SIEMENS

Marine

Sredne-Nevsky Shipyard

Using Fibersim, ship builder establishes an unparalleled composite facility, capable of making extremely large and complex hull designs

Product

Fibersim

Business challenges

Enter the international market

Deliver government contracts on time

Remove toxic hazards in composite manufacturing

Improve composite surface finish

Reduce dry fabric layup effort

Reduce material waste

Save composite manufacturing costs

Keys to success

Support from company management

Selection of an experienced deployment partner

Deployment of Fibersim

Implementation of new reinforcing fabric layup technology

Results

Met production schedules

Improved product quality

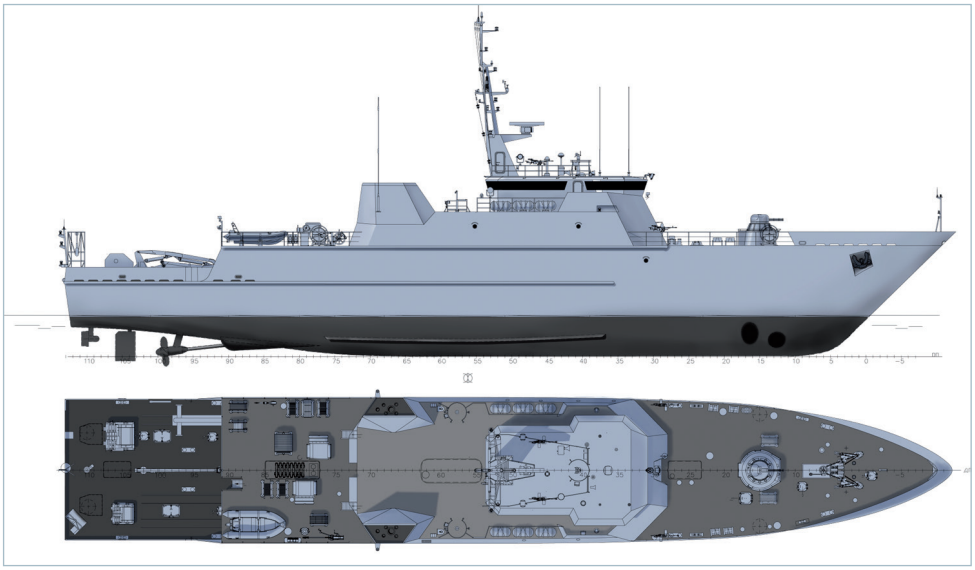
Reduced effort in reinforcing material layup

Sredne-Nevsky Shipyard uses advanced composites technology to manufacture stronger, more fuel-efficient marine vessels

Sredne-Nevsky Shipyard, JSC (SNSZ) is using the Fibersim™ portfolio of software for composites engineering from Siemens PLM Software to help the company build stronger, more lightweight ships and vessels. A part of the United Shipbuilding Corporation, with more than 100 years of operation, SNSZ has built hundreds of ships of varying designs.

Today, the company's competitive advantage is its ability to build some of the world's largest one-piece fiberglass hulls. The company's strategic goals are to maintain its position as a leading Russian large-scale composite manufacturer and to enter the world market.

SNSZ performs a complete production cycle, from vessel design to delivery, building ships made of conventional steel, magnetic steel, aluminum and fiberglass. The company builds a wide range of products, including mine sweepers, missile boats, multi-purpose patrol boats, tugboats, utility boats, passenger ferries, fireboats, surveying vessels and environmental protection vessels.



Results *(continued)*

Reduced number of mistakes

Diminished composite costs

Developed future-proof composite technology

Reduced toxic hazards

Lighter, more efficient ships using composites

The Russian Navy modernization initiatives for mine sweepers have led to the implementation of advanced composite manufacturing technologies. Composites are lightweight and strong, helping make ships more lightweight and fuel-efficient, while extending service life.

To build composite ships for the Russian Navy, SNSZ has completely overhauled its fiberglass production facility, purchased modern equipment and implemented advanced technologies. "We have established an unparalleled facility," says V.A. Seredokho, director general at SNSZ. "We are capable of making extremely large and complex designs with the most advanced technologies."

