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ENHANCING FIRE SAFETY AWARENESS

Relevant for design offices, shipyards, owners/managers.

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In this issue, DNV GL emphasizes important aspects of fire safety in the engine room, regarding both newbuildings and ships in service.

RULES AND REQUIREMENTS

Many aspects which determine the fire risk in an engine room, such as insulation, screening and the routing of pipes, cannot be easily addressed in the design approval phase. Therefore, these aspects require adequate attention during the newbuilding construction phase.

Insulation and screening deteriorate during the vessel's operational phase and require extra attention during the vessel's in-service phase. Often, deficiencies within these two aspects are easy to detect during a survey. However, missing insulation or screening is not always easy to identify, especially on relatively new ships. Therefore, it is important that all requirements are met when the vessel is delivered – making follow-up during the ship's lifetime simpler.

The applicable rules and requirements regarding fire safety can be found in SOLAS Chapter II-2 and in the DNV GL rules, Part 4, Chapters 1, 3 and 6. In addition, requirements related to the class notation "Additional Fire Safety" can be found in Part 6, Chapter 5.

The IMO's Maritime Safety Circular MSc.1/Circ.1321 provides practical guidelines and gives a comprehensive overview of the SOLAS regulations. This circular is available from www.imo.org or through the IMO-Vega Database*.



Figure 1: Failed flexible hose which caused an engine fire

ATTENTION AREAS

Routing of pipes (for newbuildings)

In general, flammable liquid piping systems shall not be located immediately above or near units with a high temperature and shall be located as far as practicable away from potential ignition sources. Furthermore, piping joints should be screened or protected to avoid leakage onto a potential ignition source. "Flammable liquid" refers to fuel, lubrication and hydraulic or thermal oil. In addition, fuel oil piping shall be laid in well-lit places, enabling proper inspection and observation of leaks.

The above also applies to small-diameter piping used to connect, for example, manometers. This small-diameter piping is often prone to vibrations and should therefore be properly fastened to prevent fatigue or scuffing damage resulting in leakages.

MSc.1/Circ.1321 states that spray shields should be applied both for piping systems and for pressurized equipment and/or fittings on oil fuel systems, such as heat exchangers, tube plates and filter or strainer body joints. By extending this stipulation to include other flammable liquids, a higher fire safety level can be obtained. For example, lubrication oil filters located in the vicinity of the turbo charger should be shielded to prevent leakage from the filter reaching the turbo charger. Please note that fuel oil filters fitted on the engine may not be located near rotating parts or hot components.

Flexible hoses (for newbuildings and vessels in operation)

Flexible hoses are only allowed in locations where this is necessary to facilitate relative movement between two connections. The hoses shall be type-approved and as short as possible, and should not be more than 1.5 metres long.

*Developed jointly by the IMO and DNV GL AS, the IMO-Vega Database is a powerful database which includes historical data and benefits from a sophisticated search function. See either dnvgl.com or imo.org for more information.

Flexible hoses have a limited lifetime under normal conditions, but this lifetime is greatly reduced if the installation is arranged outside acceptable tolerances, for instance when the radius of a bend is less than the minimum required or when the tightening of the connection introduces a twist in the hose. See MSc.1/Circ.1321 for examples of good and bad flexible hose installations.

Since flexible hoses are typically installed in locations with relative movement, care should be taken to prevent scuffing of the hoses. The hoses should preferably not have any contact with other pipes, hoses or machinery parts in order to minimize the risk of scuffing damage.

Because of the limited lifetime of flexible hoses, it is recommended to screen the entire hose and not just the connections.

Filters (for newbuildings and vessels in operation)

Class rules specify that filters or filter chambers fitted on the engine shall be provided with suitable means for venting when put into operation and for depressurizing before being opened. Valves or cocks with drain pipes leading to a safe location shall be used for this purpose.

MSC.1/Circ.1321 specifies in general that plug-type air vents on filters are not allowed and that air vent cocks or valves with discharge led to a safe location should be used.

Thermoscans (for newbuildings and vessels in operation)

Infrared thermal scanning equipment can be very useful when looking for hotspots in the engine room. However, it has to be kept in mind that the proper use of the equipment requires knowledge of the emissivity of various materials and calibration of the equipment. Therefore, it is recommended that the infrared thermal scanning results are used as an indicator of relative thermal differences and that the actual temperature of any hotspots indicated is determined by a contact thermometer. Thermal scanning reports prepared by the crew should be used with caution if they do not include contact thermometer references.

Insulation material (for vessels in operation)

More and more engines are delivered with an exhaust gas casing that insulates and shields the exhaust gas piping. This solution is preferred over the solution in which the exhaust gas manifold is wrapped with lagging, with or without mechanical protection, as it is easier to dismantle and reassemble and has fewer gaps through which oil can reach the heated surface. However, the insulation material inside the casing is exposed to high temperatures and vibrations and will deteriorate. Therefore, it is necessary to regularly open the casing and verify the condition of the insulation material during the vessel's in-service life. This applies to any casing containing insulation material.

The repeated heating and cooling down of sheet metal plates, for example spray shielding or mechanical protection of



Figure 2: Missing screening of boiler fuel piping connections

insulation, is likely to cause deformation of the plates. Often, this leads to openings occurring between adjacent plates or closing mechanisms not sealing properly. When this is encountered, it should be evaluated if the orientation of the opening enables a flammable liquid spray to hit a hot surface. If this is the case, it needs to be rectified.

Safety culture and general maintenance (for newbuildings and vessels in operation)

The safety culture on board is crucial to the safety of the crew, passengers and vessel. A high awareness of the risks associated with the operation and maintenance of the equipment on board greatly reduces the risk of fires.

Engine room cleanliness, the presence of "make-do solutions", such as drip buckets and "leak deflectors", or the use of emergency escapes as storage space are often indicative of a poor safety culture on board. Other less visible aspects of the safety culture are, for example, the reuse of sealing materials such as soft copper rings, the calibration of torque wrenches and the availability of the applicable tightening torque for the various engine components such as the fuel pump foundation bolts, fuel injector bolts, high pressure connections and more.

Recommendations

Fire safety is the result of design and maintenance and can never be taken for granted. Continuous attention to all aspects is a requirement across the ship's entire lifetime.

References

- SOLAS Ch II-2
- DNV GL Rules, Part 4, Ch 1, 3 and 6. Requirements related to the class notation "Additional Fire Safety": Part 6, Chapter 5.
- [IMO-Vega database](#)

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