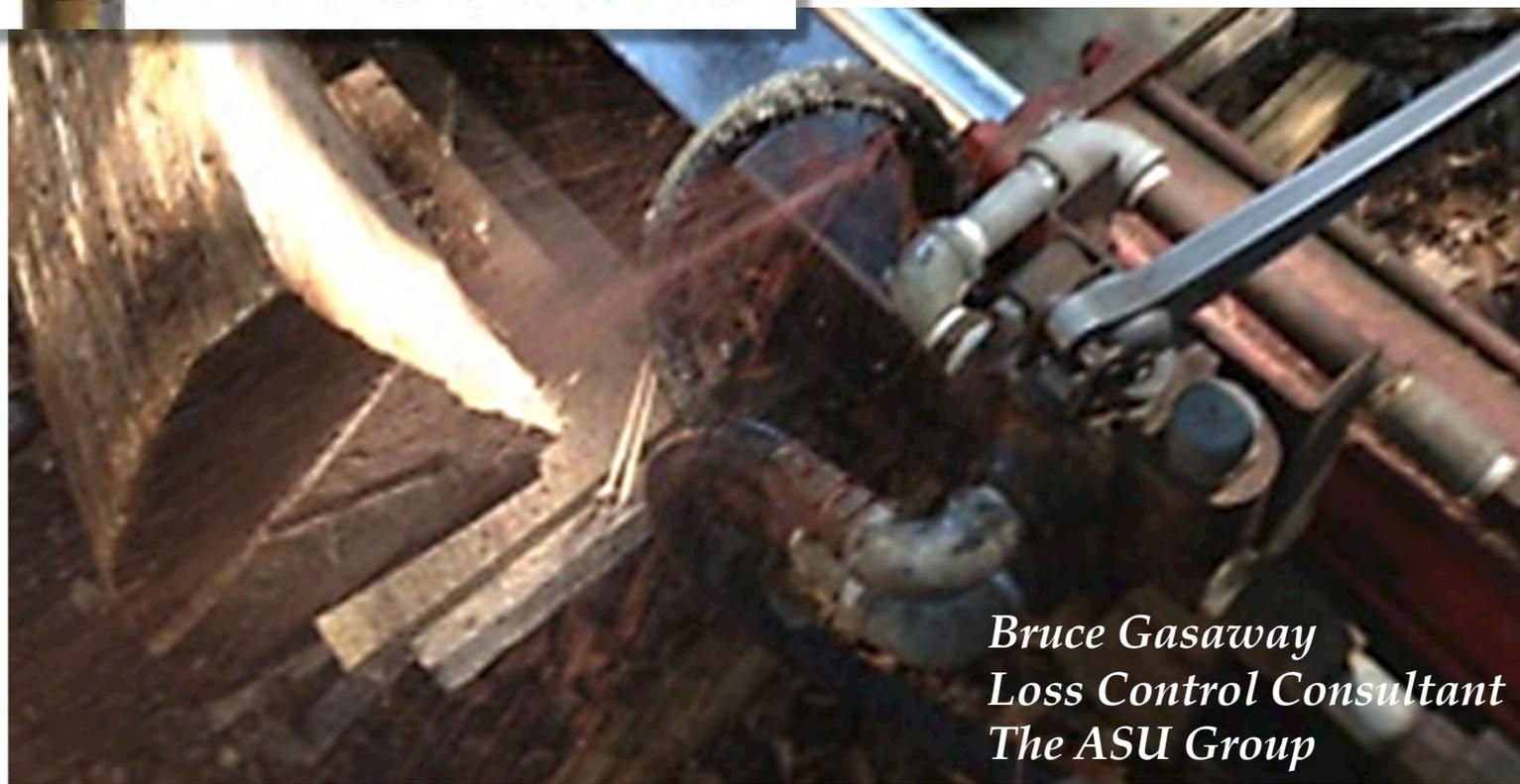


A circular pressure gauge with a white face and black markings, showing a reading of approximately 100 PSI. The needle is black and the scale has red and black markings.

