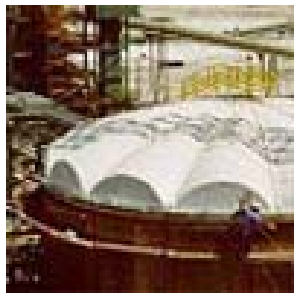
GENERAL APPLICATIONS

Tanks & Lids



Fabrication and repair on 80 x 226' diameter 14-piece sectional lids on site. In cold weather, thermal reflectors are fabricated using foil-backed celotex to reflect the sun onto the parst to heat the repair area. More recently, Fiberset designed, fabricated and delivered a complete cover system for US Borax's classifiers. The new lightweight system was designed for ease of installation, replacement of parts and high abrasion resistance.

Turbine Blades

Wind energy companies continue to call on Fiberset's composite expertise for inspection, repair and modification of blades and other fiberglass accessories. Fiberset has performed special manufacturing of low cost, durable fiberglass safety covers, plus repairing MHI turbine brakes, and reconstruction of root blades and tips for companies such as Sea West and Canon. Fiberset developed prototypes and modified blade structures to increase performance and safety in addition to performing several structural assessments and consulting for Wind Energy Applications.

Battery Shields

Fiberset designed a tough, low-cost 340-piece acid containment system to retrofit various sized racks of industrial batteries; keeping batteries accessible for maintenance. The plan used tough, inexpensive material selection, using simple standardized components in conjunction with adjustable 30 piece tooling. We scheduled production to make larger parts first and recycled the tools to produce successively smaller parts. The entire fabrication and installation was performed on site.

Channel Covers

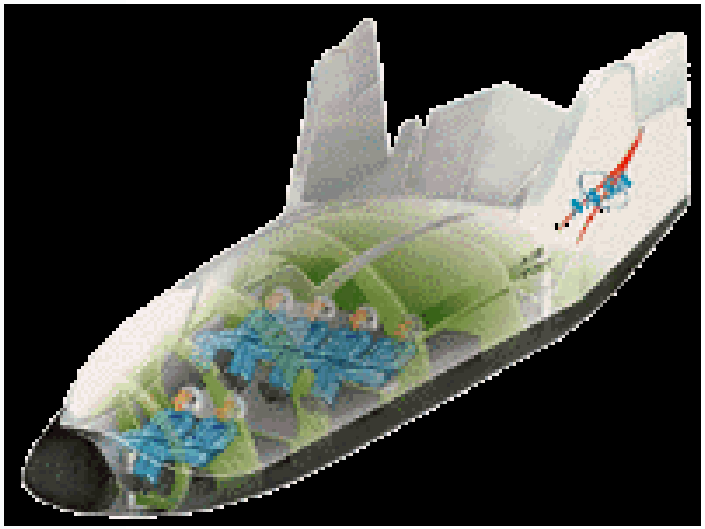
This is a good example of increasing the life expectancy of a product by taking advantage of the properties of composites; in this case corrosion resistance. These covers are for channels in the walls of the caracole stairways used for service access inside the dam. They provide a waterproof seal to prevent water from splashing onto the nearby staircases caused by normal seepage through the concrete

NASA has installed and flown active suction wing gloves on both their F-16XL aircraft. In each case, Fiberset was called on to build and install the passive fairings surrounding the perforated titanium suction sections. These fairings, which included imbedded instrumentation, not only extended the laminar flow test areas, but were also built in removable sections allowing access to suction controls and wiring.

NF-111A AFTI Gloves

Fiberset employees fabricated and installed "gloves" on both wings of an F-111 airplane to study the applicability of supercritical natural laminar flow airfoils. The project included fabrication and installation of a "mirror section" airfoil glove on the left wing for aircraft symmetry. "Area fill" gloves were also installed on the upper surfaces of both inboard wings to correct wing pressure distribution for operation of the NLF airfoil section. In addition, a method was identified and demonstrated by which the gloves were to be removed from the F-111 without damage to the aircraft itsel

X-38 Master Pattern and Tooling



This International Space Station Emergency Crew Return Vehicle pattern was originally manufactured by Fiberset to hold four astronauts and was later modified to hold six. Fiberset received NASA Johnson Space Center's performance review rating of "Excellence" in the quality category. The master pattern and 14 piece tooling was manufactured using a variety of processes, finishing techniques, core materials and fiberglass cloth/resin combinations for the highest level of quality. NASA laser precision tracking was performed to ensure the strictest of tolerances were kept within range.

