prepreg into a solid structural material that is highly durable, temperature resistant, exceptionally stiff and extremely lightweight.

Initially developed for the aerospace industry, HexPly® prepregs are now used in a broad range of applications – from golf clubs and bicycles to satellite arrays, and from wind turbine blades to the chassis and body of high performance cars. New applications include subsea tubes for oil and gas exploitation and high pressure vessels.

Prepregs are fiber-reinforced resin matrix systems, which are supplied to customers as a rolled sheet, to be stored frozen and defrosted before use. The prepreg is cut to shape and release agent is applied to the mold prior to the lay-up process. After lay-up a vacuum bag is applied and the assembly is then cured at high temperature and under pressure to form molded components that are extremely strong and stiff. A broad range of formulated resins are used to impregnate the reinforcements including epoxy, phenolic, bismaleidmide and cyanate ester systems.

The hundreds of matrix and reinforcement combinations provide great flexibility enabling specific requirements to be incorporated into the prepreg (such as fire resistance and high temperature performance). Because prepreg is molded to shape in an autoclave, component part counts are drastically reduced, cutting production assembly times.

HexFlow® resins and HexForce® reinforcements for direct processes

new fiber-reinforced materials – extending the applications for composites

Would you like a faster and more cost-effective way of manufacturing high performance composite components?

As an industry innovator, Hexcel has optimized its knowledge of resins and reinforcements to develop new solutions that enable a wider range of parts, in many sectors, to be manufactured from composites. Hexcel developments have focused particularly on resins and reinforcements for cost-effective processing in the aerospace industry. The result is a range of textile options, including standard and advanced reinforcements based on innovative technologies that are ideal for Direct Processes.

Resin Transfer Molding (RTM) is a composite manufacturing method that is particularly suitable for low to medium volume production rates, allowing high quality components to be created, without using autoclaves. Large, complex shapes can be achieved, with good surface quality and a reduced part count. HexFlow®RTM 6 is the European aerospace industry standard for resin transfer molding.

For car chassis and body parts produced with RTM technology, NC2® reinforcements are especially suitable for large components due to their unequalled width of 2500mm (98.43 inches).

Infusion is another cost-effective composite manufacturing method, particularly suitable for large and thick aerospace panels. Hexcel is developing innovative resins and reinforcements to meet the structural requirements of such parts. For industrial applications, Hexcel non-crimp NC2® fabrics bring more efficiency to the process, with faster infusion times, thanks to the unique characteristics.

HexFlow® polyurethane resins
HexFlow®705/US 45 is a wet lay-up resin formulation, ideal for applications requiring high stiffness and short cure cycles. The processing of HexFlow® is flexible, ranging from six minutes at 80°C, 3 bar (176°F, 43.5psi) to 40 seconds at 130°C, 15 bar (266°F, 217.5psi). The mechanical properties of HexFlow® laminates or sandwich compounds are superior to unsaturated polyester parts and equivalent to epoxy parts

HexFIT® is Hexcel's Film Infusion Technology enabling quality composite components to be manufactured using simple composite processing techniques, particularly vacuum bag molding. HexFIT® provides improved formability, void free laminates, processing flexibility and the ability to incorporate special surfacing materials. The multiple layers of resin and reinforcement reduce handling and lay-up time, making HexFIT® particularly suitable for thicker components, such as wind turbine blades.

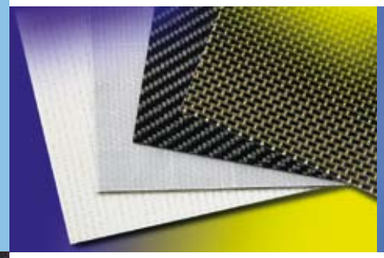
RTM and Resin Infusion are 'direct processes' in which the fiber reinforcement and the matrix come together at the molding stage. In RTM, catalyzed resin is pumped, under vacuum, into a two-sided, matched mold in which a fibrous reinforcement (preform) has been placed. During injection, the resin fills the mold and fully impregnates the fiber preform, before heat is applied to cure the resin. For RFI, sheets of resin film are stacked and infused through a dry fabric preform, or alternatively interleaved between individual fabric layers. LRI is a process variation in which liquid resin replaces resin film. Liquid resin fills the tool from the base or is distributed through a media on the part surface. It then infuses the preform under vacuum. The resin can be cured using vacuum assisted infusion, plus oven cure, or by using vacuum only, which avoids the expense of using autoclaves.

