

Making our world more productive



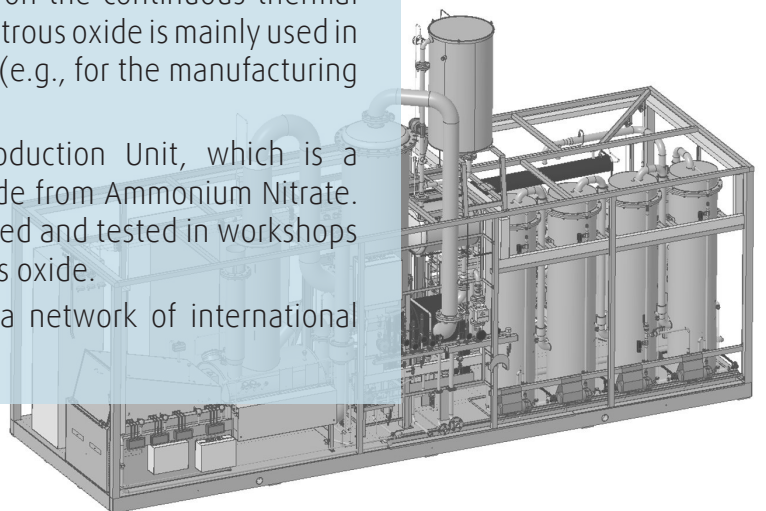
## Nitrous Oxide Production Plant

### The Number One manufacturer

The production of nitrous oxide ( $N_2O$ ) is based on the continuous thermal decomposition of ammonium nitrate ( $NH_4NO_3$ ). Nitrous oxide is mainly used in medicine (e.g., for anaesthesia), in the industry (e.g., for the manufacturing of semiconductors) and in the food industry.

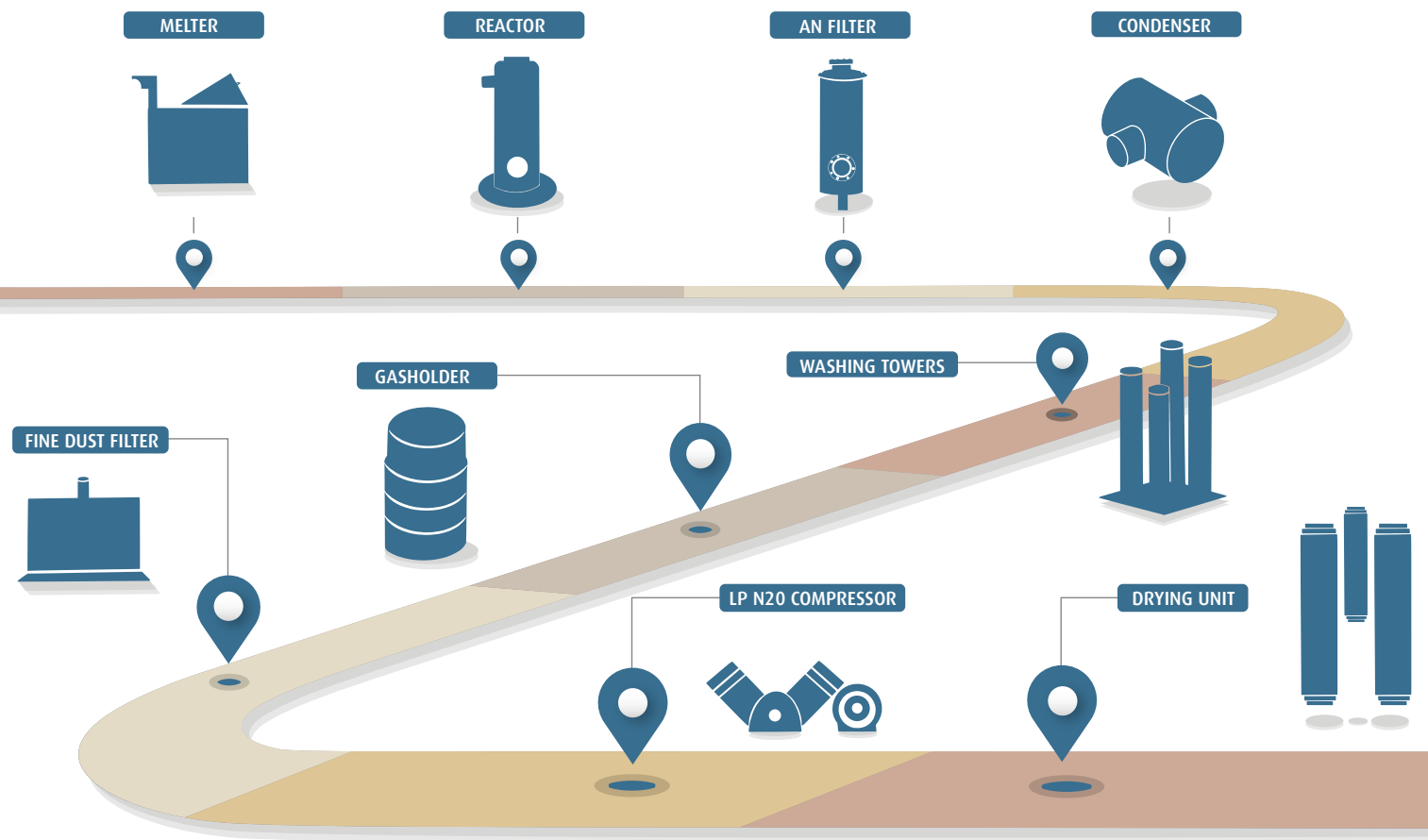
Now, Linde introduces the Nitrous Oxide Production Unit, which is a skid-mounted unit that can produce Nitrous Oxide from Ammonium Nitrate. These high-tech nitrous oxide plants manufactured and tested in workshops and guarantee the optimum production of nitrous oxide.

