

Cryo-condensation, the Flexible Process for Exhaust Gas Purification



Exhaust Air Purification by Cryo-condensation

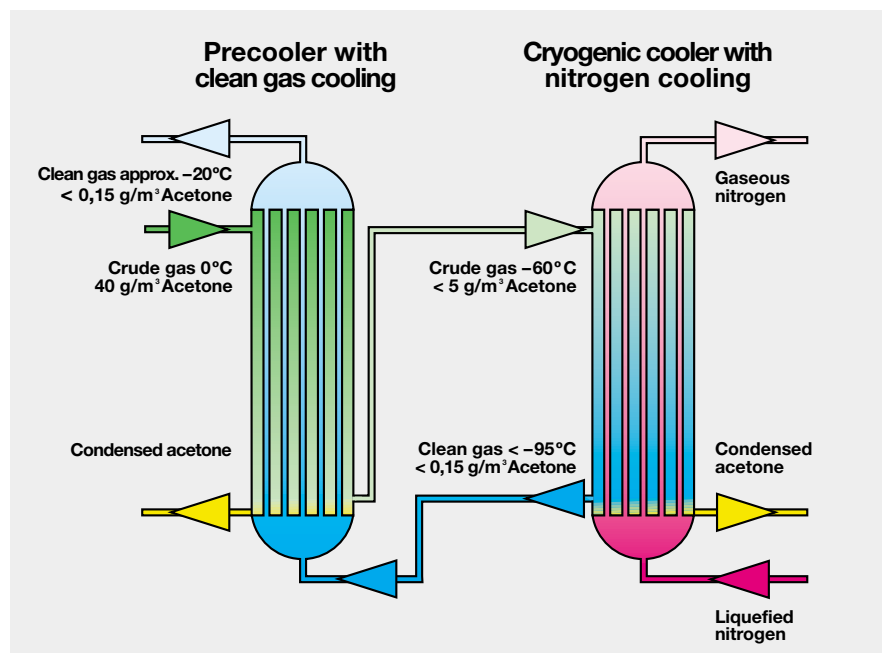
Regardless of the demands made on an exhaust air treatment plant (pollution abatement or recovery of reusable substances), the process used must not only satisfy current requirements, but also work effectively should the exhaust gas parameters change at some time in the future.

These changes, however, are rarely foreseeable. Ideal solutions are therefore those that are flexible as far as the exhaust air components that are to be held back, capacity and operating costs are concerned.

Cryogenic and very flexible...

The process of cryo-gas, which uses liquefied nitrogen as refrigerant, is highly adaptable. The contaminated exhaust air is cooled down to such a low temperature in heat exchangers that the contaminants and reusable substances in it are separated out by condensation or freezing.

The condensation temperature needed is determined by the composition and required purity of the exhaust gas (e.g. German air control specification TA-Luft). In some cases temperatures lower than -150°C are necessary.

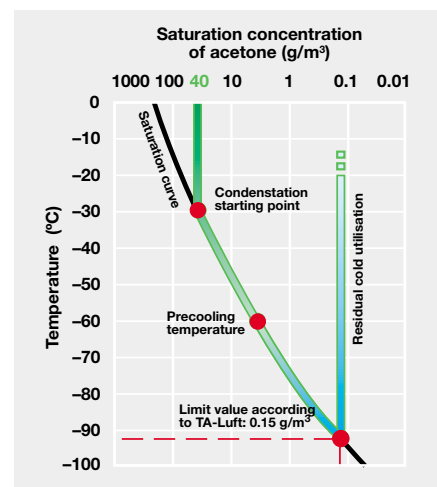


Example of the purification of an acetone-contaminated exhaust gas stream by cryogenic cooling with liquefied nitrogen

Advantageous process...

Low-temperature condensation with liquefied nitrogen (-190°C at 1.0 bar) enables:

- ▶ condensation temperatures well below those of conventional refrigerating machines
- ▶ simple adaptation of temperature control to new conditions, e.g. changed gas compositions
- ▶ adjustment of condensation capacity within broad limits through variable metering of nitrogen as refrigerant
- ▶ treatment of highly contaminated exhaust air streams
- ▶ simultaneously realisation of lowest residual contamination down into the ppm range
- ▶ unproblematic combination with other processes, e.g. adsorption.



Safe, Simple and Environment-Friendly

Economical...

Cryogenic condensation is a cost-saving process offering many advantages. The following factors speak for it:

- ▶ Reusable substances in the exhaust gas are recovered and recycled.
- ▶ Apart from the exhaust air constituents removed, no further substances requiring disposal are produced, e.g. used adsorbers or scrubbing liquids.
- ▶ Maintenance costs are kept very low by the avoidance of moving parts.
- ▶ The evaporated liquefied nitrogen used as refrigerant can be reused in its gaseous form, e.g. as inert gas in a works network. It can therefore be used twice.

Versatile...

