Fire Hazards of Hydraulic Fluid

Conventional hydraulic fluids are petroleum oils which are used as the energy transferring media in various types of hydraulically operated machinery. They operate under thousands of pounds of pressure required in hydraulic systems When a hydraulic fluid, under these extreme pressures (2,000 to 3,000 psi), escapes through an opening in the system such as a ruptured hose, gasket or pipe joint, it may become atomized into a flammable and potentially explosive mist. In the presence of a source of ignition, a serious hazard to both life and property is created.

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Hydraulic fluids may form dangerous mists or sprays from small leaks in hydraulic systems at pressures as low as 250 psi. Instances of sprays reaching 40-50 feet from the point of origin have been reported. Such a spray may become a huge torch if ignited by any source of ignition in the area.

The problem of loss caused by combustible hydraulic fluids has increased as a result of the widespread use of hydraulic equipment. In a recent 10 year study, 346 fires were reported, causing more than $26 million in total losses.

Commercially available hydraulic fluids are generally listed in five basic categories; they are: petroleum-based oils, high water content emulsions and solutions, water-in-oil emulsions, water-glycol fluids, and synthetic fluids. All the named fluids, other than petroleum-based, are considered less hazardous. Less hazardous fluids are not entirely nonflammable, but their fire hazard has been greatly reduced as compared to the petroleum-based fluids.

With the exception of the synthetic fluids, most of the other less hazardous fluids do not provide as much lubrication as petroleumbased fluids. These other fluids have a tendency to swell or dissolve gaskets and hoses or corrode certain metals. When changing to less hazardous fluids the costs of necessary modifications to the equipment are likely to be much greater than those for the fluid itself.

Control of Hazards

1. Remove all sources of ignition (open flames, electric arcs, etc.) from the area of operation of the hydraulic system.
2. Use a “less hazardous” or “fire resistant” hydraulic fluid in all areas where it is not possible to remove the source(s) of ignition. Only those less hazardous hydraulic fluids which have been tested and listed (or approved) by a nationally recognized testing laboratory should be used.
3. Rigidly support all piping against vibration and mechanical injury. The entire hydraulic system, including piping, fittings, gaskets, etc., should be adequate for the pressure(s) involved. The principal cause of breakage or leakage of hydraulic lines is excessive vibration. Better supports for piping hoses or swivel joints should be provided.

4. Provide suitable controls for the equipment. Remote control (in the operator's path of escape) should be available for shutting down oil pumps or shutting off the flow from the accumulators in case of a fire.
5. Provide a schedule of frequent and competent inspections and maintenance on all components of the hydraulic system. Detect leaks immediately and make necessary repairs.
6. Check the hydraulic fluid frequently to detect any thermal breakdown or contamination of the materials.
7. Whenever possible, isolate hydraulic systems by suitable cutoffs or barrier walls.
8. Do not use combustible piping and hose, when possible.
9. Keep all hydraulically operated equipment and surrounding areas clean and free from fluid residue.
10. Provide adequate fire extinguishers, hose stations and automatic sprinkler protection for the hydraulically operated equipment and surrounding building areas.
11. Emergency exits should be located so that employees will not be trapped in the event of a flash fire. Adequate escape routes should also be provided for all work areas including upper working levels, if any. A working fire alarm system connected to a central station should be installed and employees trained in the proper evacuation procedures.