DEPARTMENT OF THE NAVY
SBIR/STTR TRANSITION PROGRAM

SUCCESS STORY

TOPIC NUMBER: SOCOM96-002

SBIR INVESTMENT: $864,325

PHASE III FUNDING: $60,131,039

NON-AUTOCLAVE COMPOSITE SYSTEMS FOR SUBMERGED MARINE COMPONENTS

Seemann Composites, Inc. developed a low-cost alternative to traditional fabrication of submarine composite components used to build the Columbia-class submarine.

Seemann Composites, LLC

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THE CHALLENGE

Composite structures for submarine components must possess both high strength and high fracture toughness to survive underwater shock blasts. Traditionally, these components have been manufactured by autoclave molding, a process that demands large capital investment, incurs high operational costs, consumes a great amount of energy, and restricts the size of components that can be produced. As the Navy develops the next-generation Columbia-class nuclear-powered ballistic missile submarines, it requires lower-costs and a more versatile production process for composite materials.

THE TECHNOLOGY

Seemann Composites, Inc. developed an advanced composite structure using a toughened resin system to manufacture submarine components. These composite materials are fabricated using an out-of-autoclave (OOA) process, which delivers the same high quality as autoclave molding, but through a more efficient process. The OOA process achieves the desired material properties by employing a closed mold, vacuum pressure, and lower heat compared to autoclave methods. Seemann Composites is leveraging the OOA process and composite structures to develop composite propulsor prototypes for the Columbia-class submarine, as well as material coatings and other solutions supporting submarines, ship, and small craft programs for the Navy.

THE TRANSITION

Seemann Composites was awarded a $74.9 million single award indefinite delivery/indefinite quantity contract by Naval Sea Systems Command to advance OOA composite fabrication practices for large-scale marine composite structures. This contract builds upon fundamental processes originally developed under the Small Business Innovation Research program, with $60,131,039 allocated as Phase III funding.

It extends the work initiated under SBIR topic SOCOM96-002, “Non-Autoclave Composite Systems for Submerged Marine Components.” The work under this contract includes further development, design integration, and testing of engineering solutions to address hybrid material and composite laminate fabrication of marine and Navy-relevant components. Thus far, this funding has been used to design and fabricate composite advanced propulsion bearing shaft components, advanced propulsion composite control structures, and composite computer numerical control machining and inspection/handling fixturing for propulsor components.

THE NAVAL BENEFIT

Seemann Composites' advanced composite structures are lighter, tougher and more reliable than previous designs, with the strength to withstand underwater shock blasts. This results in significant improvements in ruggedness and service life for submarine components. The OOA manufacturing process used for these composites cures materials at lower pressures and temperatures compared to traditional autoclave methods, reducing both costs and energy consumption. Additionally, the OOA process is flexible capable of producing complex shapes with minimal waste, allowing precise control over composite content and part thickness.

THE FUTURE

As the Navy constructs and commissions 12 Columbia-class submarines to replace the Ohio-class, Seemann Composites is refining its manufacturing processes to produce large- and full-scale submarine propulsion and shafting components . Additionally, the company is manufacturing bow domes for both the Columbia-class and Virginia-class submarines. In response to Navy contracts for composite production, Seeman Composites expanded its workforce and manufacturing facilities in Gulfport, Mississippi, to meet the demand.

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