



## FILTER ELEMENTS

# Lubricating oil filter for refrigeration systems with $\text{NH}_3$

In industrial refrigeration systems that use  $\text{NH}_3$  as a refrigerant, ammonia can get into the lubricating oil system, where it then attacks the oil filters. Ammonia-resistant filter elements are available to overcome this issue.



Source: Stauff

Special adhesives, seals and filter materials are used in oil filters for refrigeration systems with ammonia.

Depending on the application, original equipment manufacturers, maintenance companies and users opt for filter materials such as glass fibre fleece, stainless steel mesh or filter paper, the filter fineness of which is usually between three and  $250 \mu\text{m}$ .

A typical filter element, such as one made by Stauff, consists of up to seven different filter materials, which are put together and folded by machine. Folding increases its capacity to trap dirt and ensures greater filtration performance in a confined space. In addition to precise-

ly manufacturing the individual elements, the quality of a lubricating oil or hydraulic filter also depends on carefully connecting the filter elements using special adhesives, and the sealing materials used.

### | If ammonia gets into the lubricating oil

Manufacturing filter elements for the lubricating oil systems in industrial refrigeration systems poses a particular challenge. Given its high energy efficiency, ammonia has been used as a refrigerant for decades. However, if  $\text{NH}_3$  enters the oil circuit, unfavourable chemical processes are set in motion there.

It is impossible to completely prevent the diffusion of gaseous ammonia into the lubricating oil system due to the design of the piston and screw compressors used to compress the refrigerant. Gaps and cracks in seals or connections caused by material fatigue, for example, also allow ammonia to enter the oil, the ageing of which is accelerated by subsequent oxidation processes: Deposits form, clogging filters and pipes, and impairing heat transfer. Volatile oil components evaporate, so that the viscosity of the remaining oil is impaired. The lubricity decreases and bearings and other moving parts wear more.

In addition, seals and other non-ammonia-resistant materials are affected, leading to further leaks and thereby exacerbating the problem. Overall, the lubricating oil quality deteriorates rapidly, necessitating more frequent oil changes, costly maintenance work and, in extreme cases, the oil system to be completely replaced.

### | Standard oil filters are insufficient

Most conventional filter elements are not designed to come into contact with ammonia. Standard adhesives and many common sealing materials are not resistant to ammonia. The adhesives swell, lose their adhesive strength or simply dissolve. The sealing material also loses its elasticity and becomes brittle, thus causing the filter elements to leak. This results in impurities enter-



Source: Stauff

ing the oil systems unhindered. In the worst case, the entire refrigeration circuit is affected.

Filter materials are combined: one filter element can contain up to seven different filter materials.

### | Ammonia-resistant filter elements

To eliminate these risks, special ammonia-resistant filter elements are available, such as those from Stauff. These components only comprise filters, sealing materials and adhesives that retain their stability and functionality, even when in permanent contact with ammonia.

Depending on the supplier, they can even be fitted in existing systems without requiring any design changes, thereby improving safety and performance levels. Manufacturers of industrial refrigeration systems use these filter elements to increase system reliability.

The service life of compressors is also extended, as lubrication is permanently guaranteed and no harmful deposits are formed. Maintenance intervals are longer, downtimes are less frequent and the total cost of ownership is reduced. (dm)

## INFORMATION

### Key filter types in the hydraulic and lubricating oil circuit

**Pressure filters** are installed after the pump to clean the oil of wear particles before it flows through the downstream components, such as valves and cylinders. Alongside their function as protective filters, pressure filters also serve to maintain the required purity class.

**Return-line filters** are installed on or in the oil tank to remove impurities from the oil before it flows back into the oil tank.

**Diffusers** are used in conjunction with return-line filters to ensure that the returning oil flow is calmed and reaches the oil tank without foaming or swirling up deposited dirt.

**Suction strainers** are primarily used as functional protection of the downstream pump in the circuit.

Suction filters should always be installed if there is a particularly high risk of pump damage due to coarse contamination. This risk exists if impurities collect in the tank and it cannot be cleaned.

**Tank filler breathers** are fitted to the oil tank and prevent the ingress of dirt from the environment by ventilating the tank.

**Desiccant air breathers** remove moisture from the air flowing into the tank, thereby preventing water from accumulating in the oil.

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