

# Performance and longevity for climate control systems

From scroll to screw, rotary to reciprocating compressors, each configuration will have its own individual lubricant requirement. With such a wide range of oil options available on the market, what help is available in choosing the right one?

THE LUBRICATION OF compressor systems is paramount in keeping a cooling installation in good working order. The lubricant or oil facilitates the movement of parts, controls wear and reduces friction. It also absorbs and dissipates heat, and seals and protects systems from corrosion.

The selection of a lubricant will very much depend on the installation or application in question and more importantly which refrigerant type is in use, but it is likely to necessitate a mineral, a semi-synthetic or a synthetic oil.

A mineral oil is a wax-free hydrocarbon mixture specifically chosen for its excellent fluidity at low temperatures. These oils are adapted for use with CFC, HCFC, ammonia and hydrocarbon refrigerant fluids. In recent years hydro-treated mineral oils have become commonly used in ammonia systems. Mineral oils are not compatible with HFCs.

A synthetic oil consists of polymers made up of specific chemical monomers such as esters. The first synthetic oils; alkyl benzene oil (AB) and poly-alpha-olefin oil were developed for HCFCs. With the arrival of HFCs in the 1990s, polyol ester synthetic oil appeared in refrigeration compressors as the mineral, alkyl benzene and poly-alpha-olefin oils were not compatible with HFCs.

A semi-synthetic oil is a mixture of mineral and synthetic oils and can be designed for refrigeration installations that work at low temperatures with limited miscibility. The mineral/AB blends that were typically used with R22 are no longer available. With the demise of R22 that is understandable.

Types of oils used within the refrigeration industry:

- Mineral oil (MO) – Good low temperature oil used in air conditioning and refrigeration compressors
- Alkyl benzene oil (AB) – A synthetic base oil and a good alternative to mineral oils,
- Polyol ester synthetic oil (POE) – A synthetic and wax-free oil used within refrigeration compressors, has the flexibility of use with HCFC, HFC, CO<sub>2</sub>, HC and HFO refrigerants. Hygroscopic tendency
- Polyalkylene glycol (PAG) – A synthetic oil typically used in automotive air conditioning compressors. Hygroscopic tendency

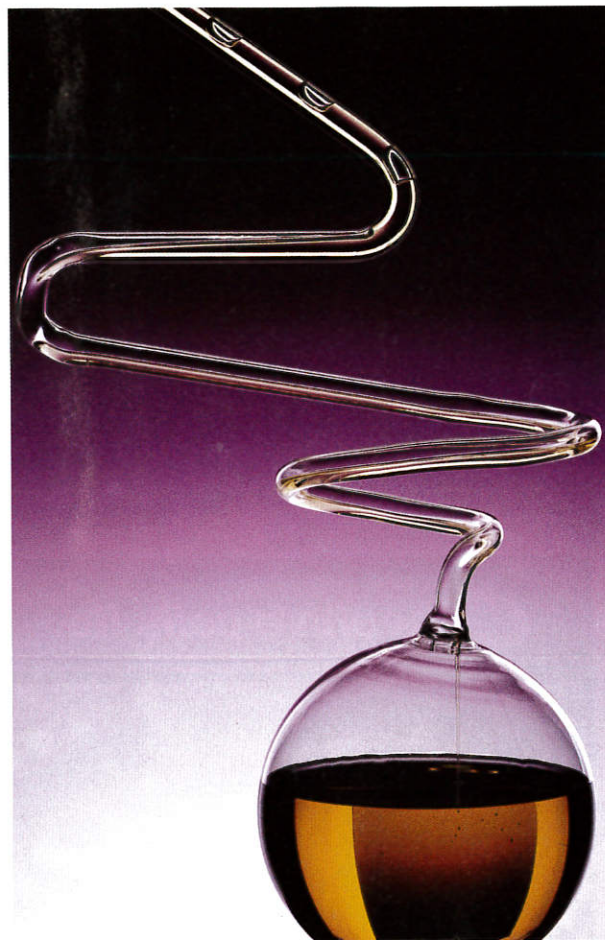
- Poly-alpha-olefin (PAO) – Synthetic lubricants which contain only poly-alpha-olefin type hydrocarbons. A very high quality oil, some of which are food grade
- Poly vinyl ether (PVE) – A refrigerant oil specially formulated for Hydrofluorocarbon (HFC) refrigeration systems

## Oil properties

- The viscosity of an oil can define its operating capability at high or low temperatures and its ability to reduce friction within a system and minimise any wear and tear. The correct viscosity oil for the type of compressor is very important.
- The solvency of an oil can help to create a seal within a compressor and also its compatibility with any additives.
- The oxidation stability of an oil will affect the amount of acid and sludge that could form within a system.
- Residue could form, depending on the solvency, volatility and oxidation stability of an oil.
- Chemical activity within the oil will determine its corrosion properties.
- Any tendency to foam or demulsify will depend on any surface activity of the oil.
- Miscibility with the refrigerant for the system requirements.

All of the above properties can have an influence over oil return to the compressor, this is why it is critical that a high quality oil fit for purpose is always used.

Thankfully compressor manufacturers will specify the viscosity and type of oil for their compressors and a brand or brands which they approve. Nevertheless, it is important to keep oils in good condition and carry out oil changes at recommended intervals depending on running hours and the condition of the oil.



In the case of POE oils it is important to ensure moisture ingress is kept to a minimum.

Failure to keep the oil in good condition will lead to changes in its properties which can lead to increase energy consumption, greater wear and reduced compressor life.

Unlike refrigerant, records are often not kept of the grade of oil used in a system. Sometimes its name may be unfamiliar or the oil used as the initial fill may not be readily available.

Choosing to use the wrong oil or even the incorrect viscosity for the type of compressor, could prove very costly.

This is where consulting the technical team of refrigerant oil suppliers such as Climalife with its wealth of knowledge and experience of selecting the right oil for the right system and conditions could be extremely useful.