Seal compatibility in hydraulic systems

Introduction

Oil leakage is common in industry particularly in pressurized systems. A few oil drops per minute in multiple places may not seem a problem but the associated costs can quickly mount up and it can represent lost profitability.

The impacts of poor sealing

Seal breakdown, caused by hydraulic systems running at ever increasing temperatures and pressures, can result in:

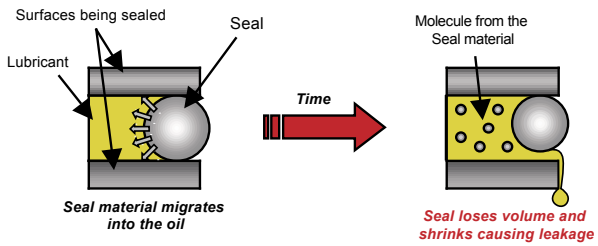
- Loss of pressure and poor system efficiency
- Oil leakage that leads to higher maintenance, higher oil consumption and safety/slip hazards
- Air, water and dirt contamination entering the system
- Oil leakage into the environment
- Unscheduled shutdowns from malfunctioning equipment.

How does the lubricant influence seal performance?

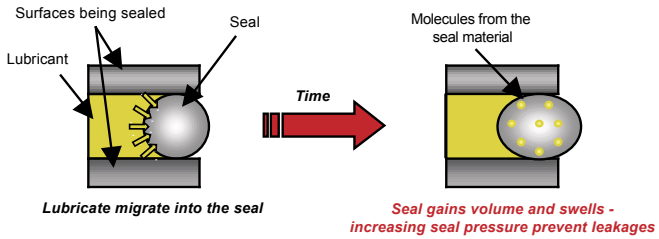
There are two main interactions between seal and lubricant.

1. Physical interaction

Seal shrinkage - seal components migrate out of the seal matrix into the lubricant.

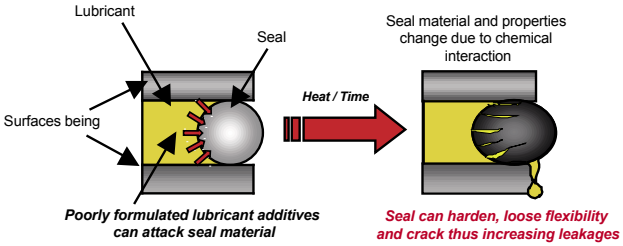


Seal swell – lubricant components migrate into the seal matrix. Moderate seal swell is welcomed whilst over swelling can cause deformation and leakage.



2. Chemical interaction

The lubricant and seal may react chemically to alter elasticity, strength and durability.



Many other environmental aspects can impact the seal's performance, such as higher temperatures that can accelerate chemical reaction, and dust/dirt and other contaminants that can cause seal wear. It is very important therefore that the lubricant and seal are as compatible as possible to optimize the system's efficiency.

How is seal compatibility tested?

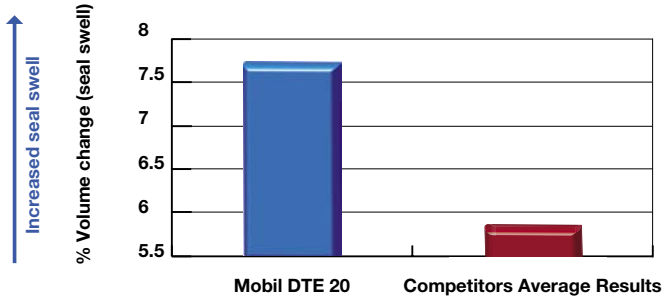
Static seal compatibility tests use standardised specimens of seal material which are immersed in the lubricant under defined conditions (temperature, time) and then assessed for changes in volume, hardness, tensile strength and rupture elongation. Results are quoted in hydraulic oil International specifications such as DIN 51524, ISO 11158 and ASTM D6158.

Mobil DTE 20 series meets the seal challenge

Mobil Industrial Lubricants designs hydraulic oils for excellent compatibility with a wide range of seal materials. This is achieved through the «balanced formulation» approach where the optimum base oils and additives are selected. There is little value investing in using premium hydraulic oils such as the Mobil DTE 20 series if the oil is lost through leakage.

The results of eight competitive hydraulic oils in a standard seal test using Nitrile NBR-1, the most common elastomer used in hydraulic systems, are shown below. The standard DIN limits for an ISO VG 46 oil are between 0 to 12%.

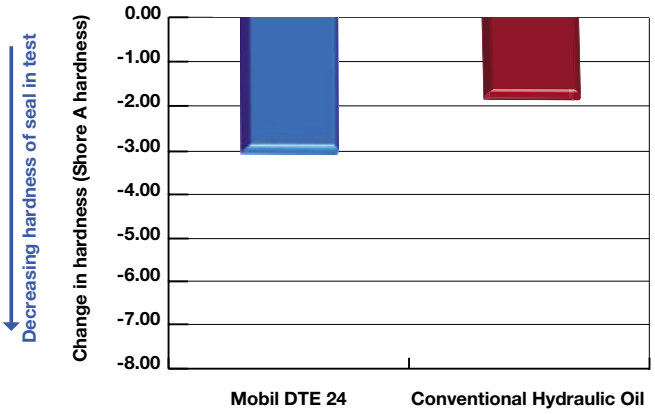
ISO VG 46 Hydraulic Oil in seal swell test
NBR-1, 100°C, 168 hrs (run under DIN conditions)



Mobil DTE 20 is designed to provide extra seal swell properties as demonstrated by the results of this test. This higher swell tendency, which is within manufacturers guidelines, can help reduce oil leakage resulting from oil/seal interactions.

A hydraulic oil should not react and harden the seal. In a second seal test, see below, Mobil DTE 24 shows no seal hardening but a slight but acceptable level of softening (industry limits are generally set at 0 to -7%).

Seal Compatibility 168 hrs, 100°C, NBR -1,
Shore A Hardness Run under DIN conditions



The Mobil DTE 20 series - Lubricating Productivity

The Mobil DTE 20 series has carefully balanced seal compatibility properties that help provide long-term equipment protection for both older and modern high pressure hydraulic systems. This can help to reduce leakage and ingress of contaminants, prolong component life, reduce slip hazards and reduce oil losses to the environment.

Mobil DTE 20 is designed to lubricate productivity and help reduce maintenance costs.

For more information on these and other Mobil industrial lubricants and services, please contact your local Mobil lubricants representative or visit our web site at **www.mobilindustrial.com.**