Reduce the oil consumption in your SMC 100 compressor

New oil demister kits help you cut back on oil consumption by recovering the oil inside your SMC 100 compressor instead of some leaving along with the exhaust gases into your plant.

- Cut back on oil refill costs by 50–75%
- Cut service costs for draining off oil
- Reduce oil degradation by preventing oil being exposed to high temperature
- Increase refrigeration capacity by keeping heat exchanger surfaces free of oil.

Example of oil demister kit
Oil demister kits for reducing oil carry-over in SMC 100 compressors

It is a well-known fact that small concentrations of oil – in the form of small droplets and mist above the oil sump in the compressor housing – leave the compressor and are normally lost along with the discharge gas to the high-pressure system in a refrigeration plant.

It is now possible to install an internal demister unit in the compressor housing to help deal with this, and to supplement the external oil separator vessel. This demister unit can be attached to the inner surface of the compressor side covers. It must be connected to the breathing channel for the blow-by gas flowing from the oil sump to the suction gas channel of the compressor block.

The small oil droplets in the entering refrigerant gas will tend to hit a steel wire in the knit mesh in the demister unit. The force of gravity means this oil then slowly collects at the bottom of the unit, from where it flows back to the oil sump through a rubber hose. This demister unit (patent pending) is designed for installation in all SMC 100 Mk 2–3–4 compressors. The number of compressor cylinders determines how many demister units should be installed.

All parts required for the installation are contained in the kits. In water-cooled compressors (only), the demister kits can be mounted on the side covers.

<table>
<thead>
<tr>
<th>Description</th>
<th>No. of demister units required</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil demister kit SMC 104</td>
<td>2</td>
<td>3184.714</td>
</tr>
<tr>
<td>Oil demister kit SMC 106</td>
<td>2</td>
<td>3184.715</td>
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<tr>
<td>Oil demister kit SMC 108</td>
<td>2</td>
<td>3184.716</td>
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<tr>
<td>Oil demister kit TSMC 108</td>
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<tr>
<td>Oil demister kit SMC 112</td>
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<tr>
<td>Oil demister kit TSMC 116</td>
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<td>3184.720</td>
</tr>
</tbody>
</table>

Demister kit mounted on a side cover

For further information or ordering, please contact your local contact person at Johnson Controls.
Sabroe compressor oil
High-quality oils specially developed for refrigeration systems

What’s special about Sabroe compressor oils?

Johnson Controls provides a range of branded synthetic or semi-synthetic oils specially developed for use in refrigeration systems.

In contrast to mineral oils, these high-quality oils are manufactured using stringent refining standards that ensure identical specifications for every batch, as well as providing excellent chemical stability.

This is why we are able to provide unequivocal guarantees for the quality and performance of Sabroe compressor oils.

All Sabroe compressor oils are

• Pure, clean synthetic or semi-synthetic base oils free of any additives that might react with the refrigerant.

• Straight-cut to the specified viscosity, securing the long-term lubrication performance of the oil.

• Field-tested under the kinds of demanding operating conditions encountered in modern refrigeration systems.

• Chemically and thermally stable – with excellent wear protection and fluidity down to ~40°C.
Why use Sabroe compressor oils?

There are big benefits to be gained from using high-quality lubricating oils in a refrigeration system. This is because standard mineral oils often lack the necessary chemical stability and their lubricant qualities often begin to tail off after only a short time in operation.

The benefits of Sabroe compressor oils include:

• Extend the time of operation between oil changes - their service life is as much as five times longer than typical mineral oils.
• Provide excellent stability even under demanding operating conditions, resulting in low oil consumption.
• Ensure the best possible lubrication, resulting in longer service life for the compressor in general.
• Proven to be cost-effective, with savings on top-ups, oil filter changes, waste disposal and labour costs.

Warranty

Johnson Controls provides full warranty for refrigeration systems using Sabroe compressor oil should any unforeseen operating problems arise on account of the oil.

Product info

<table>
<thead>
<tr>
<th>Oil type</th>
<th>Application</th>
<th>NSF Registration</th>
<th>Quantity</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sabroe PA068</td>
<td>New R717 plants</td>
<td>Code H1</td>
<td>20-litre pail</td>
<td>1231-256</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>208-litre drum</td>
<td>1231-259</td>
</tr>
<tr>
<td>Sabroe AP68</td>
<td>R717 plants formerly charged with mineral oil</td>
<td></td>
<td>20-litre pail</td>
<td>1231-257</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>208-litre drum</td>
<td>1231-260</td>
</tr>
<tr>
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<td>R717 plants currently charged with mineral oil</td>
<td>Code H2</td>
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<td>208-litre drum</td>
<td>1231-341</td>
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<tr>
<td>Sabroe A100</td>
<td>R22 plants</td>
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<td>20-litre pail</td>
<td>1231-263</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>208-litre drum</td>
<td>1231-262</td>
</tr>
</tbody>
</table>

For further information please consult the “Sabroe oil recommendation” section at www.sabroe.com.
Refguard oil analysis

In a refrigeration compressor, the oil is one of the very first places to reveal symptoms that indicate possible malfunction. Regular oil analyses are therefore an inexpensive, uncomplicated method of monitoring the conditions of a refrigeration plant.

