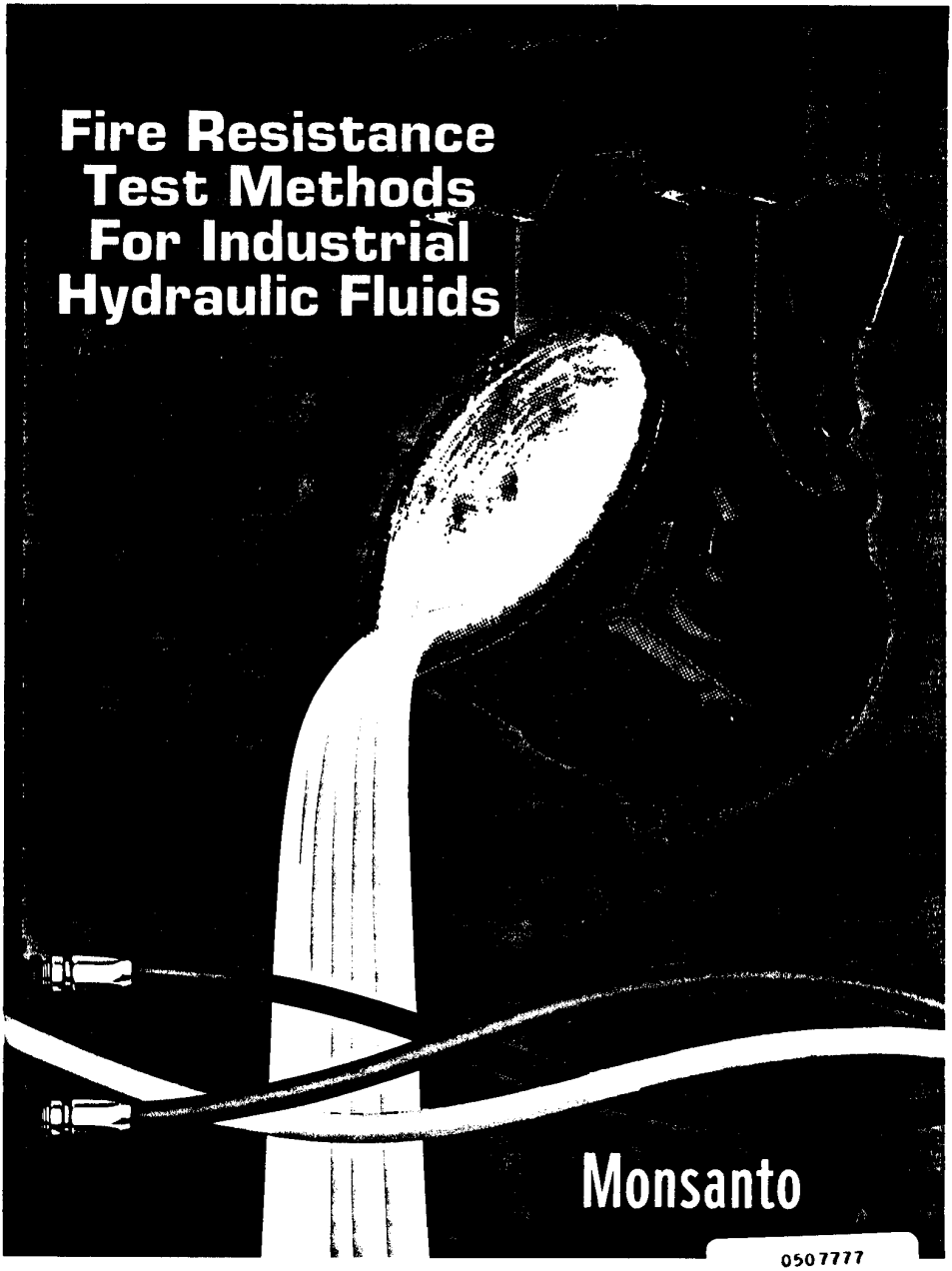
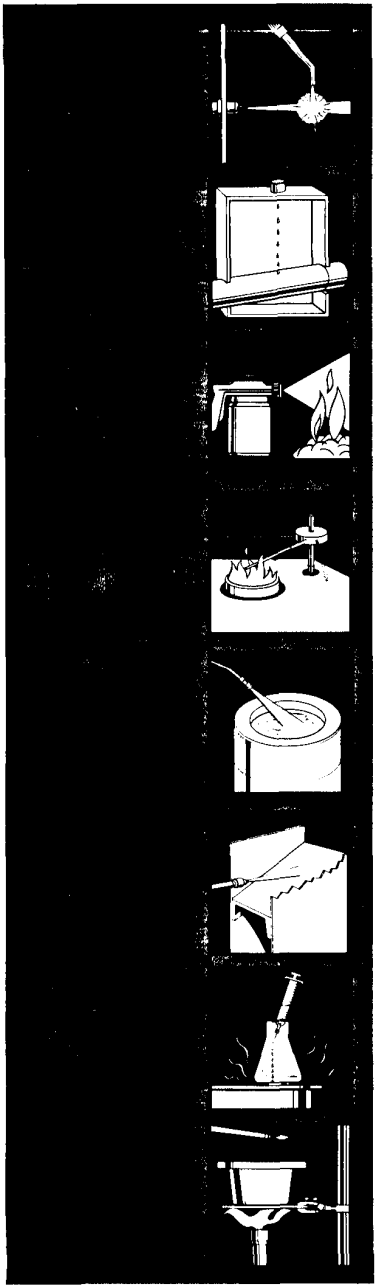
Fire Resistance Test Methods For Industrial Hydraulic Fluids



