



ATMO
sphere

Business Case for
Natural Refrigerants

19-21/11/2018 – Lago di Garda

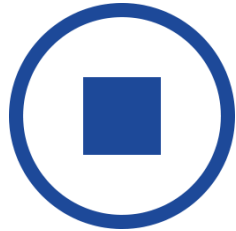
The Use of Lubricants in Systems Using Natural Refrigerants

Introducing your speaker



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Mobil Industrial Lubricants

An Industry in Transformation



Global legislation is limiting the use of refrigerants with high Ozone Depletion or Global Warming Potential



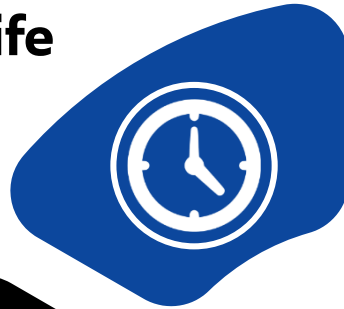
Businesses are increasingly adopting **natural refrigerants** – ammonia, carbon dioxide & hydrocarbons



The switch to natural alternatives presents a number of **new challenges** for operators – particularly **lubrication**

The role of lubricants

Increase component life



Reduce friction & wear



Dampen noise



Provide a seal between high and low pressure sides of compressor



Eliminate debris



Provide cooling



Refrigerant / lubricant interaction: Design

Pressure & temperature

Oil viscosity falls when °C rises
Refrigerant solubility rises with pressure



Viscosity

To maintain peak performance your oil must have the optimum viscosity.

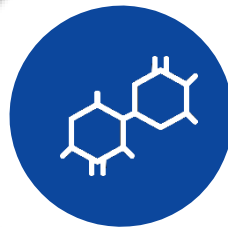
Miscibility

How easily the oil mixes with the (liquid) refrigerant

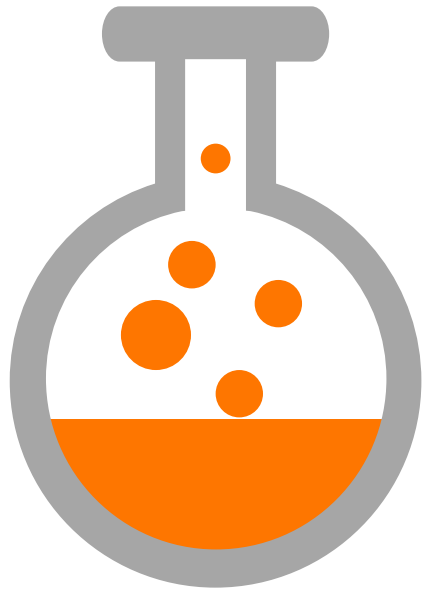


Solubility

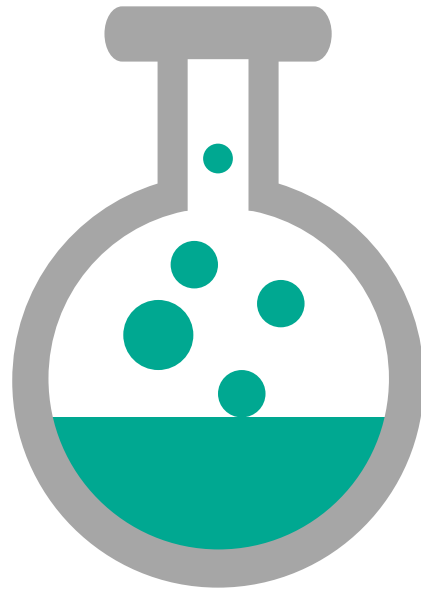
Capability of refrigerants (gas) to dissolve in an oil



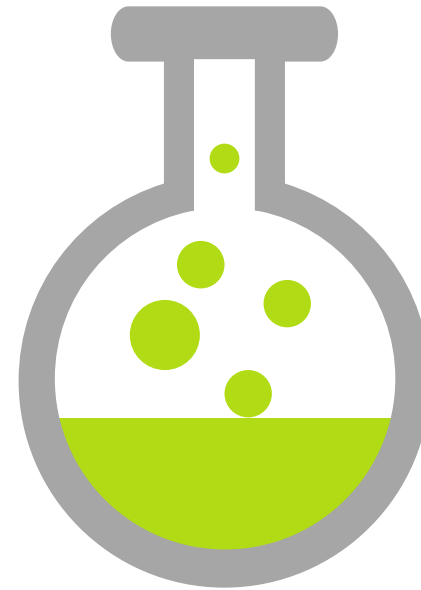
Current refrigeration compressor lubricants



