GEA
Refrigeration Division

Grasso

Grasso self-limiting automatic Purger

Improves the performance of every industrial refrigeration plant

Grasso Purger

The Grasso self-limiting automatic Purger...

Non-condensables bring down plant performance and increase energy consumption

Refrigeration systems must therefore be kept as free as possible from non-condensables. The most effective way of doing this is by automatic purging, as this responds immediately to any entering of non-condensables in the system.

Conventional purging is always accompanied by loss of costly and polluting refrigerant. The Grasso self-limiting and cooled Automatic Purger reduces this loss to a minimum.

Non-condensable gases cause considerable loss of efficiency. Air or other non-condensable gases can dissolve in the refrigerant and come into circulation in the refrigeration system, causing even in small concentrations a significant increase in condensing presure, resulting in a considerable loss of efficiency.

Five ways in which non-condensables enter the system

1. The refrigerant, when delivered, may contain non-condensables up to 1.5%.
2. For service and maintenance certain parts of the refrigeration plant are frequently opened, causing air to penetrate into the system. Oil changing and recharging with refrigerant have the same effect.
3. Leakage: Systems operating with suction pressure below atmospheric pressure can have small leaks (close to seals etc.) allowing air to penetrate into the system.
4. Inadequate evacuation before commissioning the refrigeration plant.
5. Decomposition of the refrigerant or the lubricating oil can occur due to catalytic action of the various metals in the installation and due to high discharge temperatures.
   Ammonia for instance decomposes into nitrogen and hydrogen.

Dimensions
Length: above 700 mm
below 500 mm
Height: 450 mm
Width: 330 mm
Weight: 40 kg

...increases the efficiency and improves the characteristics of every industrial refrigeration plant

Example NH_3

In a plant, operating with ammonia, the discharge pressure gauge indicates 12.4 bar and 32 °C. A condensate temperature of 24 °C is measured and this value corresponds to a condensing pressure of 9.7 bar. So the partial pressure of the non-condensables is 2.7 bar. If in this case the suction pressure is 2.9 bar (-10 °C), it follows from the calculation that the refrigerating capacity has decreased by 7.3%, based on an increase in power consumption by 17.1%. This results in an increase in energy consumption by 26.2%!

Example R22

In a plant, operating with R22, the discharge pressure gauge indicates 12.6 bar and 32 °C. A condensate temperature of 24 °C is measured and this value corresponds to a condensing pressure of 10.2 bar. So the partial pressure of the non-condensables is 2.4 bar. If in this case the suction pressure is 3.5 bar (-10 °C), it follows from the calculation that the refrigerating capacity has decreased by 8.5%, based on an increase in power consumption by 13.9%. This results in an increase in energy consumption by 24.5%!

How can the presence of non-condensables be proved?

Pressure gauges on refrigeration plants are always provided with a temperature scale parallel to the pressure scale and corresponding to the refrigerant used. This scale indicates, at each pressure, the corresponding saturation temperature of the particular refrigerant.

The condensate leaving the condenser has the saturation temperature corresponding to the condensing pressure. This temperature must be established by means of a thermometer. If the discharge pressure gauge shows a temperature higher than the measured temperature, this points to the presence of non-condensables. The difference between the condensing pressure corresponding to the measured temperature and the total condensing pressure indicated by the pressure gauge is the partial pressure of the non-condensables.

Universally applicable, and saving a multiple of its investment

The Grasso self-limiting Automatic Purger is a purging device which reduces the concentration of non-condensables to a negligible percentage, with a just as negligible loss of refrigerant. This patented self-limiting Automatic Purger starts only when the concentration of non-condensables in the liquid receiver is 2% or more and stops when this concentration has dropped to below 1%. Since, in the entire installation, the average concentration of non-condensable gases is much lower, this represents an average concentration in the installation of less than 0.1%.

