

Power Dense Single Core Three-Phase Transformer



Diversified Technologies Inc.

Bedford, MA

www.divtecs.com



Figure 1 DTI and Neeltran 4.3 MW, 7 MVA, 24 pulse transformer rectifiers that DTI installed at the integrated system at the Army Corps of Engineers facility in Romeoville, Illinois



Figure 2 First of Twelve Planned Cobra Dane Transmitter Group Replacements

Contact:

Dr. David Cope
Principal Investigator, Director of Research
Diversified Technologies Inc.
cope@divtecs.com

Topic Number: N201-039

SYSCOM: Naval Sea Systems Command (NAVSEA)

Program Sponsor: PMS400D

Other Potential Programs:
NSWC Philadelphia Division

Current TRL: 7

Projected TRL: 8 / Q3 2024

Keywords:

Power transformer, three-phase, single-core, reduced footprint, galvanic isolation, TRL 7

SBIR Innovation Center



2023 Navy Gold Coast | July 26 – 28, 2023

THE CHALLENGE

The main objective is reducing the size and weight of militarized single-core three-phase transformers for use within Navy shipboard power distribution systems, while meeting Navy-specific requirements for shipboard use.

THE INNOVATION

Diversified Technologies Inc. (DTI) developed a compact, 60 Hz, 440 Vrms, 150 kVA, militarized, 1:1 galvanic isolation transformer. DTI fabricated and demonstrated four transformers and qualified the transformer, achieving TRL 7. DTI will deliver, install, and fully test a final qualified isolation transformer shipboard or at a U.S. Navy test facility, thereby achieving TRL 8.

THE NAVY BENEFIT

Power transformers are key components in shipboard AC electrical power distribution systems. Their function is to provide galvanic isolation and efficiently transform electrical energy to more convenient voltages at the point-of-load. Reducing Size, Weight, and Power (SWaP) losses are important for shipboard applications. DTI's transformer easily fits through hatches with a front face of less than 57.5", has reduced footprint, and satisfies the touch-temperature requirement of less than an 80°C rise.

THE FUTURE

Potential platforms include updates on Naval ships, such as DDG-51, and incorporation of this transformer into future platform designs. These ships could each utilize between 6 to 12 transformers, depending on the vessel and the number of vital loads that require galvanic isolation. Commercial applications that could benefit from this technology include power distribution systems of civilian marine vessels, such as shipping vessels and cruise liners. Land-based applications, such as the power collector networks of wind and solar farms, could also benefit from smaller, rugged, high efficiency three-phase custom transformers.