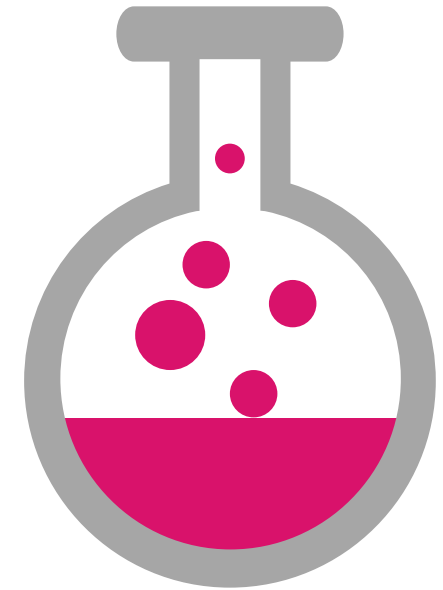
Mineral



**Polyol Ester
(POE)**



**Polyalkylene
Glycol (PAG)**



**Polyalphaolefin
(PAO)**

An aerial photograph of a dense forest, viewed from above, with a blue color overlay. The trees are small and densely packed, creating a textured pattern of green and brown. The blue overlay is uniform across the entire image, giving it a cool, monochromatic appearance.

Benefits & Lubrication Challenges

Lubrication Challenges: Hydrocarbons

01

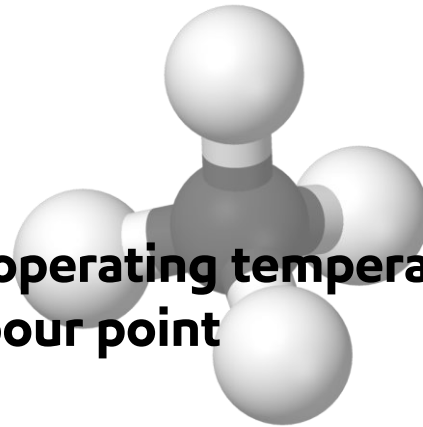
High solubility with mineral lubricants & ester oils

