Read the room – Port side azimuth thruster shutdown and subsequent partial blackout on DP vessel

Incident

DP Event • Published on **22 December 2023** • Generated on **28 January 2026** • DPE 04/23

A series of incidents involving the unexpected shutdown of a port side azimuth thruster and a subsequent partial blackout on a DP vessel.

Overview

This report provides a detailed technical analysis of a series of incidents involving the unexpected shutdown of a port side azimuth thruster and a subsequent partial blackout on a Dynamic Positioning (DP) vessel. The vessel was engaged in DP operations with a ROV and a crane deployed at working depth.

During the incident, Diesel Generators (DG) 2 and 4 were online, DG 1 was out of order, and DG 3 was on standby. The vessel was operating an open bus.

What happened?

First shutdown: The port side azimuth thruster unexpectedly shut down. A DC over-voltage alarm was observed on the local display of the Inverter Unit (INU) at the Port Side Variable Frequency Drive (VFD). After checking all Motor Drive Control (MDC) circuit boards, which were found operational with green LED indicators, the alarm was reset and cleared. The thruster was then restarted without active alarms.

Second shutdown: A similar incident occurred again with the same thruster, followed by the same diagnostic and reset procedure. The thruster was reselected into the DP system, and operations were resumed.

Third shutdown: The thruster experienced another shutdown with the same DC over-voltage alarm. The alarm was reset after standard checks.

Partial blackout: During an attempt to restart the port side azimuth thruster, a partial blackout occurred on the Port Side Switchboard (PS SWB), powered by DG 2. Bow Thruster 1 and Azimuth Thruster 3 went offline. However, the vessel maintained station keeping with Bow Thruster 2 and Azimuth Thruster 4 remaining online. WCFDI was equalled.

The root cause was identified as a failure of the Insulated Gate Bipolar Transistor (IGBT) module on the port side azimuth thruster VFD. The IGBT module is critical for the VFD's operation, controlling the power flow to the thruster motors. The repeated DC over-voltage alarms suggest a malfunction in the VFD's ability to maintain the DC voltage, stemming from the damaged IGBT module. Although the report did not detail the reason for the generator tripping (causing the partial blackout) it is assumed that the failed IGBT being continually reset eventually resulted in power system fault causing the generator protection to trip.

Conclusion

The attempt to restart the thruster with a compromised VFD likely contributed to a power system fault, resulting in a partial blackout on the PS SWB. The specific interaction between the failed IGBT module and the generators protective systems requires further investigation.

Emergency response procedures should be assessed and updated to address potential power system instabilities, especially

during critical DP operations.

Conduct crew training focused on response to power system anomalies and emergency station-keeping procedures. Vessel technical staff need to fully understand all the nuances of DP operations and be involved in the development of the ASOG in order to understand the guidance within such document.

It is unknown whether this vessel in this case was equipped with an ASOG; however, machinery that has malfunctioned must not be reinstated until the vessel has stabilised and the underlying cause has been adequately identified and resolved.

The case studies and observations above have been compiled from information received by IMCA. All vessel, client, and operational data has been removed from the narrative to ensure anonymity. Case studies are not intended as guidance on the safe conduct of operations, but rather to assist vessel managers, DP operators, and technical crew.

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