Calculate your profit on the basis of:

- **Savings in terms of money**

$$S = f_a \times Q_O \times \tau \times T \times E_c \times X$$

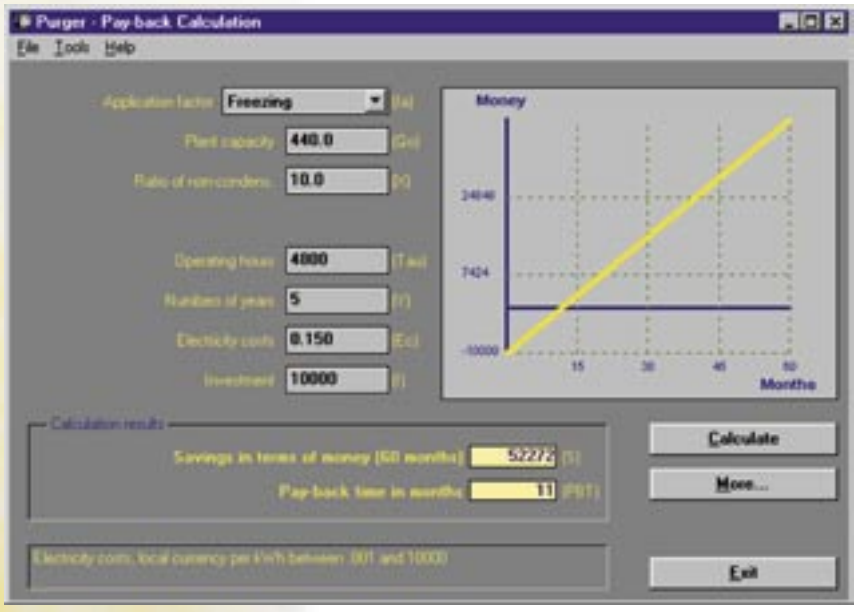
- **Pay-back time in years**

$$PBT = \frac{I}{f_a \times Q_O \times \tau \times E_c \times X}$$

f_a = *application factor:*
f_a cooling ~ 0.25
f_a freezing ~ 0.33
Q_O = *plant cooling / freezing capacity in kW*
τ = *full load operating hours per year*
T = *numbers of years*
E_c = *electricity costs, local currency per kWh*
X = *ratio of non-condensables in the condenser before purging (average directional value 0.1)*
I = *investment in automatic purging*

By using the Grasso Purger - Pay-back Calculation software programme you can calculate your own savings and Pay-back time.

Free to download from the grasso internet site: www.grasso-global.com



Results of use

- Capacity of the refrigeration plant comes up to and stays at maximum level
- Quality of the oil and the refrigerant stays at high level
- Safer for operators
- Increased safety of the total plant
- Friendly for the environment

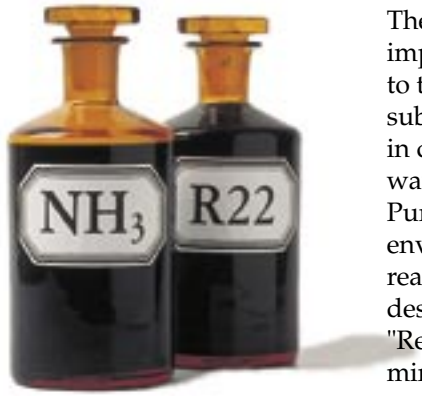
- Lower energy consumption
- Very sharp reduction of refrigerant losses
- Less oil consumption
- Less or no plant breakdowns during hot summers

- Fully automatic and self-limiting operation
- Due to maximum efficiency less running hours of the compressors and the condenser fans, less wear of the installation and less maintenance
- Longer life for the plant

The Grasso self-limiting Automatic Purger very quickly saves a multiple of its investment and is universally applicable.

Environment and the future

General concern about the effect of human activities on the global environment has grown rapidly. There is a widespread anxiety over the influence of CFC's and other manmade gases on the ozone-layer, some of which are used in refrigeration systems.