02

Low operating temperature demands low pour point

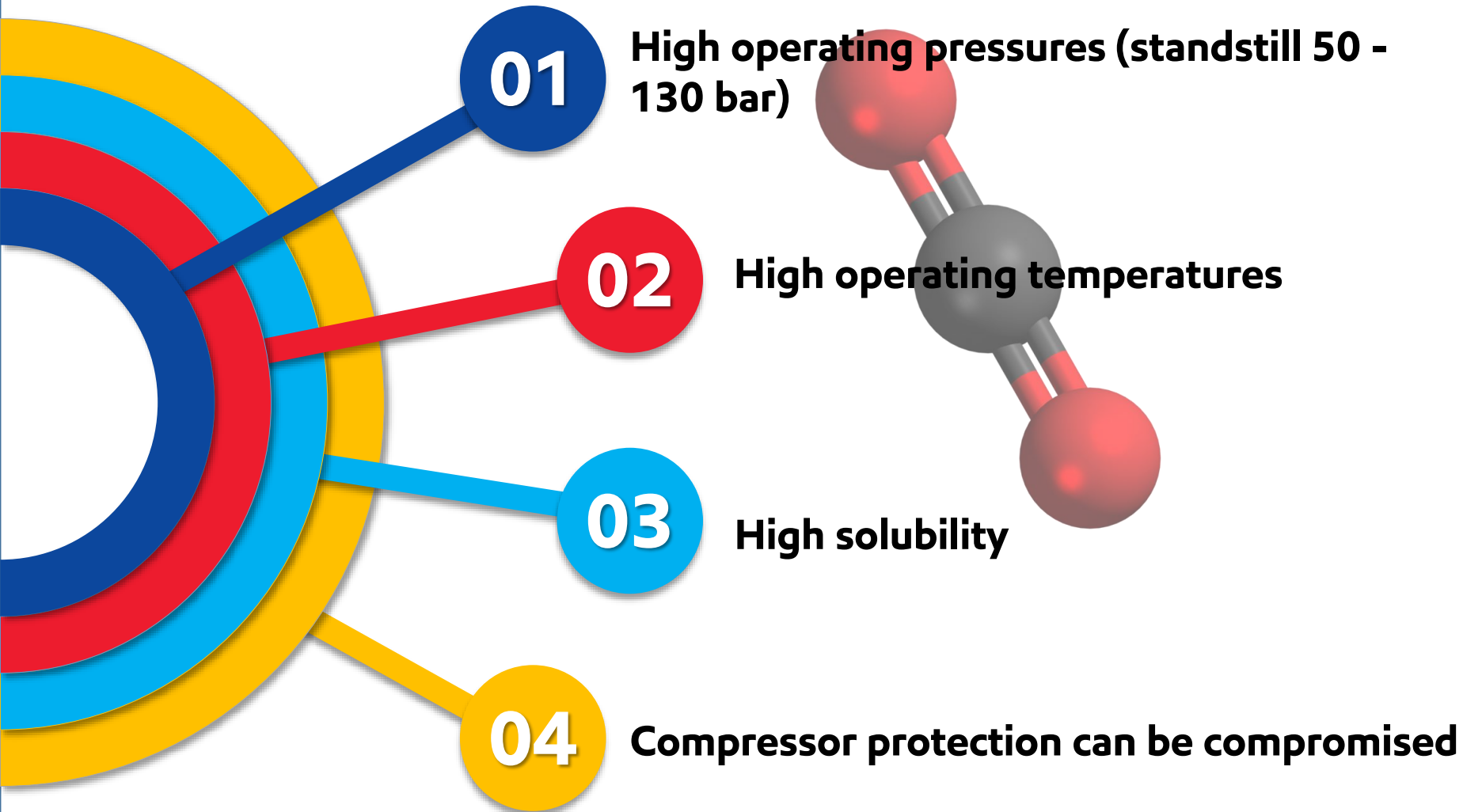
03

Minimal vapour pressure



PAO & PAG
technologies
are
recommended

Lubrication Challenges: Carbon Dioxide



Synthetic
lubricants
(POE)
specifically
designed for
refrigeration
applications

Lubrication Challenges: Ammonia

01

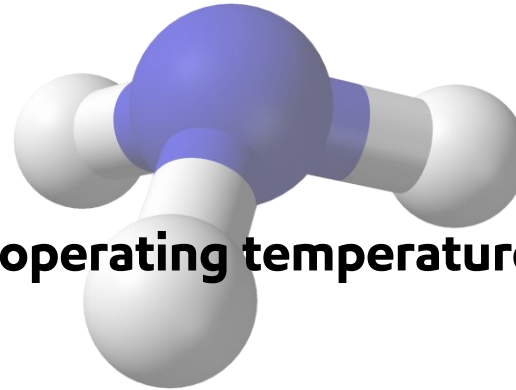
Minimal miscibility

02

High operating temperatures

03

High thermal stresses



**PAO or
PAO/AB**
(Alkylbenzene)
blends are
preferred
technologies

Real world solutions

The Abera slaughterhouse in France was experiencing **CO2 compressor failures**, forcing them to **decrease the inspection period** from 6,000 to 4,500 hours.

High performance refrigeration oil (**Mobil SHC™ Gargoyle 80 POE**) was introduced.

Use of lubricant with specifically designed POE technology helped **lower oil temperature and reduce wear**, **extending inspection intervals by 30%**, and **reducing power consumption by 2%**.



Real world solutions

Türk Tuborg A.S. brewery operates **11 refrigeration compressors**, with an average power of **260 kW**, for **8000 hours per year**. They were looking for efficiencies.

A high performance refrigeration oil designed for compressors using ammonia (**Mobil Gargoyle Arctic™ SHC NH 68**) was introduced.

Top-up quantities were reduced by 73% alongside a similar **decrease in waste oil** and a **safer work environment**.