Simple procedure – detailed result
Testing the oil in a refrigeration compressor is simple and easy using the Sabroe Refguard oil analysis system, with results rapidly available online to enable prompt action.

An on-site test simply involves taking a sample of approx. 100 ml oil from the compressor unit and sending it to Sabroe for detailed analysis. Sabroe then provides a detailed analysis via a specialist laboratory. This features a customised report about the oil characteristics, focusing on providing accurate information about the general condition of the refrigeration system.

Significant advantages

• A more efficient way of taking oil samples, which is simple and easy to carry out.
• An inexpensive way to get accurate diagnostic information.
• Clear analysis on the basis of specific information.
• Clear facts about any oil impurities that could cause greater energy consumption.

Customer benefits

► • Saves on time and manpower.
► • Provides useful early warning before problems arise.
► • Optimised maintenance.
► • Lower operating costs.
Analysis procedure

Step 1
Order Sabroe Refguard oil analysis sample kit 1231.250.

Step 2
- Follow the enclosed instructions and take the oil sample
- Register via the Internet
- Send the sample to the laboratory.

Step 3
Five days after the laboratory receives the oil sample, your result will be available via a standard Internet browser and will also be sent to any required e-mail address.

Additional Refguard benefits
- Sabroe Refguard oil analysis on a regular basis, with the results annotated by Sabroe refrigeration specialists, helps guard against the unexpected consequences of “hidden” problems.
- The Sabroe Refguard oil analysis system is an inexpensive way to get a “health report” on any refrigeration system.
- Potential problems can be identified and dealt with in time, before they have expensive consequences.
- The oil analysis provides the best possible basis for Sabroe specialists to provide concrete, useful advice about current or future problems in either a refrigeration compressor or the system as a whole.

Sabroe Refguard
Sampling and shipping instructions

1. Fill the sample bottle to between the min. and max. line.

2. Allow refrigerant to completely evaporate.

3. Make sure the cap is securely tightened.

4. Register your oil sample.

5. Place the bottle and the label you print out from our Web site in the special envelope. Send by post or courier. Please use the address at the bottom of this page.

The Sabroe Refguard concept is now Internet-based. Please consult our Web site at http://www.sabroeparts.com Click the link to Parts Centre under products and click the “oil analysis” link to learn more.

Apart from saving your time, the system enables you to receive automatic notification via e-mail and a combined overview of previous analyses.
JOHNSON CONTROLS PARTS CENTRE

Sabroe S68 refrigeration oil
Hydro-treated, high performance oil for refrigeration

Sabroe offers the highest quality lubricants available for today’s refrigeration market. The increased demand for cleaner operating systems and the heightened environmental awareness is reflected in the move to semi-synthetic and synthetic refrigeration lubricants.

Synthetic and semi-synthetic fluids are widely used in harsh environments including ammonia. Sabroe S68 refrigeration oil provides improved performance over traditional mineral oils with ammonia. Benefits include cleaner operation, lower carryover, improved lubrication and reduced foaming.

Production process

The Sabroe S68 refrigeration oil is based on hydro-treated basestocks. Refined through a two-stage process with high temperatures and hydrogen pressures, the basestocks contain less than one percent of the impurities typically found in solvent refined mineral oils. Impurity removal greatly improves basestock stability and performance.

Applications

• Sabroe S68 lubricates and removes the heat of compression in ammonia refrigeration systems. It is especially effective against corrosion and it extends the life of compressors.
• Sabroe S68 is well suited for all applications with screw and reciprocating compressors.
Sabroe S68

Benefits

Superior stability to oxidation

• Excellent resistance to degradation means that Sabroe S68 inhibits oxidation and reduces sludge and varnish build-up
• Efficient water separation protects against corrosion
• Outstanding additive response means that Sabroe S68 lasts 4 to 8 times longer than normal, solvent refined mineral oils.

Reduced need for oil changes

• Reduces waste oil quantities
• Reduces maintenance costs.

Additional Benefits

• Contains no toxic or carcinogenic materials
• Waste oil can be eliminated by incineration in accordance with current regulations and guidelines.

Food Grade registered by NSF International

This product is acceptable as lubricant where there is no possibility of food contact (H2) in and around food processing areas. Such compounds may be used as lubricants, release agents, or antirust films on equipment and machine parts in locations in which there is no possibility of the lubricant or lubricated part contacting edible products.
Hydro-treated lubricant for refrigeration

Manufactured by a patented procedure, Sabroe S68 is a superior lubricant that provides improved performance in ammonia refrigeration systems.