HexFIT® is a new range of film infusion technology products, supplied ready to use as a combination of layers of resin, reinforcements and other finishing films, which saves lay-up time. HexFIT® enables even large and thick laminates to be molded quickly and economically with a very low void content, achieving prepreg quality without the lay-up time or autoclave cure.

HexFlow®705/US 45 is a two component pre-formulated resin, with superior resin flow to standard epoxy systems, providing an outstanding surface finish for components. It is compatible with UP and EP gelcoats and thermoplastic materials such as ABS or polycarbonates and requires no additional adhesive agent.

Polyspeed® laminates and Modipur® polyurethanes

for rapid and cost-effective production



Laminates: Could your application benefit from the lightness and strength of fiber-reinforced epoxies, but without the time consuming lay-up and cure processes? Polyspeed® is Hexcel's range of laminates, used predominantly in the manufacture of skis and snowboards, but equally useful for many industrial applications, wherever light, strong and durable materials are required to resist high stresses and strains. The laminates are also suitable as skins for sandwich panels.

Polyspeed® laminates are epoxy or phenolic resin impregnated reinforced materials, in which the matrix is already cured. Hexcel manufactures a range of unpressed laminates, with woven reinforcements and a range of pressed laminates with either woven or UD reinforcements for high performance. Polyspeed® laminates are supplied as sheets or in roll form, and can be delivered already slit to size.

Polyspeed® grid laminates, used in the manufacture of large composite structures, deliver a number of benefits including cost-effective manufacturing where infusion technology is combined with laminates or other pre-cured load-carrying structures such as pultruded components. Grid laminates also provide mechanical fixing of dry reinforcements prior to infusion and contribute to the final mechanical performance. The need for auxiliary materials is also reduced and there's no requirement for dry reinforcement in wet processes, as grid laminates contribute to the structural performance.

Polyurethane: Do you need to produce cost-effective high performance components in high production volumes? The properties of Modipur® polyurethane (PUR) systems enable complex shapes to be achieved at low cure temperatures and in rapid production cycles.

Hexcel supplies a wide range of formulated two-component polyurethane systems that are used for sports, automotive and other industrial applications. The Modipur® range includes rigid, semi-flexible and integral foams with closed or open cell structures. The products are used as core materials, as insulation and/or for their adhesive properties. Hexcel also manufactures a polyurethane injection molding system and a gel coat.

Reaction Injection Molding (RIM) is a quick, clean production method for medium-sized polyurethane parts with moderate temperature and pressure. A mixture of two components is injected into a mold and produces a solid non-cellular skin zone and a cellular core of the foam – a one-shot composite. These Modipur® formulations can be tailored to meet virtually any customer specification, enabling a wide range of complex shaped products for high-volume production. Depending on the hardness/density ratio selected, parts ranging from large-scale to compact and with or without reinforcements, are possible. Current applications include skis, automotive parts and various other industrial uses.

Polyspeed® cured glass fiber epoxy laminates are available in a range of thicknesses and strengths, ideal for skis and snowboards.

Polyspeed® grid laminates are woven glass fiber epoxy laminates with an open grid structure, supplied in roll form. Grid laminate materials are available in a wide fiber areal weight range from 500 up to 1600g/m² (14.75 up to 47.20oz/yd²) including flexibility on mesh size of the grid pattern. The open grid structure provides reinforcement whilst the holes enable liquid resins or reactive foams to flow through the lay-up structures, making the materials ideal for combined technologies where reactive liquid systems need to be combined with solid, already cured composite parts.

