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Preventing High-Pressure Injection Injury: A Hazard of Hydraulics and Pneumatics

Abstract

[Excerpt] A high-pressure injection injury involves air, fluid, or solids forced into the skin by high pressure. Typically these occur when we feel for leaks with our fingers, such as when air or hot hydraulic fluid is forced into the skin by high pressure from a leak in a high-pressure line. Another example is the painter using a paint gun with so high of a pneumatic pressure that it twisted around in his hand and injected paint and solvents into his abdomen. So many of these injuries happen in the hands and fingers when feeling for leaks, but there have been cases such as someone searching for leaks with the tongue (ouch!), or listening for leaks producing an injury into the side of the face, or being struck by a detached hydraulic hose whipping around in the air.

Keywords

high pressure injection injury, workplace hazards, hydraulics, pneumatics

Comments

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PREVENTING HIGH-PRESSURE INJECTION INJURY

A Hazard of Hydraulics and Pneumatics

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A high-pressure injection injury involves air, fluid, or solids forced into the skin by high pressure. Typically these occur when we feel for leaks with our fingers, such as when air or hot hydraulic fluid is forced into the skin by high pressure from a leak in a high-pressure line. Another example is the painter using a paint gun with so high of a pneumatic pressure that it twisted around in his hand and injected paint and solvents into his abdomen. So many of these injuries happen in the hands and fingers when feeling for leaks, but there have been cases such as someone searching for leaks with the tongue (ouch!), or listening for leaks producing an injury into the side of the face, or being struck by a detached hydraulic hose whipping around in the air.

This can be a sneaky injury when it doesn't hurt much at first, so the victim is deceived into delaying seeking medical assistance. And it is this delay which can lead to a tragic outcome. When air, liquids, or solids are injected into the skin, the injected material puts pressure on the blood vessels blocking blood circulation. The skin beyond the point of injection becomes pale and can appear white or mottled blue. As the swelling and inflammation develop, the pain becomes unbearable. Delaying medical attention becomes quite serious as tissues are starved of oxygen and nutrients, infection can develop, and injected materials can migrate from the site of injury (such as from the hand up into the arm).

So, if you experience a high-pressure injection injury, you must seek medical attention immediately – a surgeon can open the injection site, decompress the tissues, clean out the injected material, and provide antibiotics to prevent infection. Delaying treatment has led to gangrene; for example, some victims have needed amputation of a fingertip.

What kinds of work could involve high-pressure injection injury? Some examples are:

- Compressed air lines; pneumatic tools
- Hydraulic-powered machinery and equipment
- Injection molding of plastics
- Presses such as hydraulic presses
- Pressure washers
- Diesel engine fuel injectors
- Commercial paint spray guns
- Pneumatic transport of solids such as powders

Prevention is the key!

Gloves and clothing are not usually protective. You need to address this hazard higher up on the hierarchy of controls by using **engineering controls and administrative controls**.

Does your workplace include maintenance on high-pressure lines or equipment as a part of its lockout/tagout program? (See the OSHA standard on *Control of Hazardous Energy, 29 CFR 1910.147*) Your workplace program should include making sure that all pressure is bled/released from the hydraulic or pneumatic system; for some systems it may be possible to work on a part of the system by using line-breaking or blanking procedures. During maintenance, you will want to inspect all gauges for zero pressure and review the hydraulic/pneumatic schematic for pressure traps, such as accumulators, and check valves.

Some other examples of engineering and administrative controls may include:

- Reduce the pressure below 103 PSI, if possible. This may be an option for pneumatics or for pressure washers, although probably not likely for hydraulics which may need to operate at 1000s of PSI.
- Use a low-pressure sensor or alarm so that a leak is known.
- Does your workplace have a **preventive maintenance program** that includes inspecting hoses at regular intervals for wear? Then hoses can be replaced before leaks can develop.
- Use braided hoses which blister before leaking – so impending failure is obvious.
- Never loosen or tighten a hydraulic connection when the system is under pressure. The connection could fail catastrophically and cause an injection injury and/or damage to property.
- Awareness -- training on the hazard of high-pressure injection injury.
- Provide immediate warnings and signage on the hazard of high-pressure injection injuries.
- Does your workplace have work practices which forbid the use of the fingers to check for leaks? (Or forbid any other of the leak testing situations described earlier that use the body as a test instrument?). Consider other methods of leak detection, such as submersion of a line under water or applying a soap solution to show bubbles; dyes added to a fluid may help to identify the source of a leak.
- Use barriers: any hydraulic lines and components that are exposed and routed near the equipment operator should be shielded to protect the operator.
- Avoid routing hose assemblies in areas where the ambient heat is excessive. Heat may cause the hose to fail and potentially ignite an oil fire, injure people, or damage equipment. Check the specifications for the correct temperature rating of the outer hose cover material and use a fire sleeve when necessary.

If you believe that you have experienced a high-pressure injection injury, seek emergency medical treatment immediately.

The information in this fact sheet was originally developed for The Center for Occupational & Environmental Medicine at the Erie County Medical Center (ECMC), 462 Grider St., Buffalo, NY 14215. The fact sheet is licenced under a [Creative Commons Attribution-NoDerivatives 4.0 International \(CC BY-ND 4.0\) licence](https://creativecommons.org/licenses/by-nd/4.0/).

