

## Starting air system incident

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**A Member has reported an incident which occurred during vessel management system trials, whereby an overpressure event occurred in the starboard engine room air start system.**

A company investigation team carried out a detailed examination of the damage to determine the root cause of the event. It was apparent that an explosion had occurred in the system causing visible damage in four locations; failed hose, ruptured pipe-work, cracked tee piece and failure of valves and fittings at the receivers. The sequence of events was established through discussion with crew members, engine room logs and physical examination of the damage.

The investigation determined that the air system had become saturated with compressor oil sufficient to provide a flammable mixture and sustain combustion. Ignition occurred when the DG had started up and blew back via the start valve and solenoid valve into the air system, causing the damage to the pipes and fittings.

Key indicators to support these findings were that:

- Oil found in the pipework was tested and confirmed to be compressor lube oil.
- The pattern of the damage indicated that the explosion had travelled from the DG into the air system pipework.
- The air start solenoid valve on the DG was removed and contained evidence of combustion.
- Starting air valve no. 4 from the DG also showed signs of sooty deposits on the stem and spring. This indicated that combustion had travelled from the cylinder into the common air rail.
- There was no indication of combustion between the air start compressor and the receivers, eliminating the compressor as a source of ignition.

The investigation concluded that the event occurred due to compressor lube oil carried over to the air start system pipe work over a number of years and collected in an isolated crossover system. During maintenance operations the crossover was de-isolated and oil distributed to the system. Additionally the air start system was not fitted with NRVs and flame arrestors as required by the latest codes.

### System Reinstatement

It was highlighted that the system drawings did not reflect the actual outfitting of the engine and that the non-return valve on the solenoid valve was not in place on any of the four engines, these components will be fitted during the next DG maintenance periods. All pipe work and fixtures that were exposed to the explosion have been replaced with approved material and fittings. These have been pressure

tested prior to assembly into the systems and the systems have been subject to a full leak test at working pressure and flushing prior to being taken into service. The classification society has subsequently accepted the reinstatement of the pipe-work and valve arrangements.

Both air start compressors have been tested for oil carryover, and found to be below 0.5 mg/m<sup>3</sup>. Flushing of the systems has been carried out to an acceptable standard to remove all traces of the compressor lube oil.

Based on these actions being completed, the vessel was considered fit for return to service. In the longer term, the company has committed to the following actions:

- Installation of suitable coalescing filters to the air start compressor outputs, to prevent any future carry-over of oil.
- A review of PMS with regard to the air start system, including starting valves; compressor air samples and overhauls; and pipework and receiver inspections.
- A design review with regard to the installation of flame arrestors and burst discs to the air start systems of the four DGs.
- Review of engine room as-built documentation.

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