**Contents
Under
Pressure**

*HIGH PRESSURE
INJECTION
INJURIES*



*Bruce Gasaway
Loss Control Consultant
The ASU Group*

What is an injection injury

- ▣ A high velocity stream of fluid penetrates human skin like a hypodermic needle
- ▣ Hydraulic oil, diesel fuel, gasoline, paint, grease
- ▣ Pressures 100 – 30,000 PSI.
- ▣ Damages human tissue
- ▣ Requires surgery to remove
- ▣ Blood stream can be fatal



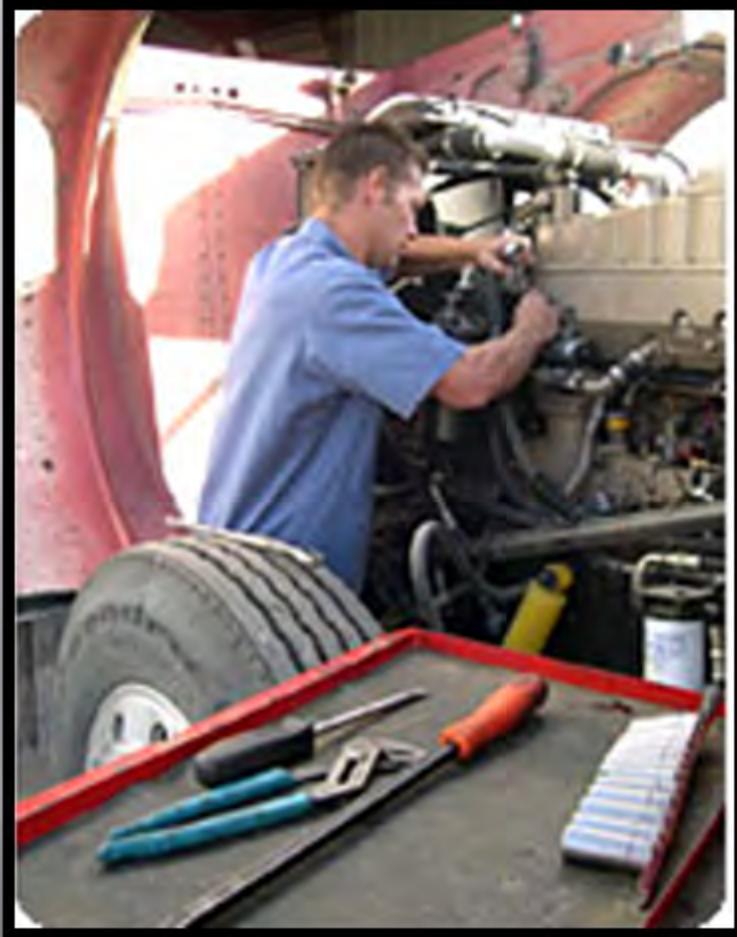
Exposure / Risk



Hydraulic Systems

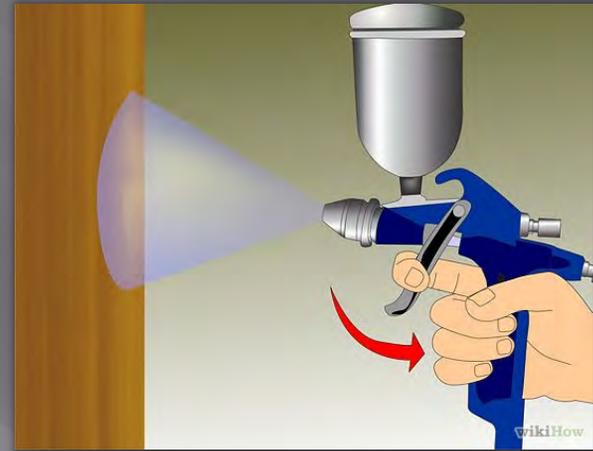


Fuel Injection Systems



Other Injection Concerns

- ▣ Paint Guns
- ▣ Grease Guns
- ▣ Pressure Washers
