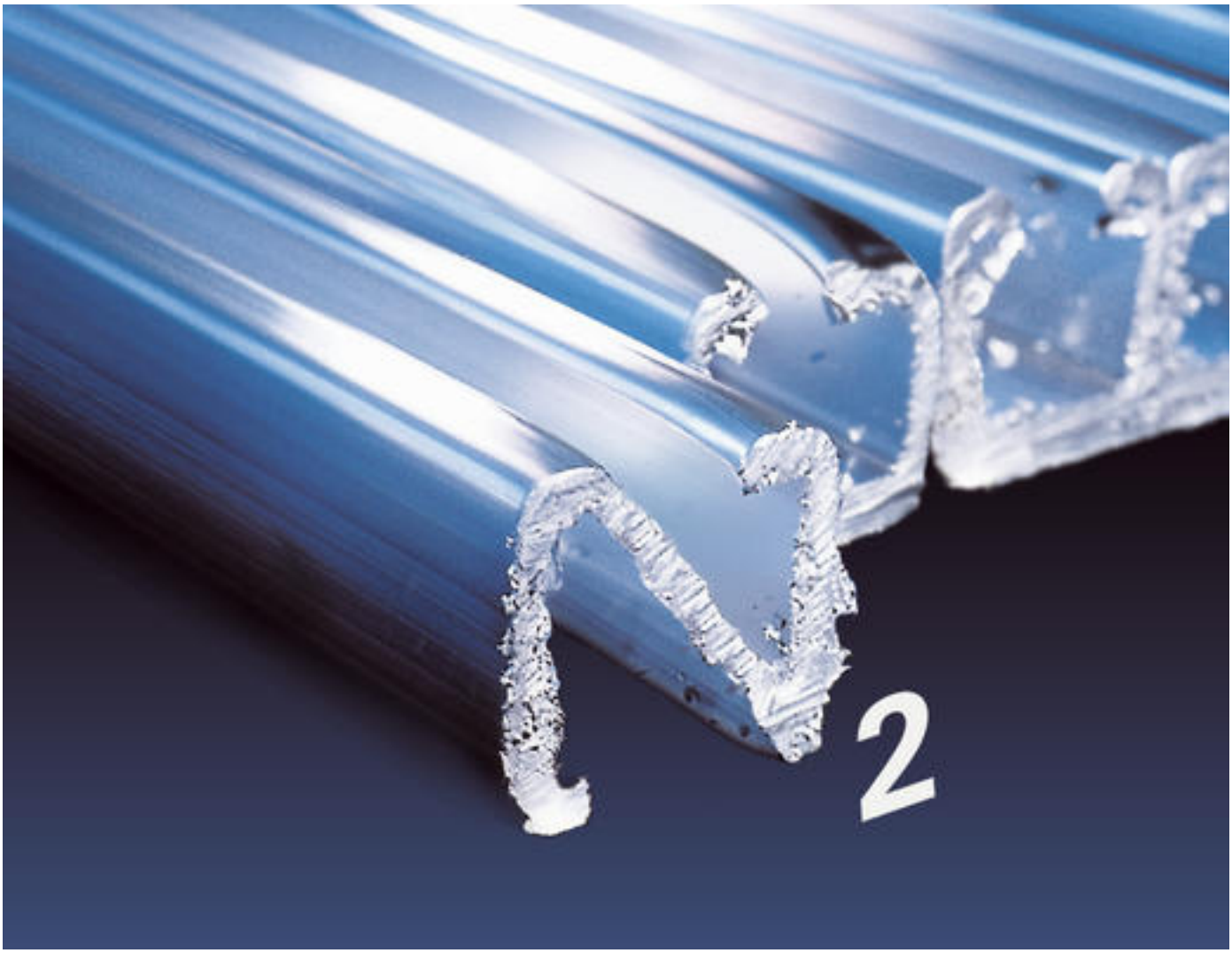
Quality – cryogenically produced

Cryogenic nitrogen for industrial applications



The nitrogen is stored in specially insulated tanks.

Nitrogen: tried and tested, economical, versatile

At approx. 78% by volume, nitrogen is the main constituent of the air we breathe. Air was first liquefied back in 1877 by L. Cailletet and R. P. Pictet. Nitrogen made its breakthrough as an inert coolant in the 1950s and 1960s thanks to the construction of large-scale, highly efficient cryogenic air separation units. This meant that large quantities of economically priced nitrogen were available for a wide variety of processes.

