

Topic: N141-052

NanoSonic, Inc.

Low-cost, Easily Applied VOC-free HybridSil® CRES Pipe Leak Repairing Resins

NanoSonic, who specializes in advanced materials research, has developed an easily applied Volatile Organic Compound (VOC)-free HybridSil® corrosion resistant steel (CRES) pipe leak repairing resin that readily seals pipes, withstanding continuous pressures beyond 350 psi within aviation jet fuel (JP-5) piping systems, and prevents exterior crevice corrosion during ASTM B117 salt fog corrosion testing. For leaking CRES fuel pipes on Naval ships, this repair works in areas with limited working envelopes and cures within 20-minutes. In a controlled environment, NanoSonic has repaired actively leaking CRES pipe sections, demonstrating patch durability for 40+ hours at 350 psi within recirculating JP-5 closed loop assemblies while passing Navy fuel purity requirements after extended JP-5 exposure. NanoSonic seeks to become the sole source supplier of its ceramic copolymer pipe repair kits and is currently working to provide its kits through the GSA Schedule.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)

Survivability

Maintainability/Sustainability

Unmanned Ground and Sea Vehicles

Corrosion

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SYSCOM: NAVSEA

Contract: N00024-15-C-4056

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N00024-15-C-4056

Department of the Navy SBIR/STTR Transition Program

Statement A: Approved for Release. Distribution is unlimited.

NAVSEA #16-567

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WHO

SYSCOM: NAVSEA

Sponsoring Program: PMS 312, In-service aircraft carrier program office.

Transition Target: CVN 77

TPOC:
(215)897-7948

Other transition opportunities:

Pipe repair on fuel delivery systems on U.S. Naval Ships.

Notes: NanoSonic has a dedicated manufacturing space that supports the production of our HybridSil® and HybridShield® products with a 200-gallon batch reactor with current production capability of 8,000 lbs/day for related HybridSil and HybridShield nanocomposite formulations



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WHAT

Operational Need and Improvement: Some aviation capable U.S. Naval Ships use thin walled (Schedule 10) corrosion resistant steel (CRES) pipe for fuel systems. CRES is susceptible to chloride corrosion, occurring if water is introduced into the piping system. Leaks in fuel piping systems create hazards and may interfere with ship operations. The Navy has a need for an easily applied repair to staunch any leak which may occur as a result of corrosion or damage to the pipe. The leak repair is to be applied on a ship while underway. In many instances, access to the area surrounding the pipe leak would be limited.

Specifications Required: Requirements for proposed CRES Pipe Leak Repair:

- Material/technique must be safe for use in fuel piping
- Able to tolerate contact with fuel without contaminating the fuel
- Able to withstand internal pressures up to 190 psi (prefer 250 psi)
- Should be expected to last as long as the base piping (~25 yrs.)
- Applicable for pipe sizes ranging from 2 to 12 inches
- Stop existing leaks on-board Naval ship while underway
- Prevent future leaks
- Achieve objectives of low installation, low maintenance costs, and easy application with particular attention to small working envelopes

Technology Developed: 2-part repair kit that is VOC-free, repairs CRES leaks < 15 minutes, easily employed in limited spaces, and lifetime greater than installed base piping (~25 years).

Warfighter Value: Benefits of a new CRES Pipe Leak Repair:

- Provides a reliable repair method to stop pipe leakage
- Provides a more cost effective repair method than currently available
- Avoids costly wide-scale replacement of system piping

WHEN

Contract Number: N00024-15-C-4056 **Ending on:** August 5, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate extended high temperature and pressure resilience of HybridSil CRES repairing resins	Low	Continuous flow testing at >200 psi	5	October 2016
Validate fire/smoke/toxicity (FST) compliancy of HybridSil CRES repairing materials	Med	Exceed FST targets	5	November 2016
Identify and Exceed Military Performance Specifications and Deposition Requirements	Med	Empirical validation of FST performance	5	December 2016
Provide NAVSEA Approved HybridSil CRES Repairing Kits and Procedures to U.S. Navy Personnel	Med	Integration and Use of Pipe Repair Kits	7	July 2017

HOW

Projected Business Model: NanoSonic's CRES pipe repair kits will be transitioned to Navy use through placement on the Qualified Parts List for Coatings on fuel piping and subsequent distribution to the Navy through direct Phase III contracts and purchasing through Defense Prime Contractors. Additional Phase III work may include resin manufacturing optimization and identification of additional secondary military applications for HybridSil pipe repairing technology.

Company Objectives: Upon completion of the NAVSEA SBIR program, NanoSonic will become a large-scale manufacturer and distributor of HybridSil pipe repairing materials for in-service aircraft carriers, as well as any other Navy or DoD platform desiring low-cost, easily installed VOC-free pipe repairing materials. Initial customers will include Navy groups responsible for CRES pipe leakage repair caused by poor initial welds worsened by chloride corrosion. It is envisioned HybridSil pipe repairing materials will be transitioned onto a U.S. Naval ship equipped with thin walled CRES piping. The acquisition program for this effort is PMS 312, In-service aircraft carrier program office.

Potential Commercial Applications: By providing a low-cost, easily depositable pipe leak repairing resin that is VOC-free, non-toxic, and extremely solvent resistant, NanoSonic's envisions considerable military and civilian market interest during Phase II and III efforts. If successfully demonstrated, there may be a commercial market for this thin walled pipe joint leak repair in any industry that employs thin walled CRES piping, such as petroleum production or distribution.

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