- ▣ Air Nozzles

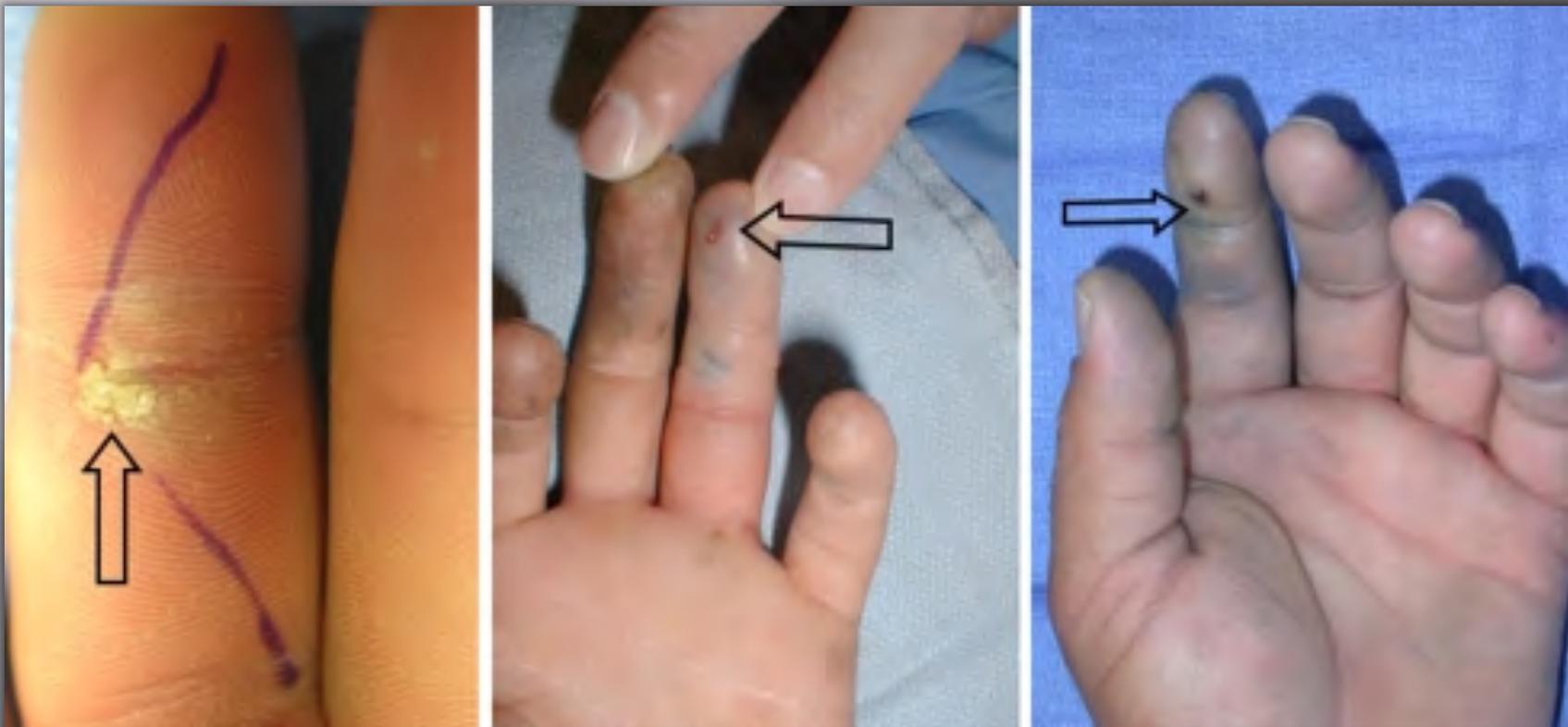


Medical Study

- ▣ 435 Injection injuries from 1966 – 2003 (11.5a)
- ▣ Organic solvents such as paint, gasoline, fuel, hydraulic oil, jet fuel
- ▣ 30% of injections resulted in amputations
- ▣ Amputations reduced if surgery within 6 hrs.
- ▣ Thumb / palm lower frequency of tissue loss
- ▣ 6 – 12 months lost time days
- ▣ \$50,000 – \$100,000+ in medical cost

High Pressure Injection Injury

These are pictures of injection injuries. As you can see, it has the appearance of a minor superficial wound, and that's why its severity is oftentimes undermined.