Cryo-condensation can be used in a wide range of fields of application.

Common fields of application are:

- ▶ the purification of exhaust gas streams up to about 500 m³/h
- ▶ the cleaning of highly contaminated exhaust gases, e.g. in dryers with inert gas circuit or in tank exhaust-air systems
- ▶ the removal of exhaust air components requiring low temperatures for condensation, e.g. CFHC, acetone, alcohols
- ▶ exhaust air streams with low water content, where the cold of the nitrogen can best be used.

Customised solutions...

Every exhaust air problem is different. The implementation of the process in an industrial plant must therefore be as individual as the problem itself.

In close co-operation with the plant operator, Linde's experienced application engineers therefore look for the best solution for the particular case in hand.

Standard processes are not used – but proven standard components are. These include specially developed condensers, which enable optimal purification of the exhaust air at high degrees of efficiency.

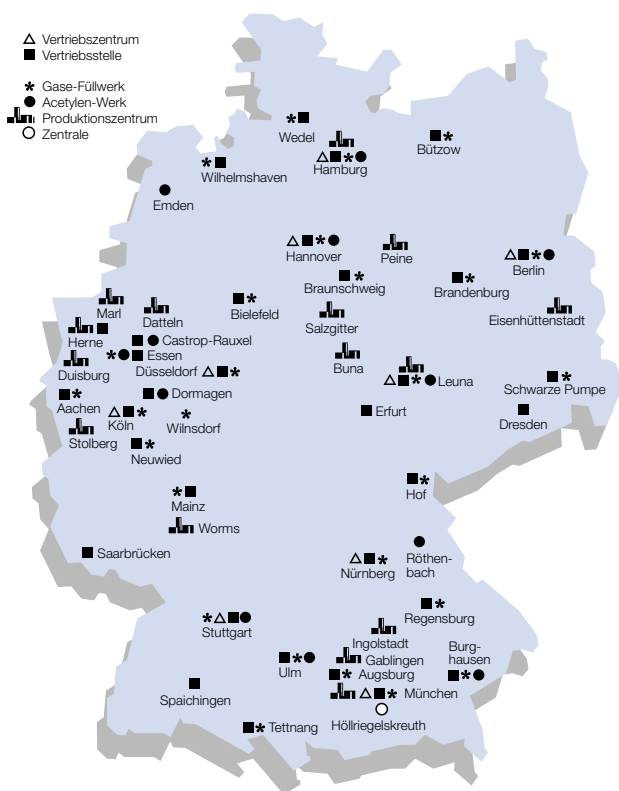
In addition to the know-how of our experts, we also make a mobile test plant available to our customers for important tests – alternatively in our Application Engineering Centre or on-site at the customer's.

This makes it possible to find a simple, yet customised solution for every exhaust air problem.

Plant for the recovery of acetone



Linde Service, bundesweit in Kundennähe



Vertriebszentrum **Berlin**
 Gradestraße 107
 12347 Berlin
 Telefon (0 30) 6 09 08-0
 Telefax (0 30) 6 09 08-1 36

Vertriebszentrum **Düsseldorf**
 Reisholzer Bahnstraße 4
 40599 Düsseldorf
 Telefon (02 11) 74 81-0
 Telefax (02 11) 74 81-1 90

Vertriebszentrum **Hamburg**
 Schnackenburgallee 22
 22525 Hamburg
 Telefon (0 40) 85 31 21-0
 Telefax (0 40) 85 31 21-66

Vertriebszentrum **Hannover**
 Entenfangweg 6
 30419 Hannover
 Telefon (05 11) 2 79 93-0
 Telefax (05 11) 2 79 93-53

Vertriebszentrum **Köln**
 Grüner Weg 6-12
 50999 Köln
 Telefon (0 22 36) 39 08-0
 Telefax (0 22 36) 39 08-37

Vertriebszentrum **Leuna**
 Spergauer Straße
 06237 Leuna
 Telefon (0 34 61) 8 53-0
 Telefax (0 34 61) 8 53-3 00

Vertriebszentrum **München**
 Carl-von-Linde-Straße 25
 85716 Unterschleißheim
 Telefon (0 89) 3 10 01-0
 Telefax (0 89) 3 10 01-3 46

Vertriebszentrum **Nürnberg**
 Vogelweiherstraße 73
 90441 Nürnberg
 Telefon (09 11) 42 38-0
 Telefax (09 11) 42 38-1 15

Vertriebszentrum **Stuttgart**
 Daimlerstraße 27-33
 70825 Korntal-Münchingen
 Telefon (07 11) 8 00 02-0
 Telefax (07 11) 8 00 02-19

Änderungen vorbehalten • Gedruckt auf chlorfrei gebleichtem Papier

Linde

Linde AG
 Werksgruppe Technische Gase
 Seitnerstraße 70
 82049 Höllriegelskreuth
 Telefon (0 89) 74 46-0, Telefax (0 89) 74 46-12 30