Solubility with ammonia ISO 68 refrigeration oils

Low solubility with ammonia

Conventional mineral oils may contain up to 25% aromatics. These compounds together with sulphur, nitrogen and oxygen increase ammonia solubility and decrease the chemical stability. Sabroe S68 contains less than one percent of these compounds, limiting the ability of ammonia to dissolve in the lubricant.

Chemical stability

High temperature, long-term stability tests demonstrate that Sabroe S68 resists chemical attack by ammonia. Increased stability lengthens lubricant life, resulting in varnish free operation and extended drain and maintenance intervals.

Additional reasons for using low soluble ammonia lubricant such as Sabroe S68 include higher compressor volumetric efficiency and increased viscosity for lubrication.
Excellent lubrication

Panel coker tests have demonstrated that Sabroe S68 resists the formation of varnish and carbon, even at extreme temperatures. Traditional mineral oils used for ammonia refrigeration have a tendency to form pockets of carbon in the valves and components of the system. Sabroe S68 provides totally clean operation.

Viscosity as a function of time

The highly iso-paraffinic structure of Sabroe S68 results in a superior product with better lubrication, as compared to conventional solvent refined mineral oils. The above chart also illustrates Sabroe S68’s superior viscosity performance with time. Dramatic viscosity increases can indicate breakdown of the lubricant. Four ball wear and other tests have demonstrated that Sabroe S68 has lower wear levels.

Pour point

In addition to a higher viscosity index than conventional mineral oils, Sabroe S68 has a molecular structure that responds perfectly to pour point depressants (PPD). PPDs help ensure low temperature lubricant flow for areas such as the evaporator.

Low temperature viscosity

Lower viscosities in the evaporator provide superior oil return. The following chart illustrates Sabroe S68’s low temperature viscosity behaviour compared to that of naphthenic mineral oil.
Reduced carryover prevents loss of heat transfer in the evaporator

The presence of an immiscible lubricant in a system evaporator greatly reduces the heat transfer efficiency of the refrigerant.

Volatility of mineral refrigeration oils
ISO VG68 versus Sabroe S68

The low volatility of Sabroe S68 results in less oil consumption. Weight loss oven tests show a several-fold improvement over solvent refined oils.

Sabroe S68 product data

<table>
<thead>
<tr>
<th>Properties</th>
<th>Test method</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity @ 40°C, cSt</td>
<td>ASTM D445</td>
<td>69</td>
</tr>
<tr>
<td>Viscosity @ 100°C, cSt</td>
<td>ASTM D445</td>
<td>9.1</td>
</tr>
<tr>
<td>Viscosity Index</td>
<td>ASTM D2270</td>
<td>100</td>
</tr>
<tr>
<td>Density, g/mL, 20°C</td>
<td>ASTM D4052</td>
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</tr>
<tr>
<td>Pour point (°C)</td>
<td>ASTM D97</td>
<td>-39</td>
</tr>
<tr>
<td>Flash point, C.O.C., (°C)</td>
<td>ASTM D92</td>
<td>226</td>
</tr>
<tr>
<td>Fire point, C.O.C., (°C)</td>
<td>ASTM D92</td>
<td>246</td>
</tr>
</tbody>
</table>

A lubricant film as thin as 0.1 millimetres may result in heat transfer losses of over 50%. The low vapour pressure and ammonia affinity of Sabroe S68 provides reduced oil carryover rates and lowers potential for heat transfer problems.
Apart from delivering high quality oil, we stock over 7000 parts for the following Johnson Controls brands:
Sabroe A100 Synthetic Refrigeration Oil

Product Description

Sabroe A100 Synthetic Refrigeration Oil is a premium quality synthetic compressor lubricant based on alkyl benzene which have superior miscibility with hydrochlorofluorocarbons (HCFCs) as R22. This allows the oil to be used in very low temperature applications, down to -60 °C.

Features and Benefits

- Miscibility with halocarbons
- Increased system efficiency and reliability
- Low pour and floc points
- Avoids wax precipitation securing increased system efficiency
- Chemical stability
- Long oil service life

Applications

Sabroe A100 Synthetic Refrigeration Oil is particularly suited for use in refrigeration compressors in HCFC systems.

Sabroe A100 Synthetic Refrigeration Oil may also be used in ammonia systems in certain circumstances.