According to most doctors, surgical exploration should be the benchmark of management for an injection injury.



The entry wound should be excised and all areas permeated by the injected materials must be exposed to decompress the affected tissue and perform extensive exploration.



Outcome

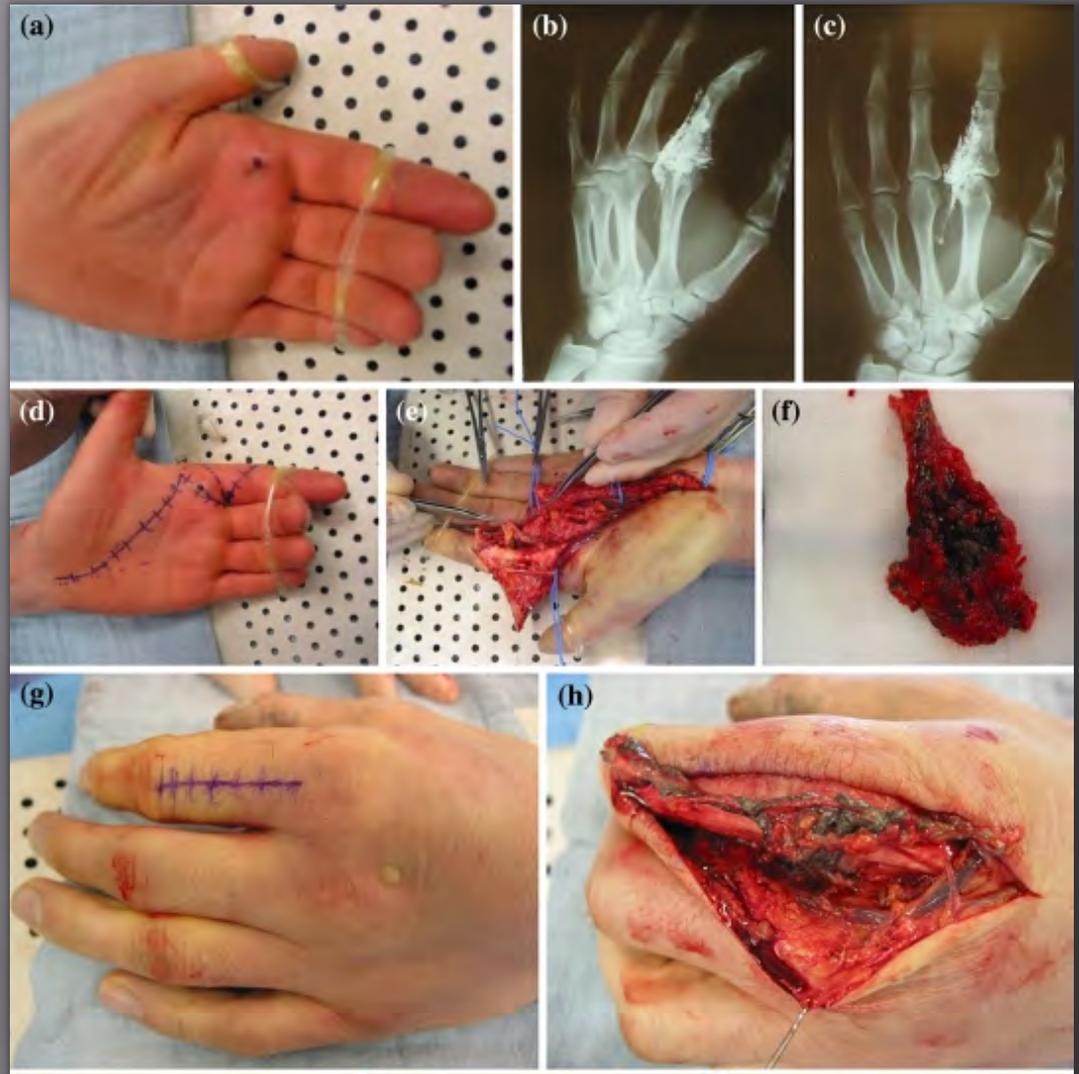
- ▣ Possible restrictions in hand function and the chance on amputation.
- ▣ Amputation risk is valued on 16–55%. With solvents it goes up to 50–80%.
- ▣ When there are already impairments of infected area during the first medical examination or when the pressure was more than 7000 lbs, amputation risk reaches the 100%.

