

# Hydraulic Systems Safety

by P.D. Ayers <sup>1</sup>(1/05) [Colorado State University Extension]

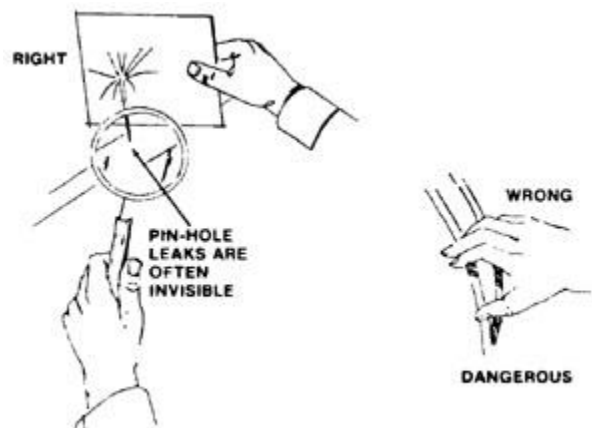
## Quick Facts...

- Hydraulic systems must store fluid under high pressure.
- Three kinds of hazards exist: burns from the hot, high pressure spray of fluid; bruises, cuts or abrasions from flailing hydraulic lines; and injection of fluid into the skin.
- Safe hydraulic system performance requires general maintenance.
- Proper coupling of high and low pressure hydraulic components and pressure relief valves are important safety measures.

Hydraulic systems are popular on many types of agricultural equipment because they reduce the need for complex mechanical linkages and allow remote control of numerous operations. Hydraulic systems are used to lift implements, such as plows; to change the position of implement components, such as a combine header or bulldozer blade; to operate remote hydraulic motors; and to assist steering and braking.

To do their work, hydraulic systems must store fluid under high pressure, typically 2,000 pounds or more per square inch. One hazard comes from removing or adjusting components without releasing the pressure. The fluid, under tremendous pressure, is also hot. The worker then is exposed to three kinds of hazards: burns from hot, high-pressure fluid; bruises, cuts or abrasions from flailing hydraulic lines; and injection of fluid into the skin.

Many systems store hydraulic energy in accumulators. These accumulators are designed to store oil under pressure when the hydraulic pump cannot keep up with demand, when the engine is shut down, or when the hydraulic pump malfunctions. Even though the pump may be stopped or an implement disconnected, the system is still under pressure. To work on the system safely, relieve the pressure first.



## Pinhole Leak Injuries

Figure 1: Detecting pinhole leaks in a hydraulic system.

Probably the most common injury associated with hydraulic systems is the result of pinhole leaks in hoses. These leaks are difficult to locate. A person may notice a damp, oily, dirty place near a hydraulic line. Not seeing the leak, the person runs a hand or finger along the line to find it. When the pinhole is reached, the fluid can be injected into the skin as if from a hypodermic syringe.

Immediately after the injection, the person experiences only a slight stinging sensation and may not think much about it. Several hours later, however, the wound begins to throb and severe pain begins. By the time a doctor is seen, it is often too late, and the individual loses a finger or entire arm.

Unfortunately, this kind of accident is not uncommon. To reduce the chances of this type of injury, run a piece of wood or cardboard along the hose (rather than fingers) to detect the leak (see Figure 1).

## Improper Coupling

Another hazard is improper coupling of low- and high-pressure hydraulic components. Do not connect a high-pressure pump to a low-pressure system. Do not incorporate a low-pressure component, hose or fitting into a high-pressure system. Component, hose or fitting ruptures are likely to occur.

Pressure relief valves incorporated into the hydraulic system will avoid pressure buildups during use. Keep these valves clean and test them periodically to ensure correct operation.

## Maintenance

An improperly maintained hydraulic system can lead to component failures. Safe hydraulic system performance requires general maintenance.

- Periodically check for oil leaks and worn hoses.
- Keep contaminants from hydraulic oil and replace filters periodically.
- Coat cylinder rods with protective lubricants to avoid rusting.

## Tips for Safe Operation

Follow these rules for safe hydraulics operation:

- Always lower the hydraulic working units to the ground before leaving the machine.
- Park the machinery where children cannot reach it.
- Block up the working units when you must work on the system while raised; do not rely on the hydraulic lift.
- Never service the hydraulic system while the machine engine is running unless absolutely necessary (bleeding the system).



- Do not remove cylinders until the working units are resting on the ground or securely on safety stands or blocks; shut off the engine.
- When transporting the machine, lock the cylinder stops to hold the working units solidly in place.
- Before disconnecting oil lines, relieve all hydraulic pressure and discharge the accumulator (if used).
- Be sure all line connections are tight and lines are not damaged; escaping oil under pressure is a fire hazard and can cause personal injury.
- Some hydraulic pumps and control valves are heavy. Before removing them, provide a means of support such as a chain hoist, floor jack or blocks.
- When washing parts, use a nonvolatile cleaning solvent.
- To ensure control of the unit, keep the hydraulics in proper adjustment.

<sup>1</sup>Colorado State University Extension agricultural engineer and professor, chemical and bioresource engineering. 10/92. Reviewed by D. Oatman, Extension agriculture agent, Las Animas County, 1/05.

*Updated Friday, April 19, 2013*

