

LECTURE 3-FLUIDS FOR HYDRAULIC SYSTEMS

FREQUENTLY ASKED QUESTIONS

1. What is a fluid? What are the functions and characteristics of hydraulic fluids

Hydraulic fluid is the transmitting medium of a hydraulic system.

In fluid power systems, hydraulic fluid has to perform various functions such as

- Power transmission – to transmit power, which is the primary function
- Lubrication – to lubricate various parts, so as to avoid metal to metal contact and reduce friction, wear, heat generation.
- Sealing – to seal the moving elements to avoid leakage.
- Cooling – to carry away the heat generated in the system and dissipates the heat through reservoir or heat exchanger.
- Contaminant Removal – to carry along the contaminations to tank, where it can be removed through filters.

2 List ten properties that hydraulic oil should possess

- Specific gravity
- Viscosity
- Stability in shear
- Foaming characteristics
- Cloud point and pour point
- Oil compressibility and bulk modulus
- Coefficient of thermal expansion
- Wettability
- Flammability
- Chemical stability
- Affinity to moisture
- Gummy tendency
- Oxidation tendency
- Corrosion resistance
- Wear resistance
- Compatibility with system material
- Heat dissipation property
- Nontoxic, easy to handle and availability

3. Discuss the role of additives used in fluid power systems

The performance of the hydraulic fluid can to some extent be improved by using additives.

The main additives are Pour point depressant, viscosity index improvers, de-foamers, oxidation inhibitors, corrosion inhibitors, anti-wear agents

4. Differentiate between absolute and kinematic viscosity

Absolute viscosity (μ) : absolute viscosity of a fluid is defined as the force required to move a flat plate of unit area at unit distance from a fixed plate with plates with unit relative velocity, when the space between the plate is filled with the given fluid.

$$\text{Absolute viscosity } \mu = \frac{F/A}{v/y} = N/m^2 \text{ per } m/s \text{ m}$$

Kinematic viscosity (ν) : Kinematic viscosity equals absolute viscosity divided by density.

$$\nu = \frac{\mu}{\rho} = \frac{\text{absolute viscosity}}{\text{density}}$$

Unit of kinematic viscosity: m^2/s

5. List some of fire resistant fluids used in hydraulic industry

Water – Glycol solution, Water in Oil Emulsions, Straight Synthetics, High-Water-Content Fluids.

6. What is the commercial name of mineral oil being used by the industry?

Some of the commercial names of hydraulic oils are Servo system 32, servo system 68, Servocirol68, Servo hydrex 32. India oils corporation was using their own names and standards earlier but now they use ISO designation such as Servo system 32, Servo hydrex 32.etc

7 Why water is not used as a medium in fluid power systems

Water is not used in fluid power system because it corrodes, encourages growth of bacteria, easily evaporates and gets contaminated easily, has poor lubricity, viscosity and prone to more leakage. So we chose petroleum based mineral oil as a medium in hydraulics.

8. What are the advantages of High water based fluids

Advantages of HWCF are

- Fire resistant due to high flash point of about 150°
- Lower system operating temperature due to good heat dissipation
- Additives are biodegradable and environmental friendly
- HWCF have high viscosity index
- Cleaner operation of the system
- Low cost – involves only cost of concentrate, less storage cost

9. How are fire resistant fluids designated

The fire resistant fluids are designated as HF-A, HF-B, HF-C and HF-D

HF-A: High water content fluids (80% or more) For example : Water oil emulsions

HF-B This is water oil emulsion containing petroleum oil and water

HF-C This is a solution of water and glycols

HF-D This is synthetic fluid, For example Phosphates or phosphate petroleum blends.

10 What is Neutralization number?

The neutralization number is a measure of the acidity or alkalinity of hydraulic oil. This is referred to as PH value of the oil. High acidity causes the oxidation rate in an oil to increase rapidly