Outcome

- ▣ Permanent complaints of the patient among others are continuous pain, cold intolerance, contracture, and reduced sensitivity. Amputation and aesthetic problems are two other complications. Only a small percentage of the patients can resume its original work.

Case Study

A 33-year-old, right-handed industrial painter injected an amount of oil-based paint, with his paint gun, in his left index finger by accident. He was immediately referred to a specialized hand center.



Hand Grease Gun Injection

Incident Date:	11 th December 2013	Location:	Perth
Safety Alert Date:	16 th December 2013	Country:	Australia
HSE Outcome:	Grease Injection into small finger, surgery, hospitalisation		
Equipment Involved:	Hand Activated Grease Gun		
Root Causes:	Operator was attempting to remove hand grease gun from grease nipple after pumping several times and finding it hard. In gripping hose and manoeuvring it the hose ruptured, injecting grease into little finger.		

Hand Grease Gun Injection

INCIDENT

OPERATOR WAS USING A **HAND HELD GREASE** GUN TO LUBRICATE VARIOUS GREASE POINTS ON EARTH MOVING PLANT.

OPERATOR ONLY FELT A SHARP PRICK TO LITTLE FINGER AND ON INSPECTION NOTICED A SMALL HOLE. ON SQUEEZING FINGER APPROXIMATELY ONE TEASPOON OF GREASE WAS EJECTED. N.B. – GLOVES WERE NOT BEING USED AT THE TIME.

MEDICAL ATTENTION WAS SORT RESULTING IN A LENGTHY OPERATION AND REMOVAL OF A VEIN IN THE FOREARM. THIS WAS REPLACED WITH AN ARTIFICIAL VEIN.

AT THIS TIME THE OPERATION APPEARS SUCCESSFUL HOWEVER CONSTANT MEDICAL MONITORING AND SURGERY CARE IS PARAMOUNT TO A SUCCESSFUL REHABILITATION.

