Advanced Active Shaft Grounding System

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At a Glance

What is it?

- The Advanced Active Shaft Grounding System (ASGS) will provide a near-zero resistance electrical connection between the vessel's propulsion shaft and hull common ground. It will also provide the capability to measure and report the magnitude of current flowing down the propeller shaft in real time.

How does it work?

- An ASGS provides electrical connections between the rotating propulsion shaft and the hull. It electrically manipulates that ground path such that it becomes a near-zero resistance ground between the shaft and the hull. For many years, the Navy has used ASGS systems in various ship classes that employ impressed current cathodic protection systems. However, these legacy systems have not possessed the capability to measure and report the magnitude of current flowing in the shaft. The Navy is developing an advanced ASGS with enhanced capabilities.

What will it accomplish?

- More efficient operation of the ship's cathodic protection system will result from an improved shaft ground. Additionally, shaft corrosion resulting from improper grounding will be eliminated.

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A ship's rotating propulsion is not inherently electrically common with the bulk structure of the hull. However, the shaft will carry electrical current either from corrosion or cathodic protection sources. Without a designed low-resistance ground, the current can ground through various ship structures (e.g., shaft seals, bearings and reduction gearing), causing damage at the ground points.

Obtaining a consistent, electrically common ground between the rotating propulsion shaft and the hull is technically challenging. Present systems are less effective, requiring frequent maintenance of the contact interface. Ideally, a new system would employ highly consistent, maintenance-free shaft contact technology. Also, the associated electronic control package for the system should be able to output data, which provides useful feedback to the control of the ship's impressed current cathodic protection system.

Also under development is an associated capability to measure current grounding to the hull at various points along the shaft, either where there is intermittent hard contact or where the design of the structure provides for close contact under normal operating conditions.

The new, advanced ASGS will ensure a consistent, low-resistance ground for the propulsion shaft. This will allow for more efficient operation of the impressed current cathodic protection system and will prevent the damage inherent in improper grounding of shaft currents.

The advanced ASGS will be transitioned to the fleet on the VIRGINIA Class, Block IV ships under the sponsorship of Program Executive Office Submarines (PMS 450).

Research Challenges and Opportunities:

- A maintenance-free, consistent contact with the rotating shaft will require improved designs and evaluation of novel contact technologies.
- Measurement of current flowing in the shaft at various points of interest (inboard and outboard) will be challenging