Technical guide

Hydraulic oil system fire exposures

Many items of plant in industrial facilities incorporate hydraulic oil actuation mechanisms. Common examples include power presses in metal working facilities, plastic injection moulders, baling equipment and tilting mechanisms on foundry equipment. As the mineral oils used within these systems typically have flashpoints in excess of 200°C, the fire risk associated with such systems is significant but is often overlooked.

Under normal operating conditions, the oil is held under high pressure within a closed system. However, because of this high pressure, if oil escapes from the system, it becomes atomised and is easily ignited. If this happens, it will result in an intense fire that will continue to burn until the fuel supply is isolated or exhausted, even in the presence of sprinkler protection. Such a fire can easily ignite combustible materials in the immediate vicinity, increasing the potential for major fire spread.

Limiting the amount of fuel available is the primary means of tackling such a fire. But as machine emergency stop buttons are often mounted on or around the plant they control, manual isolation cannot be relied upon as access can be compromised by the fire.

What causes hydraulic oil fires?

Hydraulic oil fires occur when oil is released under pressure and comes into contact with an ignition source. The failure of a hydraulic pipe or hose can result from poor standards of installation, mechanical impact, failure of components due to vibration, fatigue or / wear, coupling failure, or because of damage from a fire or other hot materials.In the case of the latter, the released oil will instantly come into contact with a strong ignition source and a fire could be immediate.

Typical ignition sources for hydraulic oil fires include the following:

- Hot molten materials, for example metals or glass in foundries
- Hot surfaces such as equipment or products being processed
- Electrical equipment
- Fire, which could include hot works or electrical failure igniting combustible storage, waste materials or oil spills in the vicinity.

What can be done to mitigate the risk?

There are a number of ways to mitigate this risk including:

1. Use of non-flammable or fire resistant hydraulic fluids

This is the preferred solution as it addresses the exposure at source and is especially important in sites where there is a greater likelihood of oil fires such as foundries or other facilities processing hot materials. These types of fluids are often used in these sectors. It is also important to note that while it is often possible to specify an oil type to equipment suppliers when purchasing their products, switching from a standard mineral oil to a less hazardous alternative is not straightforward and equipment manufacturers should always be consulted first.

2. Provision for the reliable isolation of the system under emergency conditions An automatic means of isolation should be sought for systems using standard mineral oils, especially in respect of large capacity systems, although manual isolation arrangements may also be appropriate. Options for achieving automatic isolation include the following:

- Oil reservoir liquid level devices. These should be set so as to limit the loss of liquid to the minimum possible without unduly increasing the risk of false trips
- Automatic fire detection in the vicinity of the machine in question with a means to isolate the equipment upon activation
- A system to shut down the machine in the event of activation of the sprinkler system or general fire alarm. This can be set to cover the appropriate zone
- Use of a fusible link operated valve. Careful positioning is an important factor if this option is used

The best or most appropriate solution will vary from installation to installation. For example, a reservoir level switch may not be the most appropriate on a system which has a large fluctuation in the level of oil in the reservoir during normal operations. In each case the solution that would result in thefastest isolation of the system should be sought.

3. Provision of emergency isolation points

If for any reason, the provision of automatic means of isolation is not possible, emergency isolation points should be provided at remote locations that can be accessed under emergency conditions. This arrangement should be backed up with a robust operator training and testing regime.

General risk management

The following additional points associated with hydraulic oil actuation systems and the areas in which they are sited should also be observed:

- Robust equipment maintenance routines should be maintained – these should follow manufacturers' recommendations and cover visual inspection of the general condition of the system including pipework, hoses and coupling points
- Arrangements for the automatic isolation of the system under emergency conditions should be tested on a quarterly basis
- Pipework and hoses should be suitably protected against mechanical impact damage and arranged such that they are not exposed to undue wear or vibration
- Stainless steel pipework should be used in high humidity and corrosive environments
- High standards of housekeeping should be maintained at all times
- Oil leaks should be promptly cleaned up and the source of the leak rectified as soon as possible
- In-process storage should be avoided
- Heating equipment and other potential ignition sources should be identified and sited well away from areas where a hydraulic oil leak is possible. Note that an oil leak can spray some 12m from its release point
- Automatic sprinkler protection coverage is recommended.

Further information

If you would like any further information or advice on our Risk Solutions Service please contact the team on **rs@uk.qbe.com**

For more information on QBE visit: **www.QBEeurope.com/rs**

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