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1. HIGH TEMPERATURE HIGH PRESSURE SPRAY TEST
2. HOT MANIFOLD TEST
3. LOW PRESSURE SPRAY TEST
4. WICK FLAMMABILITY TEST
5. MOLTEN METAL TEST (MONSANTO)
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Know Your Hydraulic Fire Tests

Defining fire resistance in precise terms and numbers is extremely difficult and is best done in terms of *expected* fire hazards. Assessment of hazards should include consideration of all three components required for combustion—*fuel, oxidizer,* and *source of ignition*—as well as ways in which the three can combine into a fire. Simulative tests are considered most meaningful in assessing fire resistance. Since exposure conditions and sources of ignition vary widely, multiple tests are usually used in fire resistance evaluation. Test conditions should reflect two basic parameters of fire resistance—the ability to resist ignition and to prevent propagation of flame away from the source of ignition.

An ounce of prevention can be worth the cost of a plant or even the life of a worker. Hazardous plant operations can be isolated—fire walls can be built; sprinkler systems can be installed.

But the simplest and surest way to protect against hydraulic fluid fires is to stop them before they start —with fire-resistant Pydraul® fluids. Pydraul will not support combustion.

When emergencies occur, Pydraul minimizes the danger of local fires that can injure workmen, spread to other locations, flash back to the line or hose break, or destroy equipment. By their very chemical nature, Pydraul fluids are fire-resistant—from start-up through every hour of operation.

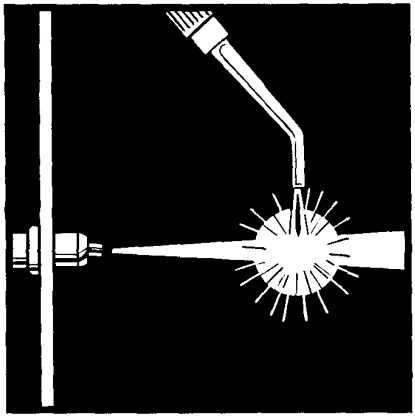
Know your hydraulic fire hazards . . . know the tests and performance levels which are essential for assessing the fire resistance of any hydraulic fluid. The most widely accepted tests for measuring fire resistance are presented on the following pages.

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HIGH TEMPERATURE HIGH PRESSURE SPRAY TEST

Procedure: AMS 3150C. The fluid, at 1000 psi, is sprayed through a 0.0145 in. diameter orifice passing through the flame of an oxyacetylene torch with a No. 1 Purox tip held perpendicular to the fluid stream. Attempts are made to ignite the fluid stream at varying distances from the orifice.

Performance: This test simulates the hazard of a spray from a hydraulic fluid leak coming in contact with a high temperature flame ignition source. Performance is evaluated based on the ease of ignition, and the distance the flame is carried from the source of ignition, if ignition occurs.



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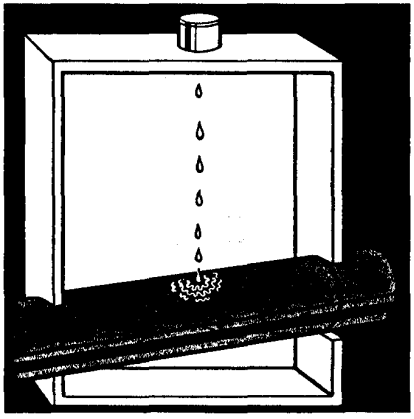
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HOT MANIFOLD TEST

Procedure: AMS 3150C. Ten milliliters of fluid are dripped in 40 seconds onto a stainless steel simulated hot manifold held at 1300°F. (704°C.). Flashing or burning on contact with the tube, and carrying of flame to fluid collected in the bottom of the shield/tube holder are observed.

