



Ship Type: All

Trade Area: All

Bulletin 92 - 05/99 - Engine Room Lagging Fires

The risk to property and life caused by fire on board ship, and particularly fires in the engine room, is well understood. Seafarers are trained in general fire fighting skills and understand the usual mechanisms by which combustion occurs and is maintained.

We have however recently been made aware of a phenomenon that results in the self-heating of combustible fluids to the point at which they can ignite, and this is less well known in the industry. The "**lagging fire**" is so named because it originates in insulation material that has been soaked in oil from leaking pipe work, valves etc.

THE LAGGING FIRE

Lagging fires normally occur as a result of a flammable liquid leaking into adjacent insulation or lagging material of heated pipework. The type of insulation material in use can influence the risk of fire. Lagging fires have been reproduced in laboratory conditions at liquid temperatures as low as about **130 degrees Celsius**. In other words, oil circulating at this temperature and which is able to leak into surrounding insulation may reach ignition temperature through oxidation. The time for the oil to reach ignition temperature varies considerably, but can be between a few minutes and a day or so. Much depends on the rate of leakage, the thickness and type of the insulation, the oil temperature and its characteristics. Heavy leakage is unlikely to result in any significant rise in oil temperature as heat is rapidly carried away from the source by virtue of the flow rate. Similarly, insulation that is not porous or is thinly applied will neither encourage oxidation nor conserve heat sufficiently to produce significant temperature rise. Conditions that influence the balance between heat loss and generation are crucial to the incidence of lagging fires. For example, an elevated risk of fire will exist when leakage occurs from an insulated oil pipe situated amongst a number of other oil pipes, where air movement is minimal and local temperatures are kept high through the radiant heat of the surrounding pipe system.

METHOD OF IGNITION

This type of fire is generally (but not exclusively) confined to machinery spaces and engine room compartments. Ignition is dependent on heat being generated through the oxidation of a flammable liquid, which has seeped into the surrounding insulation material. The porous lagging material provides a medium by which the maximum surface area of the liquid is exposed to air; heat generated through the oxidation process is conserved by the low thermal conductivity of the insulating material. Heat transfer through the lagging and away from the source may be less than the heat energy produced through the reaction with air, causing a rise in temperature of the liquid soaked lagging. The liquid need not have a particularly low flash point or be prone to rapid evaporation; indeed these characteristics have been shown to be much less likely to produce a lagging fire. Non-fuel oils such as lubricating, hydraulic and thermal oils are more likely agents of such fires.

PREVENTION AND FIRE FIGHTING

The single most important measure that ship's crews can take to minimise the chances of a lagging fire is to ensure the proper maintenance of valve glands and pipe joints. If leakage is prevented then such fires will not occur. Where leakage is a frequent occurrence, such as at sampling points, it may be prudent not to lag adjacent pipe work or protect it with sheathing. Lagging should be kept in sound condition and, if possible, lightly coloured to quickly identify leakage problems. Painted lagging can reduce air permeability and thus lessen the chances of oxidation taking place. For the process of self-heating to begin the lagging material must be porous. If lagging of a non-porous nature is used, such as foamed glass, there will be no risk of fire from oil leakage. Such materials are more expensive and their use must therefore be weighed against any potential risk.

Awareness amongst sea staff of the risks posed by oil leakage into lagging can be raised through the circulation of technical bulletins. We are aware that, on a number of occasions, sea staff have mistakenly taken smouldering lagging to indicate a problem with the quality or specification of a particular oil. If lagging material is seen to be smoking it should not be interfered with until a supply of water can be brought to bear. Once the insulation is disturbed or removed, air can circulate freely causing the rapid development of fire. The heat generated can be sufficient to re-ignite material after it has been doused with foam, water or powder, it is important therefore to ensure adequate cooling has taken place before standing personnel down. If, during the course of maintenance, areas of insulation are discovered to be charred, it is a sure sign that self-heating has taken place in the past and additional safety measures should be implemented to prevent a recurrence.