Typical Properties

<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>Typical</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity © 40°C, cSt</td>
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<td>ASTM D445</td>
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<tr>
<td>Viscosity © 100°C, cSt</td>
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<td>Viscosity Index</td>
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<td>ASTM D97</td>
</tr>
<tr>
<td>Flash Point, °C</td>
<td>195</td>
<td>ASTM D92</td>
</tr>
<tr>
<td>R22 Floc Point, °C</td>
<td>-50</td>
<td>DIN 51518</td>
</tr>
<tr>
<td>Acid no., mg KÖH/g</td>
<td>0.05</td>
<td>ASTM D974</td>
</tr>
</tbody>
</table>

Johnson Controls Denmark

www.johnsoncontrols.com

www.sabroe.com
Sabroe AP68 Synthetic Refrigeration Oil

**Product Description**

Sabroe AP68 Synthetic Refrigeration Oil is a fully synthetic lubricant formulated using wax free, synthesized hydrocarbons of polyalphaolefin (PAO) and synthetic Alkylbenzene base oils which have demonstrated outstanding resistance to thermal/oxidative degradation. Even in the worst operating conditions this oil will reduce sludge and deposit formation, hence avoiding or minimizing filter clogging.

**Features and Benefits**

- Superior thermal stability: Long oil life, extended drain intervals, less maintenance costs
- Good seal compatibility: Limited risk of leakage when changing from mineral oil
- Solvency: Cleaning effect, especially when switching from mineral oil technology
- Very low pour point: Enables lower evaporating temperatures, easier oil drainage
- Low volatility: Reduced need of oil top-up, avoids viscosity build-up

**Applications**

Sabroe AP68 Synthetic Refrigeration Oil is particularly suited for use in ammonia compressors with evaporative temperatures as low as -50 °C, and due to the good compatibility with rubber seals it is preferable to compressors that have previously been lubricated with mineral oils.

**Typical Properties**

<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>Typical</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity @ 40°C, cSt</td>
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<tr>
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<td>Flash Point, °C</td>
<td>211</td>
<td>ASTM D92</td>
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<tr>
<td>Acid no., mg KÖH/g</td>
<td>0.01</td>
<td>ASTM D974</td>
</tr>
</tbody>
</table>

Johnson Controls Denmark

www.johnsoncontrols.com

www.sabroe.com
**Product Description**

Sabroe PAO68 Synthetic Refrigeration Oil is a fully synthetic lubricant formulated using wax free, synthesized hydrocarbons of polyalphaolefin (PAO) which have demonstrated outstanding resistance to thermal/oxidative degradation. Even in the worst operating conditions this oil will reduce sludge and deposit formation and is remarkable for a very low oil carryover. This oil is miscible with most conventional mineral refrigeration oils. This may however detract from the outstanding performance properties.

**Features and Benefits**

- Superior thermal stability  
  Long oil life, extended drain intervals, less maintenance costs
- Low carry-over  
  Improves evaporator efficiency
- Wax free  
  Excellent low temperature fluidity, no wax deposits
- Very low pour point  
  Enables lower evaporating temperatures, easier oil drainage
- Low volatility  
  Reduced need of oil top-up, avoids viscosity build-up

**Applications**

Sabroe PAO68 Synthetic Refrigeration Oil is particularly suited for use in ammonia compressors with high operating temperatures and/or systems with very low evaporative temperatures.

Sabroe PAO68 is Food Grade registered by NSF International with Category Code H1.

Sabroe PAO68 is also suitable for certain HCFC (R22) applications taking the drop of viscosity into account.

**Typical Properties**

<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>Typical</th>
<th>Test Method</th>
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</thead>
<tbody>
<tr>
<td>Viscosity © 40°C, cSt</td>
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<tr>
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<tr>
<td>Acid no., mg KOH/g</td>
<td>0.03</td>
<td>ASTM D974</td>
</tr>
</tbody>
</table>

Johnson Controls Denmark

www.johnsoncontrols.com

www.sabroe.com
Sabroe S68 Refrigeration Oil

Product Description
Sabroe S68 Refrigeration Oil is formulated with high quality hydrotreated mineral oil combined with an excellent performance additive package. The oil has low volatility, enabling decreased maintenance and significantly reduced oil carryover.

Features and Benefits
- Oxidative stable: Longer system life
- Low carry-over: Improves evaporator efficiency
- Corrosion protection: Enhanced system reliability and reduced down-time
- Low pour point: Easier oil drainage
- Low volatility: Reduced need of oil top-up cutting maintenance costs

Applications
Sabroe S68 Refrigeration Oil is particularly suited for use in ammonia compressors with evaporative temperatures not lower than -40 °C.

Sabroe S68 Refrigeration Oil is Food Grade registered by NSF International with Category Code H2.

Typical Properties

<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>Typical</th>
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<tr>
<td>Viscosity © 100°C, cSt</td>
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<td>ASTM D445</td>
</tr>
<tr>
<td>Viscosity Index</td>
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<td>ASTM D2270</td>
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<tr>
<td>Specific Gravity, g/ml</td>
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</tr>
<tr>
<td>Pour Point, °C</td>
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<tr>
<td>Acid no., mg KOH/g</td>
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