Modipur® polyurethane systems once mixed, react and solidify, as a result of a reaction from combining two-component thermoset systems. Usually processed in a match-mold set-up, PUR is supplied in drums of 210kg (463 lbs), one ton containers or bulk transport. For the Component 2 (Isocyanate) Hexcel uses MDI and HDI and variations rather than TDI or IPDI Isocyanates.

HexMC® molding materials for industrial applications

high performance material for high volume production of complex shapes

HexMC® is a high performance sheet molding material, suitable for the high volume production of complex shapes and specifically designed for compression molding. With long fibers and low resin content, HexMC® provides better mechanical properties than any other short or long fiber molding compound. The HexMC® epoxy system provides short cure cycles, from five minutes at 135ºC/275ºF, depending on part thickness. Complex shapes can be achieved and inserts can be integrated in the molding process.

These fiber-reinforced materials create new opportunities for aesthetic, complex and weight critical parts that in the past have been made from metal. They are particularly beneficial for sports goods, automotive and marine applications, as well as a wide range of industrial components. HexMC® is suitable for high volume production of 10,000 parts and above.

HexMC® is based on epoxy resins and unidirectional carbon fibers and supplied in roll form. It is easy to use, there's no waste compared to metals or prepregs, no lay-up or autoclaving processes and inserts can be integrated into the molding process.

Trek Madone bike with net molded HexMC® for exceptionally precise carbon fiber shapes without the need for secondary machining operations.

HexTOOL® composite tooling material

tolerance accuracy combined with extreme lightness

Tool manufactured for San Diego Composites by Touchstone Research Laboratory, Ltd.

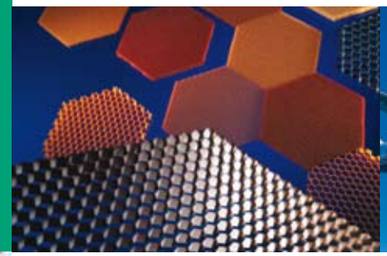
HexTOOL® is Hexcel's new patented composite tooling material that, for the first time, enables the tolerance accuracy achieved with metals to be combined with the extreme lightness of carbon fiber composites. HexTOOL® molds are also easy to repair and the dimensions are simple to modify. This new concept for lightweight, efficient large-scale tools is cost-effective compared with conventional composite tools and metal molds, especially those made from INVAR. HexTOOL® uses Hexcel's established HexMC® technology, based on high strength carbon fiber and HexPly® M61 BMI resin in the form of chopped UD prepreg tape, specifically developed for tooling. Compared to epoxy resins, this provides superior resistance to degradation (micro-cracking) when submitted to thermo-cycling.

The lay-up of HexTOOL® tooling is done with minimum labor and time – no debulking – and on a master mold that does not have to be dimensionally accurate. The 'as cured' tool is then machined to the final desired shape. The tooling has a coefficient of thermal expansion (CTE) equivalent to that of carbon/epoxy parts; is lighter and has faster heatup/cool down rates than metal; it can be machined for tight tolerances; and is repairable.

Since the launch of HexTOOL® several leading tooling engineers have used the material, confirming the benefits of the technology. They have noted that dimensional stability is maintained, at tolerances very close to those achieved with metal tooling and that vacuum integrity is assured, even in heavily machined areas. Long tool life, ease of use, and the machinability of cured structures are some of the primary reasons HexTOOL® is being chosen for the tooling for parts on new generation aircraft worldwide.

HexWeb® honeycombs

providing exceptional stiffness and strength with no added weight



Any structure requiring exceptional stiffness combined with minimal weight gain can benefit from HexWeb® honeycomb. It is a lightweight core material that offers versatility in density, cell size, temperature and other properties and is also suitable for high volume manufacture.

Hexcel was the first company in the USA to manufacture expanded aerospace grade honeycomb on a commercial scale. Today, over 700 varieties are produced in a wide range of materials and cell configurations with new versions being developed to meet customer demand.

Latest developments include: HexWeb® Acousti-Cap™ noise-reducing honeycomb for aircraft engines, HexWeb® HRP-C non-metallic fiberglass for engine nacelles, HexWeb® HDC-F heavy density fiberglass for potting replacement and HexWeb® HRH-36 high performance aramid core.

