NSW GOVERNMENT

NSW Resources Regulator

FACT SHEET

Testing of fire resistant hydraulic fluids and materials

September 2019

This fact sheet replaces MDG 3006 MRT2 dated 27 April 1995.

Introduction

This fact sheet assists manufacturers, suppliers and users of hydraulic oil and other working fluids with the methods to classify and determine a fluid's fire resistance properties. It also covers fluids that may be classified as 'less flammable' (e.g. HFDU type fluids).

Fires may arise from a variety of causes, some resulting from fluid released as a high-pressure spray or as a static pool. There is no single standard test that can predict the fire-resistance performance of a fluid, so several tests are used to understand the fire-resistance properties of a fluid.

All mobile equipment fuel, lubrication and hydraulic system fluids are potential fuel sources for fires. As these fluids cannot be eliminated, it is generally recommended that fire-resistant materials are used wherever practical. Unfortunately, a fire-resistant fluid is not available for every application.

When selecting a fire-resistant fluid, the compatibility of the fluid for the application must be carefully evaluated, including consideration of parameters such as:

- operating temperature
- viscosity
- compatibility
- chemical and thermal stability
- air release and foaming
- shear stability
- filterability
- density
- vapour pressure.

Where fire-resistant fluids and materials are required, they should be assessed against the relevant standards. Further information and guidance as to these standards are set out below.

When selecting a fire-resistant fluid, consideration should be given to the possible health effects to workers who are exposed to it. The material safety data sheet (SDS) should be consulted.

General testing requirements

All fire-resistant hydraulic fluids, greases and aerosols should be tested whenever there is a change in formulation, supply of the raw products or manufacturing process.

Testing should be carried out by a laboratory accredited by the National Association of Testing Authorities, Australia (NATA). The laboratory must be unrelated to the manufacturer or supplier. Where a NATA-accredited laboratory is not available, a suitably qualified and experienced independent testing facility, having regard to test equipment, equipment calibration, quality processes, work methods, past test experience and independent technical verification, should be used.

Classification and testing requirements

Any fire-resistant hydraulic fluid, lubricant, or emulsifying oil should comply with the classification and testing requirements referred to below.

All fluids submitted for testing should be classified according to Table 1 (classifications from AS 3997.1:1992 *Fluid power – fire resistant hydraulic fluids – Part 1: Classification*). This classification should be referenced in all documents, safety data sheets and reports.

Table 1: Classification and testing requirements

Fluid			Tests required (X)				
Fluid class	**General name of fluid**	**Remarks**	**Manifold ignition test**	**Wick test**	**Flash point test**	**Spray ignition test**	**SDS review**
HFAE	Oil in water emulsions	Typically, more than 80% water content			X		X
HFAET	Oil in water emulsion and thickened				X		X
HFAS	Chemical solutions in water				X		X
HFAST	Chemical solutions in water and thickened				X		X
HFB	Water in oil emulsions	Typically, less than 80% water content	X	X	X	X	X
HFC	Water polymer solutions	Also known as water glycols	X	X	X	X	X
HFDR	Phosphate esters (no water)	Fluids in these categories should be selected carefully, with possible environmental or health hazards being considered	X	X	X	X	X
HFDS	Chlorinated hydrocarbons (no water)		X	X	X	X	X
HFDT	Mixtures of HFDR and HFDS (no water)		X	X	X	X	X
HFDU	Other synthetics (no water)		X	X	X	X	X

Manifold ignition test

The manifold ignition test is used to check relative flammability of fluids when contacted with a hot metal surface at a fixed temperature and to gauge ignition temperature through manifold temperature adjustment. When tested in accordance with ISO 20823:2003 *Petroleum and related products – determination of the flammability characteristics of fluids in contact with hot surfaces – Manifold ignition test*, the fluid shall not flash or burn at any time (Category 'N'). For 'less flammable' fluids (HFDU), the fluid shall not flash or burn at any time for a manifold temperature less than 400°C.

Wick test

The wick test is used to assess the persistence of a flame applied to the edge of a wick of non-flammable material immersed in fire-resistant fluid to assess the bulk behaviour of fluid, relevant to safe transportation and storage.

When tested in accordance with ISO 14935:*1998 Petroleum and related products – determination of wick flame persistence of fire resistant fluids*, the mean persistence time should not exceed 60 seconds.

Flash point test

The flash point test is used to determine the flash and fire points of a fluid. It is an indicator of the fluid's characteristic to form a flammable mixture with air and support combustion.

Methods for the determination of the flash point of flammable liquids are given in AS 2106.2:2005 *Methods for the determination of the flash point of flammable liquids (closed cup) – Determination of flash point – Pensky-Martens closed cup method* (a direct text adoption of ISO 2719:2016).

When tested in accordance with this method, the flashpoint of each individual liquid component shall be greater than 200^0C.

Fluids designated as classification HFAE, HFAET, HFAS and HFAST types must be tested both on the concentrated and diluted form.

Spray ignition test

The spray ignition test is used to assess persistence of a flame with pressurised spray of fire-resistant fluid.

When tested in accordance with ISO 15029-1:1999 *Petroleum and related products – Determination of spray ignition characteristics of fire-resistant fluids – Part 1: Spray flame persistence – Hollow-cone nozzle method* and 15029-2:2018 *Petroleum and related products – determination of spray ignition characteristics of fire resistant fluids Part 2: Spray test – Stabilised flame heat release method*, the fluid should not continue to burn in excess of 30 seconds after the igniting source is removed.

Alternative tests

There are experimental tests that have not been standardised that may be useful when testing fire resistance properties of fluids. An example is the US National Institute of Occupational Safety and Health (NIOSH) project on fire resistant fluids in mines Ignition of hydraulic fluid sprays by open flames and hot surfaces.

DOC18/905539