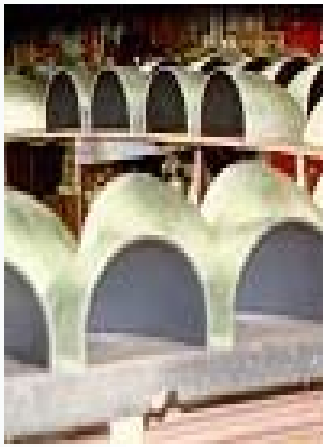
H-65A "Dolphin" Short Range Recovery Helicopter

Fiberset produced a six piece tooling set, three piece test ski set and a six each-three piece production set for the U.S. Coast Guard HH-65A "Dolphin" short range recovery helocopter, subcontracted through BAE. Skis were fabricated in two pieces, upper and lower, then bonded together. The skis were fabricated using a combination of Kevlar, carbon and fiberglass bi-directional fabrics in an epoxy resin matrix, post cured to 260 degrees F.

Retainer Rings

Fiberset was contracted to manufacture one piece seal retainer rings for the MQM Missile Drone. These rings are cast from urethane and required extensive R&D to perfect a manufacturing process that produced quality parts with no rework or rejects. This retainer ring holds an inflatable seal that protects internal systems from water penetration from the environment. Several hundred have been manufactured to date as the project continues.

Production Applications



Focused on fabricating thermoset parts for a myriad of composite applications, our moderate quantity products range from commercial wind energy components and mining to aircraft and aerospace applications.

Comercial applications (films)

When Fiberset was selected by Patrick Tatopoulos Design, Inc., to manufacture the baby head anamatronics infrastructure for the hit movie film "Godzilla", the whole region was filled with excitement. The head design was provided by Tatopoulos, but their team was having trouble with the actual development of the part and time was a critical factor. Fiberset's team of experienced technicians suggested the use of carbon fiber with a beautiful epoxy resin finish. This would provide the properties the design team needed. The prop masters were very satisfied when they gained twice the strength and half the weight of their original material of choice, plus getting the parts on time. Since these were actually worn by stunt people, the finished part properties were just what they needed to shoot the scenes.

Sporting and recreation

Fiberset was selected to develop and manufacture this hand-crafted monocoque bicycle made out of DuPont™ Kevlar fiber for Stephen & Sharp Design Group. The lightness (~45 lbs), strength and comfortable ride of the frame made this bike a sure winner in combination with experienced racer, Inga Thompson. Fiberset excels at producing articles that are necessary for that competitive edge.

Made from carbon fiber, aramid, veneer and foamcore, these kayaks were handcrafted to resemble the antique kayaks from the earlier art of the 20th century. By blending the technology of today with the natural appeal of a real wood lining and deck, Fiberset produced a beautiful leisure craft for the naturalist at heart. Detailed contouring and the treated wood panels added special qualities, performance and value to this watercraft.

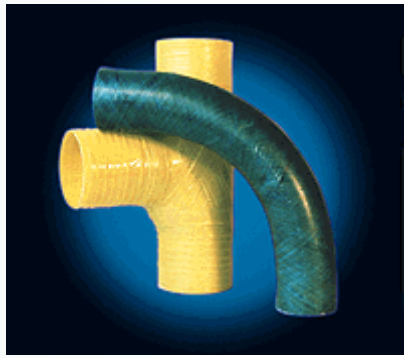
Fiberset has had the opportunity to manufacture a variety of SCCA custom racing parts for most classes, like this Tiga Sports 2000 nose cone for Luft Racing Ind. These high performance parts were hand crafted by highly skilled composite technicians to improve aerodynamic properties under stringent tolerances. The Goal - Faster is Better!

Aerospace applications

X-29-049 Camera Housings

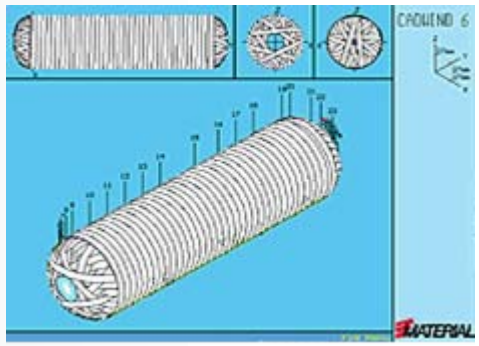
In preparation to conduct high angle of attack flow visualization research on the X-29, cameras needed to be installed at two locations on the aircraft. One location at the base of the vertical stabilizer and the other location on the right wing tip. Fiberset was selected to fabricate these housings which were attached to the aircraft, covered the cameras and provided transparent windows through which the cameras could see. The parts were manufactured to perform a maximum allowable dynamic pressure of 550 psf and 150 degrees Fahrenheit. The vertical camera housing was designed to be easily removed in order to gain routine access to the camera.