Making a large composite product such as a ship hull in an open mold is a health hazard because of the use of toxic resin for impregnation and polymerization. As a result, the company's experts use a closed mold to make hulls. The closed mold process requires special reinforcement material (dry fabric) layup technology for use with complex hull surfaces.

Fibersim predicts material behavior; helps solves production problems

It would be virtually impossible to manually design, cut out and layup more than 30 fabric layers. The Russian Navy's order specified strict hull strength requirements that could only be met with correct fiber orientation during the layup process. The key was a computer-aided simulation of the fabric behavior for different layup options and finding the best option to meet the strength requirements of the 8-meter high hull. SNSZ engineers searched the market for a solution, ultimately choosing Fibersim.

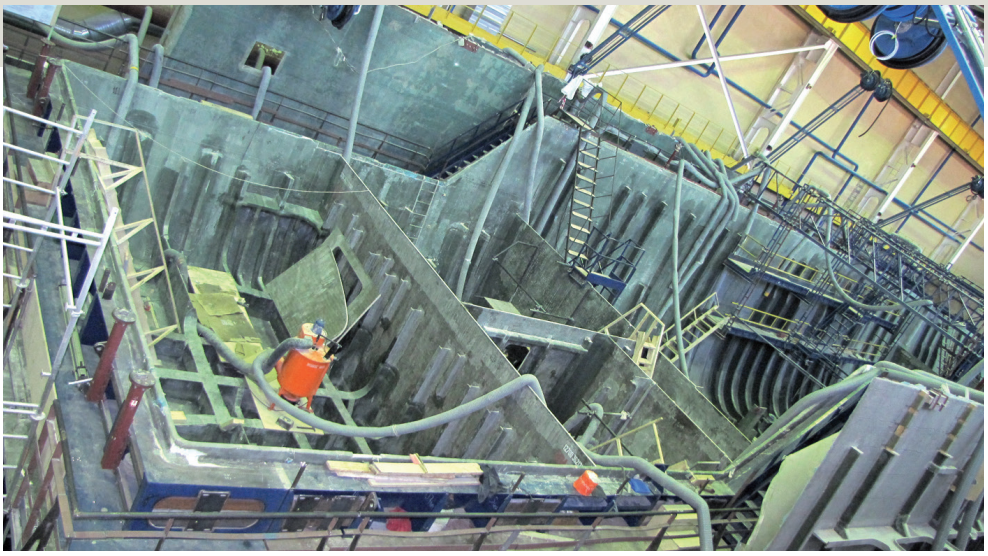
The new composites are made of quad-axial fabric and have properties that are very different from bi-axial fabric, and require a computer-aided layup simulation solution. Fibersim is able to predict the behavior of such fabric and to help companies make strong, high-quality products using composites.

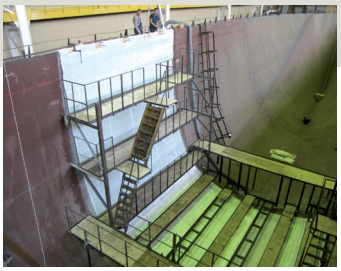
In comparison to similar systems, SNSZ determined that Fibersim was better because it could help solve manufacturing problems and generate shop floor documents. At SNSZ, any projects developed using Fibersim are sent directly to the shop floor.

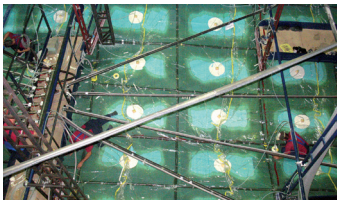
"As we developed technologies to build a new fiberglass mine sweeper, we had to make them future-proof. The fiberglass hull is a multi-purpose product, suitable for mine sweepers and for other vessels as well," says Seredokho. "The mold we have made is re-usable. That's important because we will build more than 50 mine sweeper hulls using the same mold."