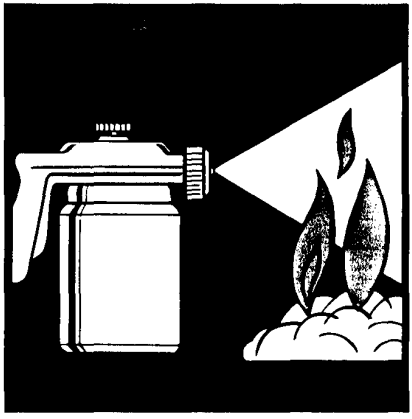
Performance: This test simulates a hydraulic fluid leak coming into contact with a hot surface. The hydraulic fluid should show only intermittent flashing or burning when dripped on the 1300°F. (704° C.) manifold and should not carry flame to the bottom of the shield.



LOW PRESSURE SPRAY TEST

Procedure: AMS 3150C. The fluid is sprayed from a Binks Thor No. 7 paint spray gun (0.070 inch diameter orifice, 40 psi air) in bursts over the source of ignition, burning oil-soaked waste. Any increase or decrease in the flame caused by the fluid mist is observed.

Performance: This test is not commonly used, but is designed to simulate a line break spraying onto an open source of ignition. Criteria of performance is to observe for flame increase, no change, or decrease in intensity.



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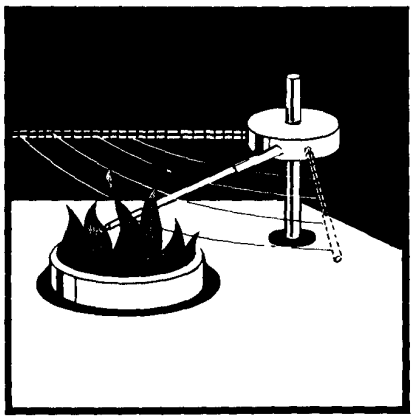
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WICK FLAMMABILITY TEST

Procedure: U.S. Bureau of Mines Schedule 30. A pipe cleaner is soaked with fluid and cycled in the horizontal plane into the hottest part of a non-luminous flame of a laboratory burner. The number of cycles required to give a self-sustaining flame is determined.

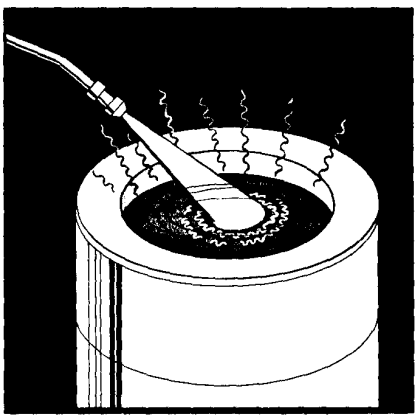
Performance: This test simulates fluid soaked in absorbent flammable materials and exposed to open flames. This test is applicable to water-containing fluids, but can also be used to demonstrate the stability of non-evaporating synthetic and synthetic base fluids.



MOLTEN METAL TEST (MONSANTO)

Procedure: Fluid is sprayed, poured or dripped on to molten metal surfaces in the 800°F. (zinc) to 1200°F. (aluminum) range. Observations are made of burning rates and tendencies to propagate flame to fluid-wet areas adjacent to molten metal surfaces. This is done both with and without an external source of ignition such as a spark or flame.

Performance: This test measures ease of ignition on a molten metal surface and provides an indication of flame intensity if flashing or burning occurs.



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HOT CHANNEL IGNITION TEST

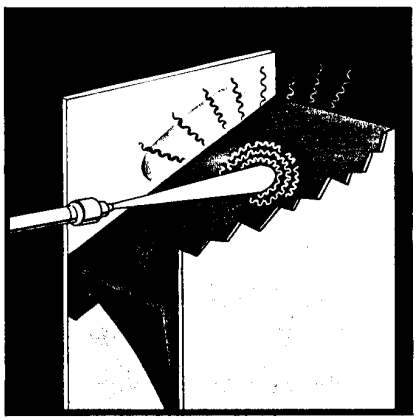
Procedure: Factory Mutual Engineering Association. Fluid is sprayed at 1000 psi and 140°F. from a 1.5 gph, 80° angle oil burner nozzle on to the 1300°F. surface of a channel iron. The channel is 7 inches wide by 26 inches long steel and is supported at a 30° angle.

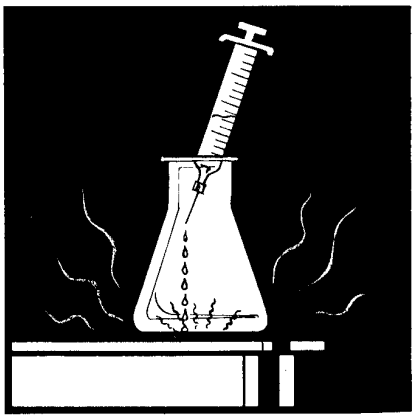
Performance: This test simulates ignition by hot metal surfaces and requires that no ignition occurs when fluid is sprayed on the 1300°F. surface.