Hand Grease Gun Injection

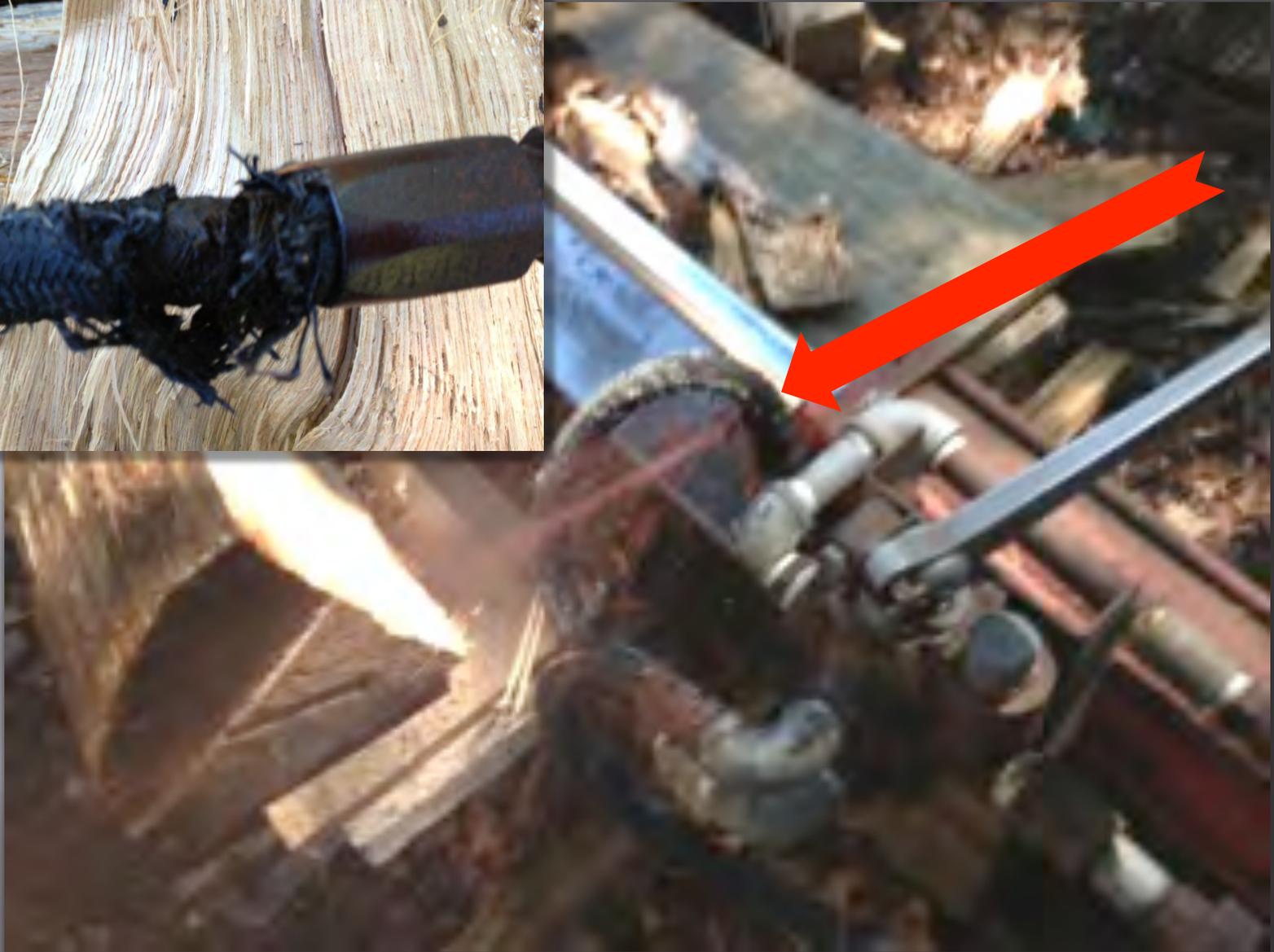


Risk at Home?

