

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2021-0388

Topic # N19A-T013

Power Dense Turbo-Compression Cooling Driven by Waste Heat
Mantel Technologies

WHO

SYSCOM: NAVSEA

Sponsoring Program: PMS460

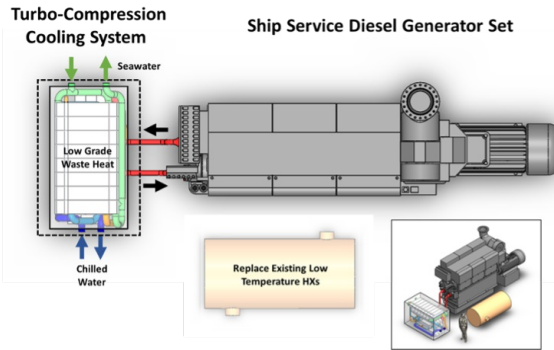
Transition Target: LPD, DDG(X)

TPOC:

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Other transition opportunities:
Installation Energy, Base Resilience

Notes: The TCCS captures waste heat from SSDG and converts it into cooling capacity. Key discriminators of the TCCS are its ability to utilize low-grade waste heat, its ability to handle fluctuations in waste heat availability, its multi-modal operation which affords for both cooling and electricity generation, and its compact size.



Courtesy Mantel Technologies

WHAT

Operational Need and Improvement: The US Navy seeks to increase the power density of existing power generation equipment such as shipboard service diesel gensets (SSDGs) in order to accommodate the power and cooling needs of emerging and future weapon systems.

Specifications Required: Increase SSDG efficiency by at least 10% through recovery and conversion of waste heat to cooling and/or electricity without increasing footprint, volume or weight of incumbent chiller system.

Technology Developed: The turbo-compression cooling system (TCCS) is an efficient, compact means of recovering and converting low temperature waste heat into cooling capacity. The system maximizes the use of COTS components to support maintainability objectives.

Warfighter Value: Implementation of the TCCS will result in improved efficiency of shipboard service diesel gensets (SSDGs). By improving SSDG efficiency, the TCCS reduces fuel costs and supports ship resilience.

WHEN

Contract Number: N68335-20-C-0630 **Ending on:** January 1, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase II Full Scale System Design Complete	Low	Successful Critical Design Review	3	May 2021
Phase II Test System Assembled	Low	100-ton Cooling Scale System Assembled	3	May 2022
Preliminary Phase II System Test Report	Low	Report Summarizing Test Outcomes	4	July 2022
Phase II Full Scale System Design Refined	Low	Design Updated Based on Test System Outcomes	4	July 2022
100-Ton Scale TCCS Shipboard Test and Evaluation	Med	System Meets Performance Requirements at 100-ton Scale in a Shipboard Environment	7	December 2023
Full-Scale Militarized TCCS Shipboard Test and Evaluation	Med	System Meets Performance Requirements at Full-Scale in Shipboard Environment	8	December 2025

HOW

Projected Business Model: Mantel has established a subsidiary, Harvest Cooling, to commercialize the TCCS. We envision a business model including both direct sales and sales through channel partners. A 200-ton-scale TCCS for US Navy shipboard applications will be the first product pursued. In parallel, will investigate additional shipboard models and will also pursue land-based/installation versions of the TCCS.

Company Objectives: Mantel seeks to deliver waste heat recovery solutions via its Harvest Cooling subsidiary. For US Navy shipboard applications, we aim to establish relationships with the appropriate shipbuilders and diesel engine manufacturers as required to gain support for inclusion of the TCCS for both retrofit and new build opportunities. For land-based applications, we aim to drive growth via pilot operations at industrial sites where waste heat is abundant and then for cooling is significant. Our vision is to establish the TCCS as a key enabler for energy resilience.

Potential Commercial Applications: The TCCS has great potential for impact in any application where there is a reliable supply of waste heat, either from energy production or other industrial processes, and a need for cooling. Markets include the food processing industry, commercial CHP and data centers.

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