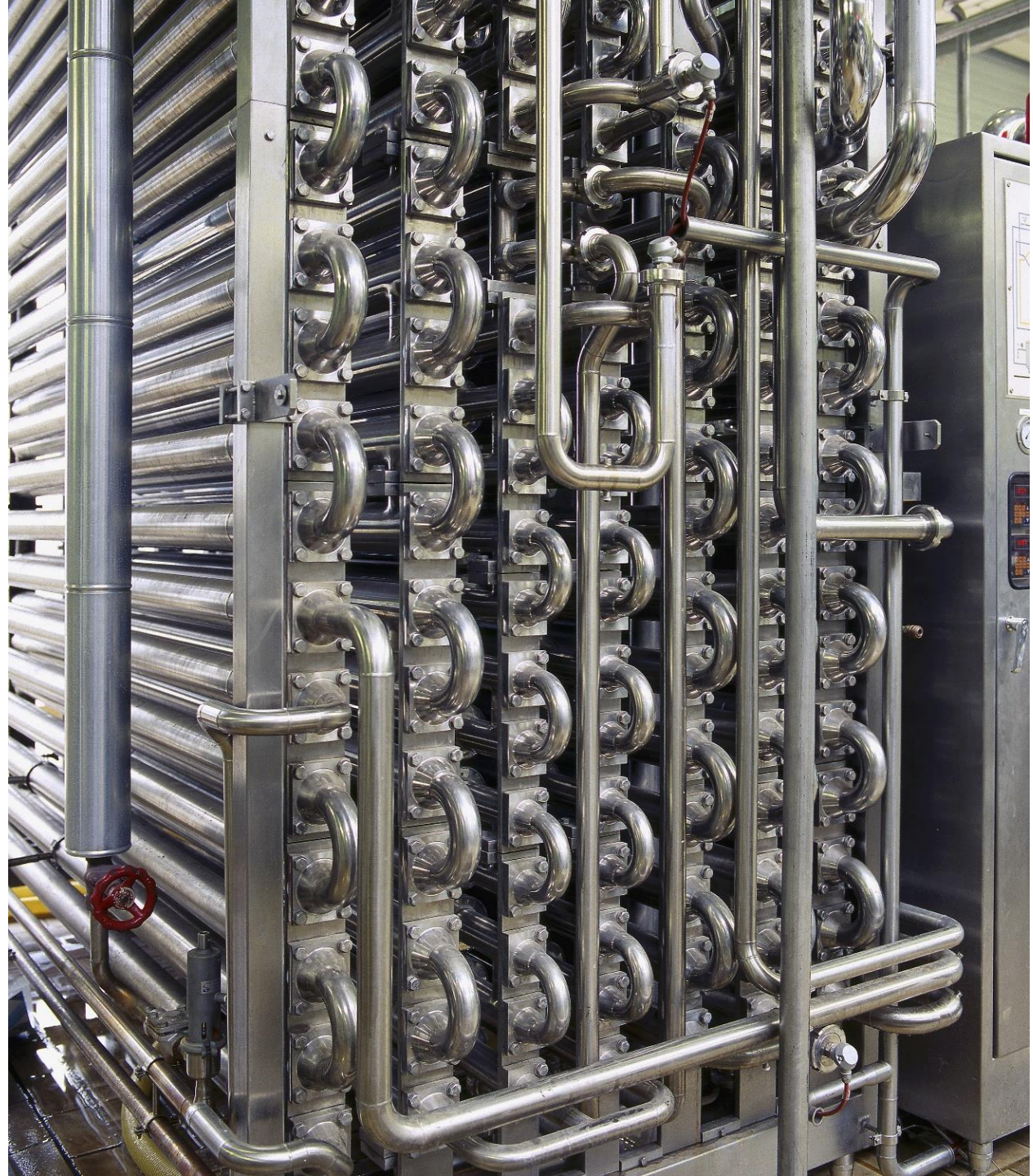
Summary

Switching to natural refrigerants can present **lubrication challenges**.

High performance fluids can help overcome these and **improve your plant's efficiency**, but they should be **carefully selected**.

We recommend choosing:

- A specifically formulated synthetic PAO and PAG for hydrocarbons
- advanced mineral-based lubricants for Ammonia
- high performance synthetic lubricants for CO₂





Thank You