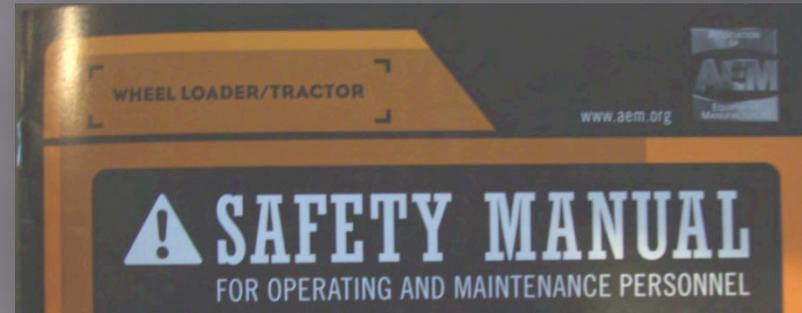
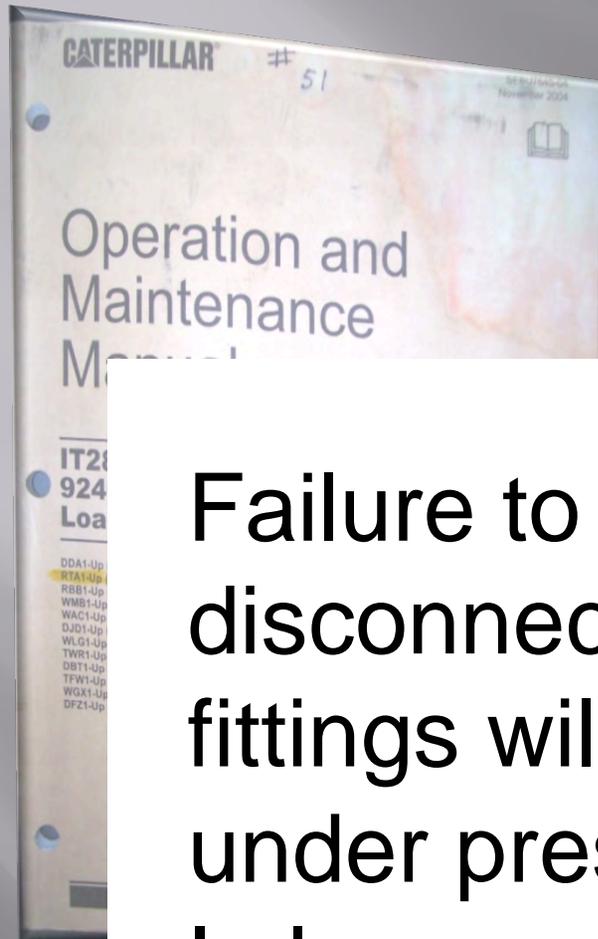
- ▣ Log splitters
- ▣ Vehicle repair
- ▣ Lawn equipment
- ▣ Tractors
- ▣ Farm equipment
- ▣ Dump Trailers
- ▣ Rental Equipment



CASE STUDY



Safety Procedures



Failure to remove pressure before disconnecting hydraulic lines or fittings will cause oil to spray out under pressure as the connection is loosened. Oil escaping under pressure can inject oil into flesh.

Equipment Manufactures Warnings

Tiger Mower DVD
4.10 – 5.06



High Pressure Lines



Dissipate All Stored Pressure

Prevention

- ▣ Awareness training
- ▣ **Develop Job Safety Analysis**
- ▣ Read operators / maintenance manuals
- ▣ Minimize exposer
- ▣ Wear necessary PPE
- ▣ Implement LO/ TO procedures



Safe-T-Bleed is a unique safety system developed specifically for hydraulic systems. After an exhaustive study on hydraulic system design, start-up, repair and operational practices, Safe-T-Bleed was designed to solve three main safety concerns: OSHA lockout/tagout compliance, safe air-bleed and haphazard pressure checks.

Maintenance

- ▣ Replace cracked / weathered hoses
- ▣ Address all hydraulic leaks immediately
- ▣ Ensure hoses / lines are rated for systems pressure
- ▣ Minimize bends in hoses
- ▣ Keep clear of abrasions or use protective wrap





Diagnostic Procedures

- ❑ Release system pressure
- ❑ Wear proper PPE
- ❑ Never grab pressurized lines / hoses
- ❑ Use cardboard to detect leaks



Prevention

Personal Protective Equipment



Need a hand?

Cut-Resistant Gloves

- Made from high tenacity fibers
- Available in various colors and sizes
- Provides excellent protection against cuts and lacerations
- Durable and long-lasting
- Suitable for a wide range of tasks

Chemical-Resistant Gloves

- Made from nitrile or neoprene
- Provides excellent protection against a wide range of chemicals
- Available in various colors and sizes
- Durable and long-lasting
- Suitable for a wide range of tasks

General Purpose Gloves

- Made from a variety of materials
- Provides excellent protection against a wide range of tasks
- Available in various colors and sizes
- Durable and long-lasting
- Suitable for a wide range of tasks

Leather Gloves

- Made from high quality leather
- Provides excellent protection against a wide range of tasks
- Available in various colors and sizes
- Durable and long-lasting
- Suitable for a wide range of tasks

Electrical Gloves

- Made from a special material
- Provides excellent protection against electrical shock
- Available in various colors and sizes
- Durable and long-lasting
- Suitable for a wide range of tasks

Use the right glove for the right job.