The key advantages of liquid nitrogen as a coolant are:

- Good dosability
- Flexible adjustment to suit refrigeration requirement
- Good heat transfer
- Chemical inertness
- Dual use possible

Dual use for cooling and inerting

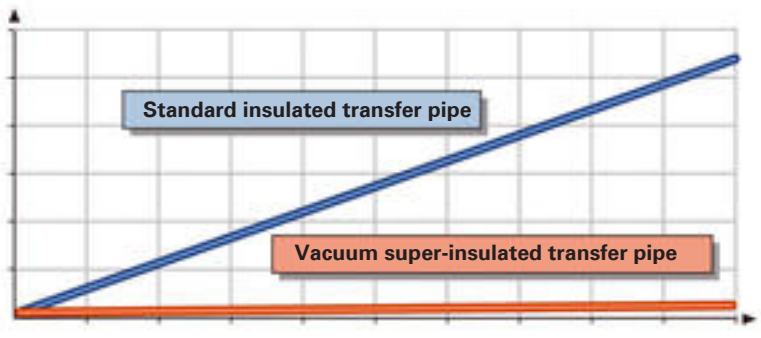
Small heat exchanger surfaces are possible thanks to effective heat transfer. The chemical inertness allows direct contact between nitrogen and the material being cooled. Costs are saved by the fact that nitrogen can be used for cooling as well as for inerting.

Cryogenic nitrogen requires expertise

The cryogenic temperature of -196 °C demands special expertise in storage, transport and application. The nitrogen is stored in special tank systems whose insulation ensures minimum long-term losses of the cryogenic nitrogen due to the effect of ambient heat. Different-sized tank systems are available for different applications and nitrogen requirements.

The nitrogen is piped to the application via a special pipe. Each heat transfer to the system results in the evaporation of nitrogen and, therefore, cryogenic losses, which should be kept to a minimum. The pipe must therefore be very well insulated. In addition to standard insulated pipes, vacuum super-insulated pipes are also popular today. Their advantage lies in effective insulation and low losses.

The diagram illustrates evaporation losses for the different pipes. It is clear that above a certain requirement, investment in a vacuum pipe pays for itself within a short period of time.



Evaporation losses in the supply pipe

The subcooler increases the cooling quality of the nitrogen.

Controlled cooling of steel parts in a cold chamber.

Perfect cryogenic control

The withdrawal of nitrogen from a tank, in which it is stored at a pressure of approximately 5 bar and a temperature of approximately -180 °C, results in evaporation until the nitrogen reaches its -196 °C temperature at atmospheric pressure. Special units compensate for the nitrogen that is evaporated in the pipe as well as the degassing resulting from the pressure difference between tank and application.

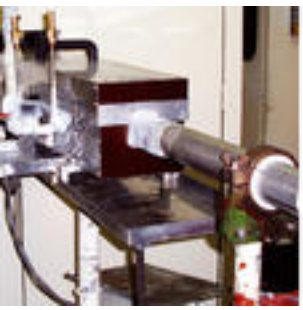
The simplest device is a gas phase separator, which distinguishes between liquid and gas and lets the gas that is formed by the heat from outside escape at the highest point of the supply pipe.

If liquid nitrogen is required at atmospheric conditions, a device known as a subcooler is used. It feeds some of the nitrogen into a depressurised container, where evaporation takes place due to expansion. The subcooler, thus filled with -196 °C, contains a heat exchanger, which then cools the still "warm gas" (-180 °C) to almost -196 °C as well. In this way, the evaporation takes place in the subcooler rather than the application.

Typical applications for cryogenic nitrogen:

- Inner hose cooling: this involves the cooling of the hose core during the manufacture of braided hoses so that the braid does not cut into the hose
- Cold chamber: it uses cryogenic nitrogen to cool steel to a set temperature in order to improve its properties (hardness)
- Rubber deflashing: cryogenic nitrogen cools the flash of a rubber moulding, making it brittle and easy to remove
- Aluminium extrusion: the nitrogen compensates for the heat that is generated. This allows the productivity of the machines to be increased while also facilitating dual use through inerting of the aluminium profiles
- Shrink fitting of bearings and shafts: for easy assembly with the aid of a nitrogen immersion freezer
- Shrink fitting: for rapid and secure joining of cylindrical metal parts by immersion in a liquid nitrogen bath
- Pipe freezing: to freeze pipe contents in order to carry out repairs
- And much more

Examples of applications



Inner hose cooling

Pipe freezing

Rubber deflashing

Aluminium extrusion

Shrink fitting

Pipe freezing is one of many applications for cryogenic nitrogen.

Messer possesses the necessary professional cryogenic expertise. In addition, we supply everything connected with cryogenic applications.

If you have any questions or would like a personal consultation with our application experts, please do not hesitate to get in touch with us.

You will find the relevant contacts in your country on our website at:

www.messergroup.com/de/Standorte

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