Hexcel also provides unique core processing technologies called Engineered Core. These parts are manufactured from standard blocks and slices of honeycomb (also known as flat core). With advanced computer-aided design and manufacturing techniques, the material is formed, shaped, machined and bonded into a range of high quality parts.

Honeycomb is made by two methods:

Expansion Process:
The expansion process begins with the stacking of sheets of the substrate material on which adhesive node lines have been printed. The adhesive lines are then cured to form a HOBE (HOneycomb Before Expansion) block.

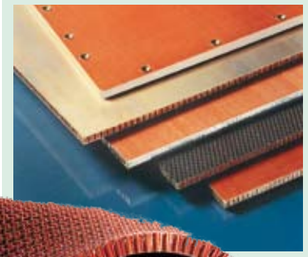
The HOBE block itself may be expanded after curing to give an expanded block. Slices of the expanded block may then be cut to the desired T dimension. Alternatively, HOBE slices can be cut from the HOBE block to the appropriate T dimension and subsequently expanded. Slices can be expanded to regular hexagons, under-expanded to six sided diamonds, and over-expanded to nearly rectangular cells.

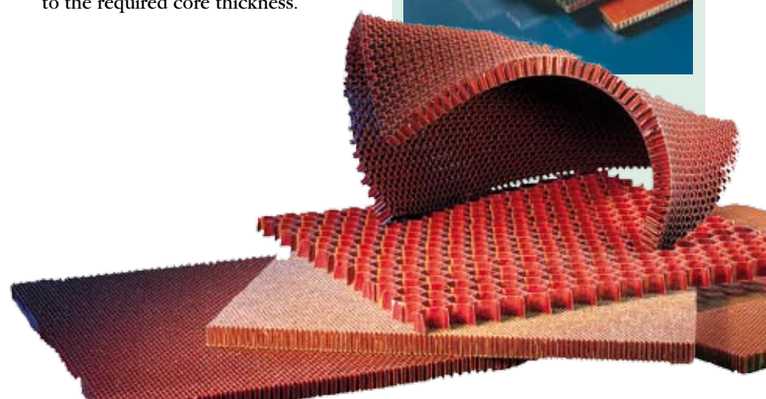
Corrugated Process:
The corrugated process of honeycomb manufacture is normally used to make products in the higher density range. In this process, adhesive is applied to the corrugated nodes, the corrugated sheets are stacked into blocks, the node adhesive cured and sheets are cut from these blocks to the required core thickness.

Fibrelam® aerospace panels
Would you like panels that are extremely lightweight, structurally sound and exceptionally stiff? That's what you get with Fibrelam® panels from Hexcel, manufactured from HexWeb® honeycomb that is bonded between composite skins.

Fibrelam® aerospace panels have been in service with leading airlines for over 25 years as aircraft flooring and interior fixtures. Hexcel continues to supply a variety of standard aircraft flooring panels for commercial transport.

Aircraft flooring panels are bonded assemblies comprising a honeycomb core sandwiched between two skins. The skins can be fiberglass or carbon reinforced epoxy composite, while the core can be metallic or non-metallic honeycomb.





HexWeb® Acousti-Cap™

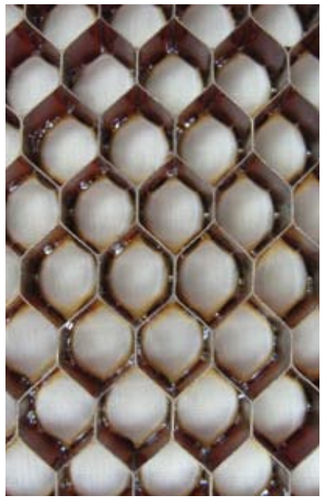
noise-reducing honeycomb for aircraft engines

2007 JEC
Innovation Award Winner

Current technology for acoustical treatment of aircraft engines requires tradeoffs between weight and noise reduction. Hexcel has developed a new patent-pending product that offers superior acoustical performance without a structural weight penalty.