AUTOIGNITION TEMPERATURE (AIT)

Procedure: ASTM D 2155-66. A fluid sample is injected via hypodermic syringe into a heated glass flask. Autoignition is determined by appearance of visible flame.

Performance: This test measures autogenous ignition temperature in glass in air at one atmosphere pressure. Test conditions are critical and application of data to metal systems of irregular design is difficult.





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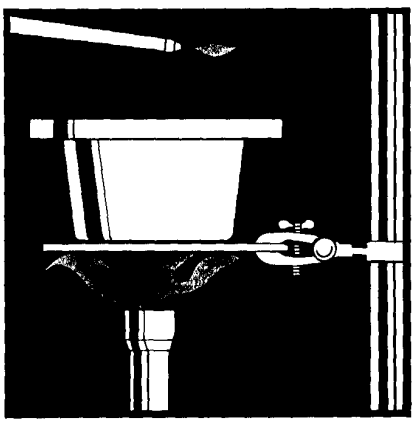
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FLASH AND FIRE POINTS

Procedure: ASTM D 92-66. The fluid is heated in an open test cup at a constant rate. A small test flame is passed over the surface at specified temperature intervals. The lowest temperature at which the vapors above the surface ignite is the flash point. The fire point is the temperature at which the fluid ignites and burns for at least five seconds.

Performance: This test measures the ignitability of heated fluid. Flash and fire test results are sometimes misleading since they are so directly related to the chemical nature of the product being tested.



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The Tests Described Here...

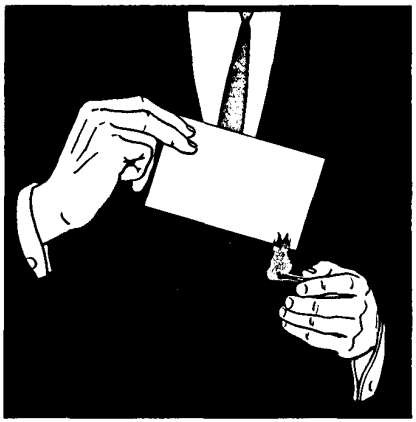
show some of the rigorous methods of determining fire resistance. Some Pydraul fluids show intermittent flashing or burning under severe exposure, but they will not support combustion away from an ignition source. Pydraul is the *only* fire-resistant hydraulic fluid listed by Underwriters' Laboratories, Inc. for hazardous hydraulic applications.

Pydraul fluids are chemically synthesized from materials which resist burning. Water-based hydraulic fluids depend on the water for fire resistance, but the lubricant components are flammable. Glycol (in water-glycol fluids) and light petroleum oils (in water-oil emulsions) will both burn. Compared with new water-based fluids for fire resistance, Pydraul fluids seldom appear more fire-resistant; but tests of *used* water-based fluids do not show the same degree of fire resistance—flammability increases as the water snuffer evaporates from the system.

Residual, or lasting, fire resistance can be tested through this simple demonstration:

1. Dip blotter paper squares in Pydraul, water-glycol fluid, water-oil emulsion, and plain water.
2. Drain off excess fluid and prop on glass dish for an hour or two.
3. Ignite with a paper book match.
4. Pydraul does not evaporate, does not change. *It does not burn.*
5. Piece dipped in water burns normally.
6. Water-Glycol and water-oil papers burn brighter, hotter, due to the flammable glycol and oil bases of the two fluids.

This demonstration points out the *lasting* fire resistance of Pydraul fluids that water and oil types do not have. In any hydraulic operation, a break or a leak can spew fluid over equipment, floors, walls, and ceilings producing an "innocent" puddle. Pydraul fluids will *remain* fire-resistant under these and all conditions.



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Pydraul Fluids Offer Fire Resistance and Top Performance

Besides fire resistance, Pydraul fluids offer you performance characteristics that will cut your maintenance time and costs drastically. Pydraul lubricates as well as premium grade antiwear oils. And they prevent rust and corrosion caused by water-base fluids. Machines operating on Pydraul simply require less maintenance; pumps last longer.

If you need the safety of a fire-resistant fluid and want the economies of less maintenance, you need Pydraul. Pydraul is now being used in these applications, but the danger of hydraulic fires exists in many other applications if ignition sources are near.

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16 mm full-color movie available—15 minutes

"BEFORE HYDRAULIC FIRES START"

Now you can see for yourself—
and demonstrate to others

- Tests showing fire-resistance of Pydraul fluids
- Typical Pydraul installations
- An incident in which Pydraul prevented disaster

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