

# COMPRESSOR OILS

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**Compressor oils** are fluids used for lubrication of moving metal parts of gas (air) compressors.

The following factors are taken into account in selection of a compressor oil:

- ☐ Type of compressor.
- ☐ Gas to be compressed.

Chemically active gases (Oxygen, hydrogen chloride) are not compressed in compressors lubricated by hydrocarbon oils (not mineral nor synthetic), which are flammable.

Mineral oils are not used for compressing breathing air.

Hydrocarbon gases (natural gas) may dissolve in the compressor lubricant changing its properties. The lubricant for this application should resist to gas absorption.

- ☐ Compressed gas pressure.

Maximum compressed gas pressure is determined by the compressor type.

- ☐ Discharge temperature.

Lubricants of low viscosity grades are used in refrigeration compressors and other low temperature applications. High viscosity grade oils are used at increased temperatures. 150°C–200°C For the discharge temperature above 300°F (150°C) synthetic lubricants (polyglycol, diester, polyolester, phosphate ester) are used.

- ☐ **ISO Designation of compressor lubricants**
- ☐ **Compressors types**
- ☐ **Properties of some compressor oils**

## ISO Designation of compressor lubricants

International Standardization Organization (ISO) established a viscosity grading (VG) system for lubricants. According to the system way lubricants are designated by the letters ISO followed by a number equal to the oil viscosity measured in centistokes at 40°C (104°F): ISO VG 32, ISO VG 68, ISO VG 100 etc. The common viscosity range of compressor lubricants is 32 cSt to 220 cSt.

## Compressors types

### ☐ **Reciprocating compressor**

In a reciprocating compressor a gas is compressed in a cylinder under a moving piston. Intake and release of the gas (air) is controlled by inlet and discharge valves (similar to the internal combustion engine).

There are two lubrication systems in reciprocating compressors: cylinder lubrication and crankcase lubrication.

Cylinder lubrication provides oil to pistons, piston rings, cylinder liners, cylinder packing and valves.

Crankcase system lubricates cross-head guides, main bearings, wristpins, crankpins and cross-head pin bearings.

Both lubrication systems are commonly lubricated by mineral oils from the viscosity range ISO VG 68 to ISO VG 220 containing Corrosion inhibitors, anti-oxidants and anti-wear additives. Higher viscosity indexes are used for higher temperatures. For some applications synthetic lubricants of equivalent viscosity indexes (diester, polyglycol, polyolester or phosphate ester) are recommended. Hydrocarbon lubricant (mineral and synthetic) are never used for compressing active gases (hydrogen chloride, oxygen).

### ☐ **Sliding vane compressor**

Sliding vane compressor utilizes centrifugal force of a rotating vane mounted eccentrically in a cylinder.

Sliding vane compressors are commonly flood or injection lubricated. The compressed gas pressure is about 150 psi (1 MPa).

Mineral oils of viscosity grades ISO VG 46, ISO VG 68, ISO VG 100 with anti-wear and mild extreme pressure (EP) additives are used for the sliding vane compressors. Synthetic oils of equivalent viscosity indexes (polyalphaolefin, diester, polyglycol synthetics) are recommended for compressors with increased discharge temperature.

### ☐ **Centrifugal compressor**

Centrifugal compressor uses centrifugal force of an impeller rotating at high speed (up to 20000 RPM).

Bearings of centrifugal compressors are lubricated by oils of viscosity grades ISO VG 32 ISO or VG 46 (for increased ambient temperatures) with anti-wear additives.

### ☐ **Screw (helical lobe) compressor**

Helical lobe screw compressor consists of two rotors mounted in a housing. When the rotors rotate they compress air between helical lobes.

The compressed gas is in contact with the compressor lubricant that may cause its oxidation.

Screw (helical lobe) compressors are commonly flood lubricated either by mineral oils of viscosity grades ISO VG 32, ISO VG 46 or ISO VG 68 with rust and oxidation preventive additives (R&O) or by synthetic based oils of equivalent viscosity indexes (polyalphaolefin, polyolester, diester or polyglycol).

Oil free (dry type) screw compressors utilize timing gear. The gear and the bearings are lubricated an oil from the viscosity range ISO VG 32 to ISO VG 100 (depending on ambient temperature and application).

#### ☐ **Rotary lobe compressor**

Rotary lobe compressor consists of two lobes mounted in a housing. When the lobes rotate they compress air between them.

Lobe compressors are lubricated by mineral oils from the viscosity range IS VG 68 to ISO VG 220 with rust and oxidation (R&O) additives and anti-foaming agents. Higher viscosity indexes are used for higher temperatures. For some applications synthetic lubricants of equivalent viscosity indexes are recommended.

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