HexWeb® Acousti-Cap™ consists of a non-metallic permeable cap material embedded into honeycomb core to create an acoustic septum, with the caps bonded to the core cell wall with adhesive. Hexcel's customers specify the flow resistance characteristics they want in the product, as well as overall core thickness, numbers of caps in a cell, and insertion depth. The final product is an assembly that is finely tuned to their acoustic requirements.

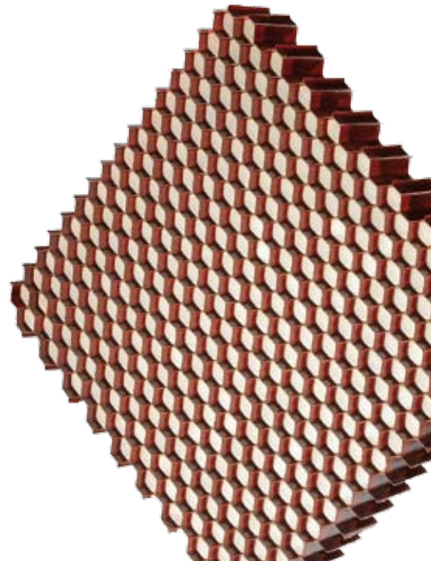
Acousti-Cap™ enables the customer to tune their structure to their noise requirements and increase absorption over a wider bandwidth. The resistance and location of the cap material determines the



frequency and level of sound absorption. The core allows the location of the septum and provides the basic structure. The cap material is flexible and allows formability of the septumized core to be much greater than traditional rigid inserted septumized core. The one piece core design provides improved nesting of individual core pieces compared to traditional multi-layered septumized core designs. Together, the product enables true 'spliceless' core blanket technology which is of particular interest in inlet applications.

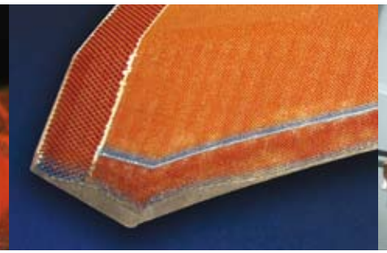
Our immediate customers, the nacelle builders and the OEMs can use this product to meet the increasingly difficult restrictions on aircraft noise. The product overcomes many of the design constraints posed by the existing technologies. These include noise reduction with increased bandwidth attenuation, greater acoustic footprint and less blockage, weight reduction and more radical contours for nacelle design.

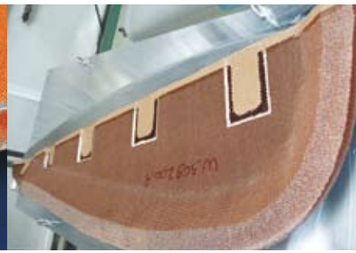
Our customers' customers, the airlines, will gain fleet flexibility in terms of which aircraft can land at which airport. It will also enable them to reduce the landing fees payable at the airport resulting in ongoing cost savings.



HexWeb® EC engineered core

producing high quality components to precise customer specification





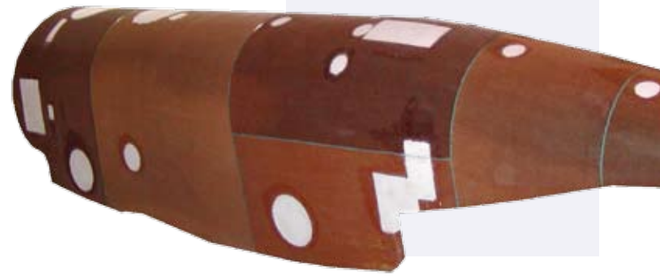
HexWeb® EC engineered core encompasses a wide range of unique processing technologies used to add value to blocks or slices of HexWeb® honeycomb. With advanced computer-aided design and manufacturing techniques, the flat core is formed, shaped, machined and/or bonded to create high quality core details and assemblies to precise customer specifications.

