

HSE information sheet

Contaminated lagging and self-heating

Offshore Information Sheet No. 11/2008

Contents

Introduction.....	2
Background	2
Advice on the prevention of OSH in contaminated lagging and removal, safe storage and transport to disposal.....	3
Relevant legal requirements.....	4
Further information.....	5

Introduction

This information sheet provides guidance for duty holders on oxidative self-heating (OSH) hazards associated with lagging type material contaminated with organic fluids. This type of chemical reaction is known to be a common cause of fires where oils and other organic fluids are stored or are present at elevated temperatures. Fluid leaking onto thermal lagging is warmed by the vessel / pipework in contact with the lagging, which increases its oxidation rate, which in turn produces heat etc etc.

Oxidative self-heating can occur in material contaminated by a variety of organic fluids, not just 'oils'. For example, a fire in 2004 in a sugar beet factory has been attributed to a plasticiser used in plastics manufacture.

Background

OSH is a recognised problem with lagging type materials that become contaminated with organic substances such as glycols, lubricating oils, diesel etc. Lagging is usually around a vessel or pipework that is being thermally insulated and therefore warm. The warm environment contributes to the OSH effect. Several significant factors need to be taken into account when evaluating the potential for OSH with flammable substances, these include;

- i. increased surface area increases a substances reaction rate;
- ii. a temperature increase of $\sim 4^{\circ}\text{C}$ generally doubles reaction rates (Arrhenus);
- iii. longer chain hydrocarbons such as lubricating oil have a lower auto ignition temperature (AIT) than shorter chain molecules like methane;
- iv. only the complete elimination of air (oxygen) and/or quenching with water will prevent the OSH reaction.

Tests carried out by the Health & Safety Laboratory (HSL) have indicated that any insulation material not wholly closed cell e.g. mineral wool, calcium silicate etc. contaminated by organic substances have shown spontaneous oxidative self heating when the material in contact with hot surfaces is removed. Over the last few years several incidents involving fires have been investigated by HSE/HSL. It was concluded that OSH in lagging contaminated with an organic fluid was the most probable source of ignition.

Advice on the prevention of OSH in contaminated lagging and removal, safe storage and transport to disposal

The accepted method of preventing OSH if lagging is suspected of being contaminated is to saturate material with water within a bag, and store in steel drums prior to disposal. It has been noted that OSH will still occur if insufficient water is added to the lagging when it is bagged. Good practice is seen as storing and transporting the lagging in steel drums. Filling the storage drum with water not only eliminates oxygen it also acts as a large heat sink.

Include OSH as a hazardous occurrence to the platforms fire hazard analysis. Tool box talks prior to intrusive activities on the subject will focus attention on the fire potential.

Thermal insulation lagging tends to hide defects, cracks, splits and small holes that may allow fluid leaks into the inside of the lagging adjacent to the hot surface of the vessel/pipework. Periodic removal is usually part of a planned maintenance regime for inspection purposes. Fully developed thermal runaway reaction to ignition will only occur if there is an adequate supply of fresh air. Removal of the lagging allows the organic fluid to contact air and OSH starts. Hence lagging removal should be planned and the actual process carried out as quickly as is reasonably practicable followed by rapid water saturation of the material.

Given the high risk of OSH, good practice would include specific inspection and test procedures to identify locations with potential for organic fluids and lagging to co-exist. Areas such as gas turbines, glycol re-generation units, bellows, pipework flanges and vessel intrusion points etc. are likely candidates.

All organic fluids present on a platform that are likely to come into contact with lagging should be subject to a test to determine the temperature at which spontaneous self-heating will occur. UN TEST N.4 has been used by HSL to determine such temperatures.

It would be beneficial for hazard management if the steel surface temperatures of the lagged vessel or pipework were measured, and recorded in relevant planned maintenance (PM) routines. Steelwork surface temperatures in excess of the auto ignition temperature of the fluid in question are then readily available to evaluate the risks from fires in local risk assessments etc.

Relevant legal requirements

Health and Safety at Work etc Act 1974 (HSWA), Sections 2 & 3
Offshore Installations (Safety Case) Regulations 2005 (SCR05), Regulation 14
Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER) Regulations 5, 9, 12 and 13

Offshore Installations and Wells (Design and Construction, etc) Regulations 1996
(DCR) Regulation 5

Further information

Any queries relating to this sheet should be addressed to:

Health and Safety Executive
Hazardous Installations Directorate
Offshore Division
Lord Cullen House
Fraser Place
Aberdeen AB25 3UB
Tel: 01224 252500

Fax: 01224 252648 This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do