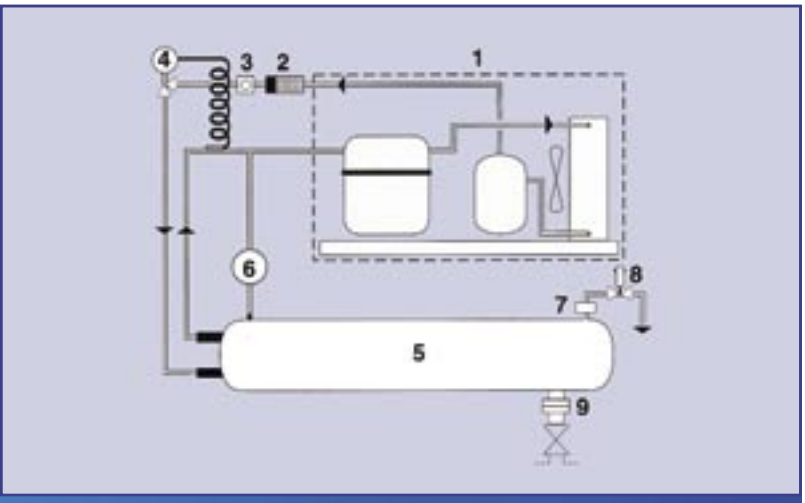
The Grasso Purger has a number of important characteristics contributing to a better environment:

- A substantial reduction of the energy consumption of your refrigeration plant.
- A controlled quantity of purge gas just sufficient to purify the refrigerant of the largest industrial plants.
- The condensation of the refrigerant in the Grasso Purger's heat exchanger takes place at condenser pressure and a very low temperature. This results in a very low refrigerant content in the purge gas. The Grasso Purger achieves this by having an independent refrigeration unit, therefore, the evaporating temperature of the main plant has no effect on the purging efficiency. The Grasso Purger can operate even when the main plant is out of operation!
- The Grasso Purger's refrigeration unit uses refrigerant R404A, this refrigerant is not harmfull to the ozone layer. R404A is also an excellent refrigerant to reach the very low temperatures required for purging.
- A fully automatic and selflimiting operation.

The savings on energy cost (indirectly implying a reduced contribution to the "Global Warming") plus the substantially lower refrigerant losses in comparison with alternative ways of purging, make the Grasso Purger also the best choice when the environment is concerned. For this reason, in 1990, the Grasso Purger design was awarded the NVKL "Refrigeration Award", by the Dutch minister of Environmental Affairs.

It is Grasso's belief, that it is the responsibility of both the suppliers and the users of refrigeration equipment and processes to do their utmost to promote a safe future development.

Outstanding characteristics



1. Condensing unit 2. Filter 3. Sight glass 4. Thermostatic expansion valve 5. Heat exchanger 6. LP and HP pressure controller 7. Calibrated restriction 8. Purging solenoid valve 9. Flanged connection

Fully automatic operation

The Grasso self-limiting Automatic Purger self starts every 24 hours. If the concentration of non-condensables in the liquid receiver is higher than 2%, the Grasso Automatic Purger continues to operate until this concentration has dropped to below 1%. The Grasso Purger is then switched off automatically.

Patented self-limiting system

This patented system reduces the loss of refrigerant to a minimum. The Grasso Purger always remains closed to atmosphere if the concentration of non-condensables is lower than 1%. As soon as it reaches 2%, purging sets in automatically.

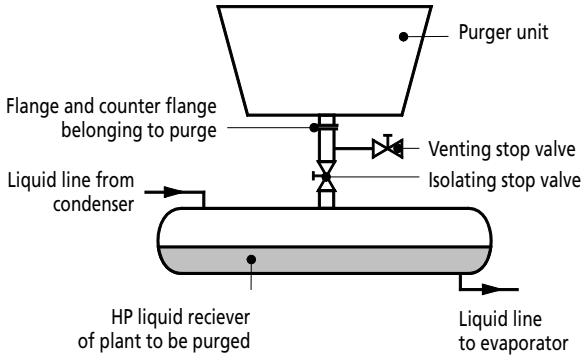
The Grasso self-limiting Automatic Purger is easy to install and ready to plug in by means of 220-240V/50 Hz (60 Hz on request).