COISU

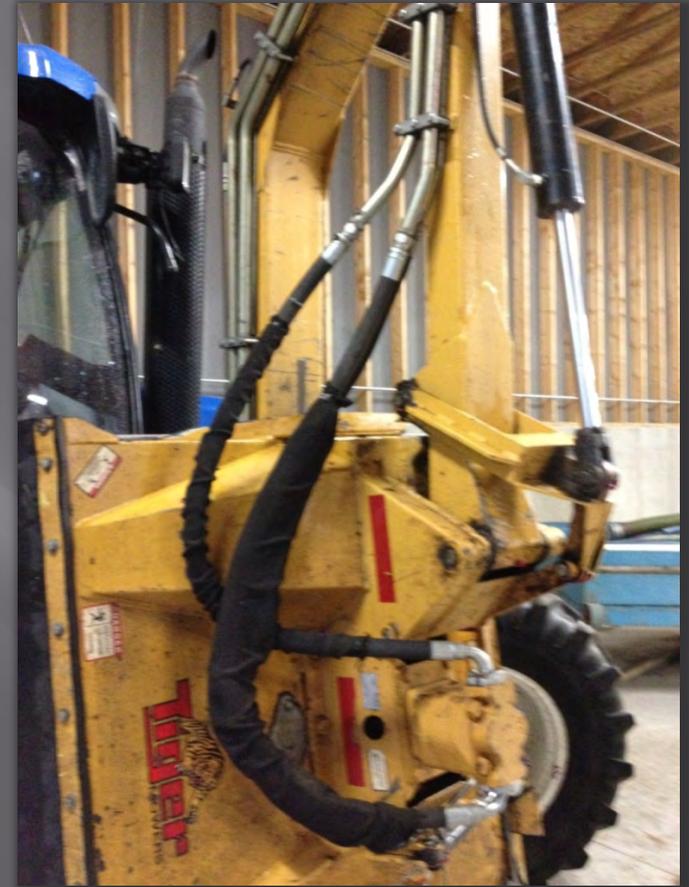
Flammability

- A technician while testing for a hydraulic leak had fluid spray into a heater which caused a fireball and \$3.5 million damage.
- A typical petroleum-based hydraulic fluid has a flash point that ranges from 300°F to 600°F, and an auto ignition temperature of 500°F to 750° F.



Fluid Burns

- ▣ A 61-year-old bulldozer operator was sprayed with hot hydraulic oil when a hydraulic hose unexpectedly ruptured. He later died from his burn injuries. Hydraulic systems generally operate at temperatures ranging from 130° F to 180°F under normal operating conditions. Can easily exceed 250°F if there is excessive wear in a system.



Hydraulic Fluid Burns



A Fluid Injection Occurs

- ▣ Immediate medical attention
- ▣ Call 911 / EMT's / Hospital
- ▣ Determine type of fluid
- ▣ Provide SDS to medical personnel
- ▣ Inform medical staff of fluid injection injury
- ▣ Injured should not drive
- ▣ Do not leave alone
- ▣ No liquids (anesthesia / surgery)
- ▣ Secure injury area Lock Out / Tag Out



PREPAREDNESS

- ▣ Consult local medical facility
- ▣ Advise on the risk of injections with your operations
- ▣ Can they handle high pressure fluid injections
- ▣ Locate proper Medical facility
- ▣ Develop company emergency procedures



Conclusion

- ▣ The frequency of high pressure injections is low
- ▣ The risk of injections at CRC's are HIGH
- ▣ The severity of a serious life changing injury is very HIGH
- ▣ Train all employees at risk
- ▣ Ensure area medical facilities can treat these types of injuries

IF I P S I ***have a***
fluid injection
seek medical