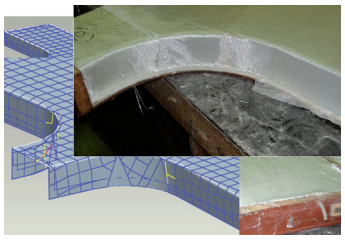
"The most significant result of deploying Fibersim at SNSZ is achieving nearly perfect product quality."

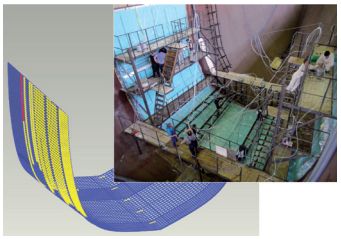
V.A. Seredokho
Director General
Sredne-Nevsky Shipyard











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After considering a number of key indicators (applicability, functionality, total cost of ownership) SNSZ chose Siemens partner ITS to help the company deploy Fibersim and to provide training. "We wanted a reputable and reliable partner with competence and experience in this field," says Seredokho. "ITS believes we are an exemplary company in terms of our Fibersim deployment in Russia. We probably use the system's functionality to a larger extent and with results exceeding those in the aerospace industry."

Quality results

Composite surface finish quality depends of the correct fabric layup and efficient resin impregnation. Fibersim enables layup simulation, taking into account fabric properties such as the direction of fibers. The most significant result of deploying Fibersim at SNSZ is achieving nearly perfect product quality, Fibersim enables you to graphically render possible fabric deformations, such as stretching or folding over a curved area, and helps you evaluate each deformation as normal, acceptable or faulty.

"The very possibility of fabric layup without any folds or pinches greatly improves quality," says A. Yu. Sofronov, deputy head of the manufacturing CAD (computer-aided design) department at SNSZ. "As we simulate composite layers using Fibersim, we optimize the design and make the fiber orientations that affect the strength consistent with the impregnation process. Good layup and impregnation guarantees a hull free of bubbles and other faults."

By implementing Fibersim, SNSZ has reduced dry fabric layup efforts, a major issue because of a lack of qualified workers. The use of Fibersim has also helped boost composite production efficiency and reduced material waste. If the layers are laid-up the wrong way during impregnation and polymerization, some areas would contain too much bonding matrix and too little reinforcing material. Such a fault is irreparable and products made this way must be discarded. The higher the composite simulation accuracy enabled with Fibersim, the more efficiently SNSZ can make any composite product. The company has optimized the entire operations process and reduced its development costs using Fibersim.

Fibersim has also boosted composite production efficiency and reduced the reinforcing material waste.

To fulfill an order for the Russian Navy, SNSZ developed a one-piece composite hull more than 60-meters long and more than 8-meters high (about 1,000 tons displacement). SNSZ engineers believe

Solutions/Services

Fibersim
www.siemens.com/plm/fibersim

Customer's primary business

Sredne-Nevsky Shipyard provides ship production, from vessel design to delivery, building ships made of regular steel, magnetic steel, aluminum and fiberglass.
www.snsz.ru

Customer location

St. Petersburg
Russia

Partner

ITS
www.inteso.ru

"Fibersim has facilitated reducing dry fabric layup efforts and improving hull surface finish quality."

A. Yu. Sofronov
Deputy Head, Manufacturing CAD Department
Sredne-Nevsky Shipyard

that this achievement is a first and a remarkable milestone in non-metal hull production technologies.

Repairability – a key feature of composites

A composite hull enables excellent repairability. SNSZ experts have developed, documented and tested a repair procedure for a new composite mine sweeper hull. This means a hull breach can be fixed even while the ship is afloat. When a ship is delivered to a customer, SNSZ also supplies documentation for a wide range of repairs that can be performed either offshore or at a repair facility. In terms of repairability, composites offer many advantages compared to metals.

SNSZ plans to erect new facilities in which to build civil composite products. The company is launching two lines of vessels, including a carbon fiber passenger catamaran and a high-speed hydrofoil boat. The technologies that have been fine-tuned during mine sweeper production will be used to make these vessels. SNSZ is also considering using Quality Planning Environment from Siemens PLM Software.

Using Fibersim, SNSZ improved product quality, lowered composite costs and reduced the toxic hazards associated with composites production.

Siemens PLM Software

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