- Suitable for all usual refrigerants.
- Self contained, independently operating refrigeration unit; also functions when the main plant is shut down.
- Easy to install; only one connection to the liquid receiver, or the HP float regulator (main plant), is required: As the concentration of non-condensables in the receiver is constantly kept at a low level, and as these non-condensables also circulate in the refrigerant, one connection is sufficient.
- Guaranteed final concentration of non-condensables in the condenser lower than 2%.
- Saving more than 95% of refrigerant when compared with manually purging.
- Suitable for any size of refrigeration plant; even on a 6000 kW installation, the Grasso Purger showed to have sufficient capacity!
- The most environmentally friendly Automatic Purger!
- Featuring an hours-run counter for the registration of the effective purging time. Also a "free contact" is available to enable central hours-run registration.
- Suitable for ambient temperatures up to 45 °C.
- Built according to CE PED regulations

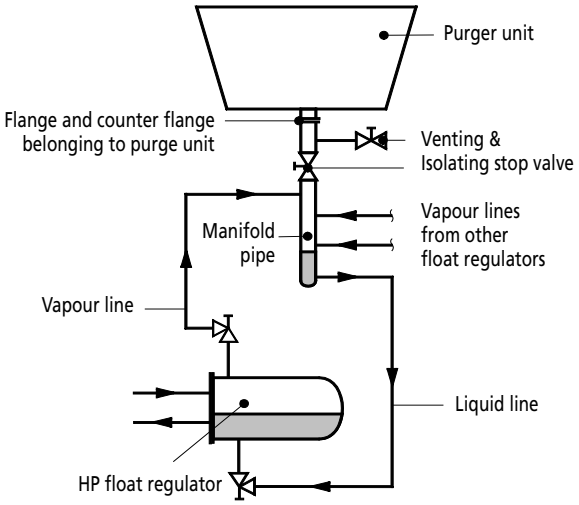
Installation

The Grasso self-limiting Automatic Purger can be quickly and easily connected to a new or existing refrigeration plant. Only one connection has to be made to a high-pressure liquid receiver (a.) or to a high-pressure float regulator (b.).

a. Grasso purge unit with connection to a high-pressure liquid receiver



b. Grasso purge unit with connection to a high-pressure float regulator



Grasso...
comprehensive and totally accessible

Grasso Products b.v. and Grasso GmbH Refrigeration Technology are among the world's leading manufacturers of state-of-the-art reciprocating and screw compressors. Our innovative packages, chillers and components for industrial refrigeration plants, freezing and air conditioning systems are also recognised for their exceptional reliability and efficiency.

The Grasso range includes:

- Reciprocating compressors and packages; single stage and compound versions, open drive, 42 types, with swept volumes ranging from 130 to 2,390 m^3/h (77 to 1,410 CFM)
- Single and two-stage screw compressor packages; 21 screw compressor models with swept volumes ranging from 230 to 8,560 m^3/h (136 to 5,069 CFM)
- Ammonia liquid chillers for air conditioning or process cooling; reciprocating compressor types ranging from 60 to 2,200 kW (30 to 627 tons) and screw compressor types ranging from 200 to 8,700 kW (57 to 2,476 Tons)

- Electronic control units
- Refrigeration valves and components
- Self-limiting automatic purgers of non-condensable gases
- Pressure vessels
- Maintenance of refrigeration systems

With headquarters in the Netherlands and with production facilities in the Netherlands and Germany, more than 90% of our production is exported to countries all over the world.
Grasso is readily accessed and at your service, via its sales offices in the Netherlands, Germany, Denmark, United Kingdom, France, Italy, Portugal, Poland, the Czech Republic, Slovakia, Russia, the Ukraine, Lithuania, the United States, South Africa, the Philippines, Australia, Chile, China, Thailand and Indonesia.

Grasso Products b.v. and Grasso GmbH Refrigeration Technology are members of GEA AG, itself now a multinational participant in the mg technologies group.

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CE

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A company of mg technologies group

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