The expertise of our manufacturing and engineering staff, combined with extensive research and unique core processing technologies, results in profiled and precise complex shapes. With Hexcel manufacturing your engineered core parts, your company will be more productive.
You eliminate the need to invest in core processing equipment, facilities and staff. Hexcel also has the opportunity to reduce customer costs further through core block optimization for the application. This means that storage space can be saved through just-in-time delivery of ready-to-fit parts, rather than stocking slices of unprocessed core. Hexcel's objective to reduce costs while improving manufacturing and administrative processes, means that your company reaps the benefits of our superior price/performance.

Hexcel is helping companies to streamline their production process and eliminate capital investment, by supplying them with high quality components that meet precise dimensional tolerances.

Hexcel's engineered core capabilities include:

- Perimeter trimming and chamfering
- Doubler relief routing
- Potting and splicing
- Foam filling
- Heat forming
- Septumization
- Stabilization
- Arc expanding, heat setting, roll forming
- Part kitting
- In-house CATIA and NC programming capabilities
- 5-axis CNC machining
- Ultrasonic cutting
- HOBE sawing and machining
- Autoclave processing
- Laser ply location for lamination
- Laminate skin and skin-to-core bonding and machining



HexMC® molded composite parts

a unique composite technology for new aerospace needs

©Boeing

Composite materials are progressively replacing aluminum and other metal alloys for new generations of commercial airplanes. Weight-saving is the principal reason for this move to composites as lighter planes mean reduced operating costs. There is also lower maintenance with composites as they have better fatigue performance and no corrosion.

Although each new generation aircraft has moved increasingly to composite primary structures, a number of smaller, but complex geometry parts have been required to connect them to the various system components. In the past these parts have been machined, cast or forged from aluminum or titanium and could not be made from composites in a cost-effective way as the techniques employed for major composite structures were not appropriate.

This was until the launch of HexMC®, a new form of cost-effective carbon fiber/epoxy molding material from Hexcel that has now become baseline for a large number of primary structure parts on the new generation of commercial airplanes. HexMC® enables complex shapes to be manufactured in series production while providing weight savings that are comparable to those achieved with aerospace carbon/epoxy prepregs.

Boeing 787 window frame manufactured by Nordam using HexMC®

Hexcel has full design, tooling and certification test capability to support HexMC® customers. We can team with customer design teams and develop HexMC® part designs starting from basic loads and envelope requirements. Currently HexMC® parts are certified by Hexcel using Point Design Test methods.

Typical aerospace applications for HexMC® are window frames, seat pedestals, fittings, frame gussets, intercostals, pressure pans and static engine parts.

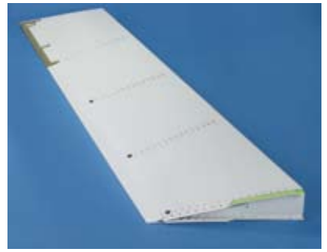
Composite structures

lightweight, high-strength composite structures and assemblies for aerospace

In addition to being a major supplier of composite materials to the aerospace industry, Hexcel also manufactures and markets lightweight, high-strength composite structures and assemblies for commercial and military aircraft, helicopters and business jets.

This part of the company was established in 1950 and since then the business has a history of documented performance for the world's top aerospace and defense contractors, including Airbus, Boeing (and McDonnell Douglas), Bombardier, Mitsubishi Heavy Industries, Sikorsky, Kawasaki Heavy Industries and Lockheed Martin. Hexcel's engineered products demonstrate the benefits of the company's many years of accumulated experience in outfitting aircraft with high-strength, lightweight applications at a cost-competitive price.

Hexcel's joint venture in Malaysia, ACM, produces low-cost, high performance composite parts, primarily for Boeing programs, achieved through the latest manufacturing technologies and efficiency principles. Hexcel can also coordinate and manage your international sourcing needs through our Asian joint venture.



Hexcel's structures include wing-to-body fairing assemblies, wing trailing edge assemblies, tail section components, radomes, dorsal and flap-track fairing assemblies, cockpit sidewall and ceiling panels and doorliners, leading edges, access doors and rotor blade components.

For your local contact please visit www.hexcel.com

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