engineering adventures

Worksheet HP05 & Training Record

Hydraulic Fluid Types and Sealing

Hydraulic Fluids

Email:	Course:	Provider:

Learning Objectives/Expected Outcomes: (2 – 3 hours)

1. Appreciate the multiple functions of hydraulic fluids.
2. Identify the range of fluids available and their applications.
3. Know the methods used to provide effective sealing of hydraulic systems.
4. Appreciate the different types of fittings and their performance limits.

Previous Knowledge Required:

Students should have completed worksheet HF.. 'theory sections' or have a good understanding of hydraulics components and circuits.

Terminology:

Fluid, lubrication, corrosion, mineral oil, viscosity, tube, fittings, adaptors, flanges, thread types, face seal, cutting rings, ferrules.

Record of Achievement:

Click the in-app email icon to post your results, once training is complete. Enter an LRS username and endpoint details or see www.e4training.com/xapi/ for free examples. Keep a record of any written work or worked calculations etc.

Fluid power can be environmentally friendly!

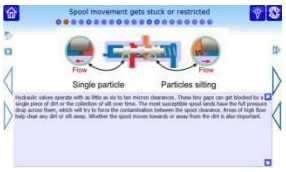
Hydraulic equipment usually uses expensive oil and not pure water. That's because pure water does not have as good lubricity although increasingly water-based and environmentally friendly fluids are being used throughout the industry.

Subject introduction

The fluid is one of the most complicated components in a hydraulic system!

Hydraulic fluids are a complex mixture of natural mineral and chemical additives. They touch every component and must work across a wide range of operating conditions. If overheated, overstressed, or exposed to elements they are not compatible with, they will fail and take the rest of the system down with them.

Interactive tutorial



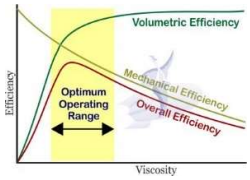
Complete the 'hydraulic fluid types and characteristics' tutorial at
www.e4training.com/hydraulic_courses/microtutor1.php?wtfluid

Complete quick quiz at end and post results.

Estimated time: 15 minutes, skill level 4
Date, score: Tick when posted ☐

Example lesson content summary

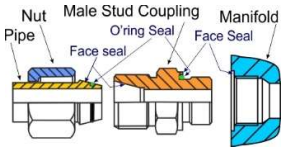
Study the 'Fluid Characteristics' training and videos at www.e4training.com/hyd_princip/fluid1.php
Identify and review the following information:



- Fluid properties are matched to system operating conditions.
- Critical to preventing metal to metal contact of moving parts.
- Considered incompressible in most applications.
- Protects components against corrosion.
- Viscosity vs temperature is a key characteristic.
- Mineral oil most commonly used but biodegradable and fire-resistant are also available.
- Fluids can be damaged with too high a temperature or shear stress etc.
- Good storage and handling are vital for keeping the fluid clean.

Estimated time: 25 minutes, skill level 4
Date complete: Complete ☐

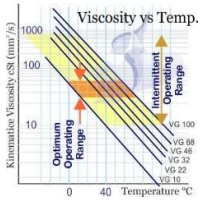
Study the detailed information and instructional video at
www.e4training.com/hyd_ancillary/pipe_fitting1.php and 2.php



- Appreciate that historically, hydraulic systems often leaked but modern fittings and assembly discipline have largely eradicated leakage.
- Appreciate that cutting rings are no longer considered safe.
- Low-duty systems use ferrule or flared connections.
- Heavy-duty systems require taper face seals and/or O'ring.
- O'rings seal by moving to block the land adjoining atmospheric pressure.

Estimated time: 20 minutes, skill level 4
Date complete: Complete ☐

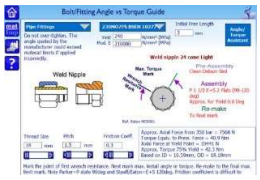
Virtual test rig experiments



Explore the 'Fluid Viscosity' simulation at
www.e4training.com/hyd_princip/fluid3.php

- Check how fluid viscosity varies with changes in temperature and fluid type.
- Consider how these changes might impact a pump's optimum working viscosity range.

Estimated time: 30 minutes, skill level 4
Date complete: Complete ☐

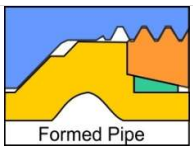


Explore a range of different hydraulic fitting types at
www.e4training.com/hyd_princip/pipe_fitting_pro3.php
Check how fluid viscosity varies with changes in temperature and fluid type.

- Select different fitting types.
- Check the manufacturer recommended tightening methods.
- Appreciate when fitting angle can be used to define torque limits.

Estimated time: 30 minutes, skill level 4
Date complete: Complete ☐

Practical & coursework exercises



Identify actual valves or fittings on equipment near you and discuss which surfaces are subject to the torque loads and also how the fluid is sealed in e.g. leaks prevented. Look at valve drawings if no actual valves are available.

Estimated time: 15 minutes, skill level 4
Date complete: Complete ☐

Key questions / Plenary

Does fluid viscosity increase or decrease with increasing temperature?
What might happen in a hydraulic system at start-up in winter?
Can you describe the three different types of hydraulic fitting?
Explain the benefits provided by formed pipe fittings?

And Finally:

Complete this worksheet and keep for your certification records. Submit any written coursework etc. to your training course provider.

Follow-on Course Worksheets:

Potential follow-on worksheets include: HP05 – Hydraulic fluid function and performance
O refer to your individual lesson plan or search the worksheet lists at
www.e4training.com/hydraulic_courses/worksheets1.php or courses1.php

Notes