

Hydraulic Seals, Basic Materials

In hydraulics, all the components have internal cavities that are sealed mostly by metal to metal contact, because a little internal leak is allowed for lubrication purposes, but in other cases the leak should be zero, for example in cylinders or in pumps to avoid external leakage. The use of elastomers or flexible materials is mandatory.

The following is a summary of the most used materials for sealing purposes in hydraulics.

BUNA N (Nitrile or NBR). It is perhaps the material most commonly used in all the hydraulic applications, is a material relatively cheap. It is a copolymer of butadiene and acrylonitrile. It is excellent with hydraulic fluids that are based in petroleum. Good low temperature resistance. Rank of temperature of -65 0F to +245 0F, good compression set, flow in cold, cut and abrasion. It has low resistance to ozone, sunlight, and weather.

Recommended Fluids:

- Fluids based on petroleum.
- Water.
- Diester.
- Fluids based on Glycol-Water.

Not recommended Fluids:

- Halogenated hydrocarbon fluids.
- Phosphate ester fluids.
- Keytones.
- Acids.
- Brake fluids.

VITON (Fluorocarbon FPM). It is the second most common material used in seals. Basically it is used at high temperature, to replace Buna N. Made of vinylidene Fluoride and hexafluoride propylene. It works very well for vacuum. Range of temperature -20 0F to +360 0F. The max limit can be increased to 550 0F for short periods of time. It is compatible with most fluids.

Recommended Fluids:

- Fluids based on petroleum.
- Silicate ester fluids.
- Diester.
- Halogenated hydrocarbons.
- Phosphate esters.

Not recommended Fluids:

- Keytones.
- Skydrol aviation fluids.

ETHYLENE-PROPYLENE Copolymer (EPR). Made of two monomers, Ethylene and Propylene. It has low compression set, good heat resistance, and good electrical properties, in addition of high tensile strength. Range of temperature -65 0F to +300 0F.

Recommended Fluids:

- Skydrol aviation fluid.
- Steam.

- Water.
- Keytones.

Not recommended Fluids:

- Fluids based on petroleum.
- Diester.

POLYURETHANE (AU, EU). It has very high tensile and elongation characteristics. It is a Tough material, with low temperature flexibility, good abrasion resistance, ozone resistance, and tear resistance. It has Poor compression and permanent set properties. It is a very useful material for specialized sealing problems.

Recommended Fluids:

- Fluids based on petroleum.
- Water / Oil
- Phosphate esters fluids.

Not recommended Fluids:

- Hot water.
- Acids.
- Keytones.
- Chlorinated Hydrocarbons.

POLYTETRAFLUOROETHYLENE (PTFE). This is a material extremely rigid, with very low friction coefficient. It is compatible and recommended with most fluids. Temperature range -300 OF to +480 OF.

The variety of seal materials are so immense, as the applications we see every day in the hydraulic field. That is why we need to understand that a seal material used in a particular application may not work well in a similar one. We need to pay attention to all the factors involved in such application (pressure, travel speed, temperature, type of fluid, cycle time, type of machine, etc.), in order to select or replace a seal.

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