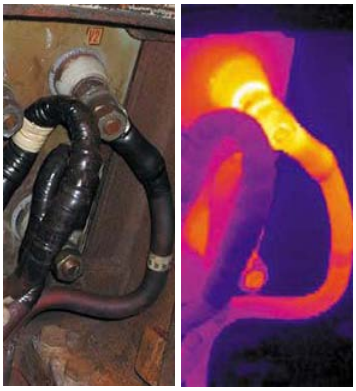
# Fire prevention in engine rooms

**Introduction**



Every year fires on board ships lead to loss of lives and severe damage to the ships themselves. The majority of fires on board ships originate in the engine room and failure in a flammable oil system followed by impingement of oil onto a high temperature surface is the leading cause of engine room fires. In addition, many engine room fires have an electrical source, such as electrical short-circuits and thermal overheating in the switchboards.

Identification and protection of high temperature surfaces in the engine room is considered to be a very effective measure to prevent engine room fires and is also fairly easy to implement on board. The purpose of this circular is therefore to increase awareness of the potential dangers associated with exposed high temperature surfaces in engine rooms.[1] The existing regulatory requirements have been highlighted to focus attention on companies' responsibility to ensure that the engine room systems are maintained in a safe condition and in compliance with relevant regulatory requirements at all times during operations.

**Rules and regulations**

The IMO Safety of Life at Sea (SOLAS) Convention provides the key regulatory framework for fire safety on board ships and Ch.II-2/Reg.4 covers measures to reduce the probability of oil leaks igniting in engine rooms. SOLAS recognizes that if fuel oil, lubrication oil or other flammable oil systems leak, the chances of preventing the outbreak of a fire will be greatly increased if all potential ignition sources have been identified and removed, or properly insulated. Accordingly, the following key safety measures became mandatory SOLAS requirements for all ships from July 2003:

- jacketed (double) pipes in high pressure fuel oil delivery lines;
- insulation of all high temperature surfaces (> 220°C) at risk of flammable oil impingement after a failure of an oil line; and
- spray shields for flammable oil lines (fuel, lubrication and hydraulic oil) located immediately above or near potential ignition sources.[2]

Compliance with rules and regulations is normally checked by classification societies/flag administrations and port authorities and fire safety in general is of course one of the main issues during their inspections on board. But the time available to complete a full survey on board is often short and when it comes to verification of the integrity/ functioning of machinery and systems, it may appear that the surveyors' inspection is often limited to spot checks of known high risk areas and hazards in the engine room. Class and port state surveyors normally attend on board while the ship is in port and the engines are therefore not running at full load. High temperature surfaces in the engine room are not always detectable in these conditions, even where more sophisticated temperature measuring tools, e.g., thermo scanning cameras, are used as part of the inspection.[3]

[1] See also articles "P&I Incident – Fire in engine room on board a fully loaded tanker" in Gard News 179, "Fire in engine room due to malfunction of moray switch" in Gard News 175 and "Hull and machinery incident – Fire in engine room" in Gard News 170.

[2] Potential ignition sources: "*Sources having enough energy to cause ignition. These include high temperature surfaces, sparks or flames from inefficient flanges or joints, electrical discharges caused from electrostatic atmospheres, or electrical contactor faults. Sources of these are for example exhaust gas piping of internal combustion engines, leakages from boiler furnace joints and electrical equipment within oil treatment rooms*" (quoted from MSC.1/Circ.1321).

[3] As far as Gard is aware none of the governing rules and regulations for ships have mandatory requirements for the use of infrared thermo scanning cameras to detect heated surfaces in engine rooms. Such measures may, however, be recommended, e.g., via classification societies' optional class notations. See also article "Thermographical examinations of engine rooms" in Gard News 170.

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## Gard's experience

Many companies go to considerable lengths to ensure safe conditions in their engine rooms and some also invest in use of temperature measuring tools to identify exposed high temperature surfaces. At the same time, Gard's impression is that the effects of the SOLAS regulations implemented in July 2003 do not appear to have been as positive as expected and the initial strong focus on the required preventive measures may have diminished somewhat.

In Gard's experience, the risks are at their highest when maintenance work is taking place or immediately thereafter. The risks involved with the execution of a specific repair or maintenance operation are not always readily identifiable and are sometimes underestimated due to the perceived simplicity of the work to be carried out. As a result, additional safety precautions may not be implemented during and after the repair work. Typical examples are missing hot-work permits and the absence of a fire watch. Following a period of maintenance, the time available to prepare the vessel and get her back in operation can be limited, and the refitting of removed insulation mats or spray shields is often left for the crew to complete during the voyage.

## Recommendations

Fire safety in engine rooms is the result of both good design and the company's and crew's continuous focus on fire prevention measures on board the ship. Companies must therefore bear in mind that, although compliance with fire safety requirements is controlled by authorities and classification societies, it is the *company's* responsibility to establish procedures to ensure that the ship is maintained in compliance with the provisions of the relevant rules and regulations (ISM Code Ch.10) and that the crew is properly trained and provided with adequate resources/tools to perform their tasks in accordance with the required standards (ISM Code Ch.6 and Ch.3 respectively).

Gard would like to draw Members' and clients' attention to the following specific measures related to fire prevention:

- High standards of cleanliness in the engine room are essential for fire prevention and any leakages in fuel, hydraulic, or other flammable oil systems must be dealt with promptly. The position and condition of spray shields for both high and low pressure flammable oil lines should be checked regularly, as should the drainage arrangements for jacketed fuel oil pipes.

- Materials used for insulating high temperature surfaces may degrade over time and regular checks should be carried out, both visually and using temperature measuring tools. Measurements using infrared thermo scanning cameras can be very useful to identify surfaces with temperatures in excess of 220$^{o}$C in the engine parts, exhaust ducts and electrical equipment. Regular (e.g., annual) measurements are recommended to be taken as part of the standard maintenance and inspection routines, undertaken either by specialist firms or by trained crew.

- Particular attention must be paid to fire risks when repairs and maintenance are carried out. Prior to the execution of an operation, the risks involved should be identified and additional safety precautions taken. Special attention should also be given to the immediate and proper refitting of spray shields and insulation materials upon completion of maintenance.

- Recommendations in IMO MSC.1/Circ.1321 "IMO MSC.1/Circ.1321 *"Guidelines for measures to prevent fires in engine-rooms and cargo pump-rooms"* should be consulted to define integrity standards acceptable under the SOLAS Convention. Standards covering maintenance of electrical systems should also be defined.

Serious fires have arisen because of failure to recognize potential fire hazards, and above all, the best fire prevention is a well trained crew. Training and experience transfer between crew should aim to create a common understanding of all hazards present in an engine room and their potential consequences.

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