Chemical Industry



In pipe manufacturing, high quality is essential for every meter. Especially with highly aggressive or toxic fluids or gasses a small defect can lead to a catastrophe. Glass fiber-reinforced plastics provide safe protection from corrosion with high strength. Because ofthe high degree of automation, filament winding technology has become the major production method.
However, in the manufacture of the pipe fittings, like elbows or tees, manual wrapping of the mandrel with tapes is still common.
With CADWIND, these complex components can also be automatically produced. It is now just as simple to calculate the desired laminate structure for elbows or tees as it is for straight pipes.
The component construction is optimized through precise fiber positioning. Up to 30% of the material and 70% of the production time can be saved. The mechanical reproducibility and the complete control of the production process by CADWIND ensures that there are no defects

Respiratory apparatus for fire-fighters

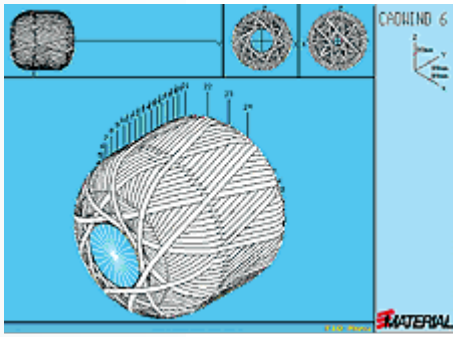


Calculated laminate structure
(1. helical winding, transition,
2. layer: circumferential winding)

In pressure bottles (e.g. for respiratory equipment) high pressure allows greater autonomy. Furthermore, a low weight is important. Both these properties are obtained with filament winding technology.
The laminate structure consists mainly of two different layers: a helical winding with a low winding angle for accommodating longitudinal forces and an outer circumferential winding for resisting circumferential forces. Since these components are mass produced, one important factor is minimizing the production times. For this, CADWIND provides two advantages. First, CADWIND can combine the different layers so that the complete manufacture is possible without machine stops. Second, CADWIND calculates the part program with the shortest production time using the maximum velocities and accelerations of the winding machine.

aerospace applications

Waste water tank for Airbus A330

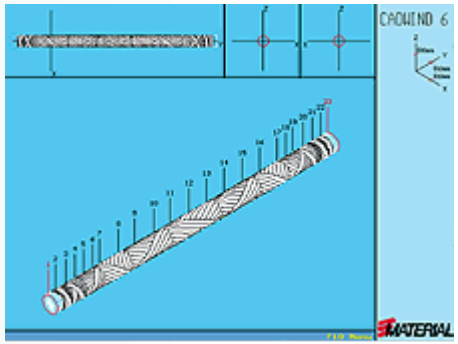


Calculated winding for the waste water tank

In aerospace applications every gram counts. The use of filament winding technology is indispensable. Fresh and waste water tanks in aircraft (e.g. Airbus A330) or hydraulic tanks for the control of rocket engines (e.g. Ariane 5) are typical components manufactured using filament winding. Here, CADWIND makes it possible to obtain the optimum design for these highly stressed components. By taking into account the friction between the fibers and the mandrel, CADWIND can also calculate the fiber paths that do not lie on the geodesic path (i.e. the shortest distance between two points on a curved surface). For example, this allows the optimization of the fiber lay-up on the pole caps of the pressure vessel. Also the manufacture of pressure vessels with different pole cap geometries no longer poses any problems. Due to the multiple optimization possibilities of CADWIND the decisive weight reductions can be obtained. Safety is paramount and thus quality is the essential requirement. However, quality control of composite components is difficult. This makes monitoring of the production process even more important. For this, CADWIND ensures accurate fiber positioning, smooth machine movements, defined impregnation of the fibers and uniform fiber tension.

Innovative concepts

Opel Calibra V6 drive shaft



Calculated winding for the drive shaft with variable winding angles

In motor racing the best is never good enough. This is a prime example for the use of composite materials. In modern racing cars, chassis panels as well as the primary structure of the frame consist of fiber-reinforced materials. Filament winding is used in the manufacture of rods, pressure vessels, and drive shafts where superior mechanical properties are required along with low weight. The example of a drive shaft, that transfers up to 1,000 hp, shows clearly that these components have little in common with those used in mass produced cars. CADWIND allows the optimum design of the drive shaft by concepts using the maximum potential of the material. Variable winding angle in the laminate gives the best resistance to the stresses on the component: a low winding angle for resistance to bending forces (mainly in the middle of the shaft), 45° for transfer of the torque and circumferential windings at the component ends for integration of the power input elements.