The Industrial Equipment activity is based on a network of international procedures and Linde's proprietary know-how.



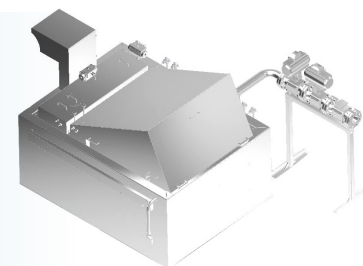


# NITROUS OXIDE PLANT



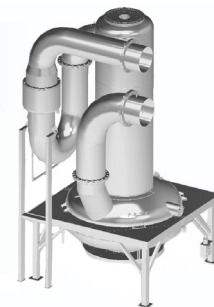
## Melter

Special grade ammonium nitrate (AN) is charged into a melting unit to homogenize and prepare the raw material for chemical reaction.



## Reactor

The resulting liquid is injected into a reactor, where the AN undergoes controlled thermal decomposition into nitrous oxide and water vapour.



## AN filter

The nitrous oxide and water vapour flow through an AN filter, where the AN content of the gas will be removed.



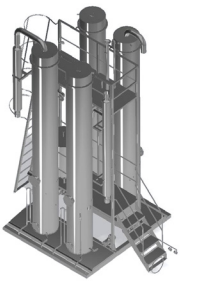
## Condenser

The produced gas is cooled, and the water vapour is condensed in a counter-current water-cooled condenser.



## Washing towers

In the next step, the  $N_2O$  gas-stream undergoes a series of purification steps and enters the washing towers. Purification is performed in these towers by washing the gas with utility water and chemical solutions.



## Gasholder

The purified gas is accumulated in a gasholder.



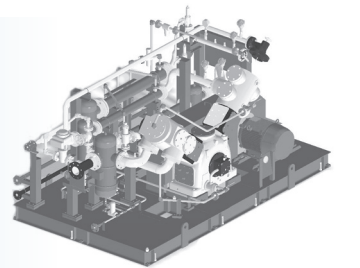
## Fine dust filter

The gasholder feeds a water-cooled compressor through a fine dust filter.



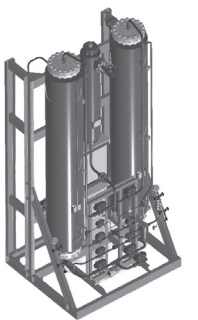
## Compressor

The compressor is equipped with an appropriate heat-exchanger, inter-coolers, after-coolers and separators. The compressor compresses the gas to liquefaction pressure.



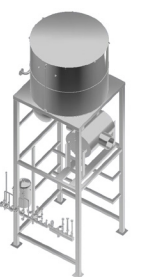
## Drying unit

The produced  $N_2O$  is liquefied and stored after drying.



## Water Distribution & Safety

This unit (WDP) provides the cooling water and process water for all parts of the plant. With its built-in condenser and the Safety- and Additional Safety Water Tank, it is responsible for the water supply of the reactor cooling if that is necessary.



## What can we offer?

- Easy to install container type M-series (which is a container-like module) units from 25 kg/h to 80 kg/h capacity and S-series (separated skid-mounted group of bigger units) units from 130 kg/h to 300 kg/h capacity, tailored for your capacity and layout requirements.
- The production unit can be a high-pressure unit (60 barg), which may be optimal if only cylinder filling is the goal or a low-pressure unit (22 barg), which is more suitable if further filling or purification is required.
- Relay/PLC control system provides an option to choose between a simpler manual system with easier maintenance or an automatized system with tracking possibilities, ensuring increased safety, reduced manpower and further opportunities for preventive maintenance, analysis of issues and a wide range of remote-control possibilities.
- Feed with solid or liquid ammonium nitrate. The feeding in both cases can be automatized. The solid feed can provide smoother heat-balance control, and liquid feed provides better material flow and easier handling.
- 99.5 % (V/V) stable and controlled product purity.

## Why choose us?

- State of the art construction.
- Outstanding quality (components and implementation).
- Reliability and historical background.
- More than 70 years of experience and expertise in Nitrous Oxide technology with more than 50 plants in operation worldwide.
- Investment/operation cost optimizing solutions are available.
- Extensive contacts.
- Worldwide reference.
- Lego-like expandable units with accessories covering the whole production plant from raw material handling to end-product filling.

