

Making our world more productive



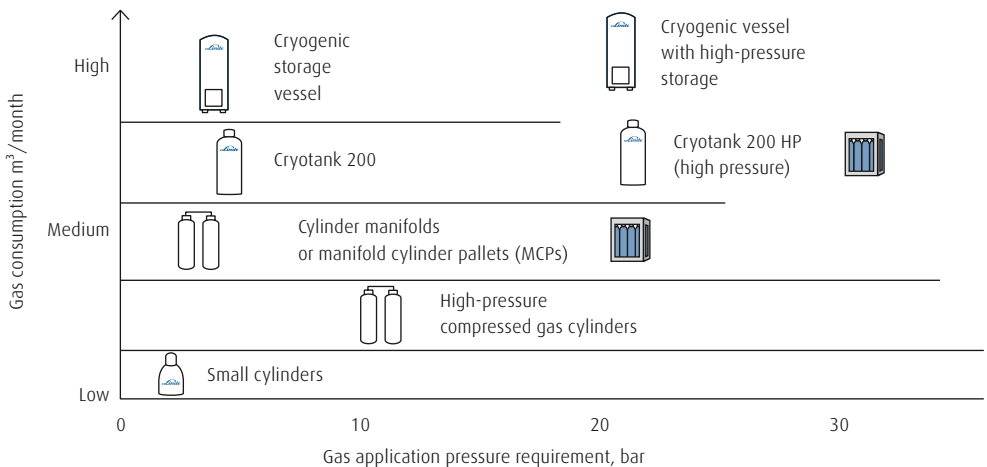
# MAP – Food-grade gases and gas supply





Scientists working in food packaging laboratory.

## Matching supply modes to customer volume and pressure needs



Names may vary from country to country.



## A gas supply adapted to every application

The gases predominantly used in modified atmosphere packaging (MAP) are carbon dioxide ( $\text{CO}_2$ ), nitrogen ( $\text{N}_2$ ) and oxygen ( $\text{O}_2$ ). These gases are used either alone or in mixtures. The gas properties and the interaction of gases with the food ingredients, e.g. solubility in the foodstuff, should be taken into account when choosing the gas or gas composition.

Linde supplies the food-grade gases  $\text{CO}_2$ ,  $\text{N}_2$  and  $\text{O}_2$  and other gases authorised for foodstuffs either pre-mixed or as individual gases in cylinders under high pressure. For higher volume needs, these gases can also be supplied as liquids in insulated tanks for subsequent mixing at the packaging machine.

“Food-grade gas” is a specific definition for gases used as a processing aid and/or additive in order to ensure that standards are complied with. Linde’s food-grade gases conform to food-grade regulations, e.g. the regulation (EC) 1333/2008 and regulation (EU) 231/2012 on food additives within EU countries and the FDA guidelines in the USA.

$\text{N}_2$  and  $\text{O}_2$  are separated from atmospheric air.  $\text{CO}_2$  is taken from natural wells or captured as a by-product of, for instance, fermentation processes (wine, beer) or ammonia production. Sometimes it may be more effective and practical to produce nitrogen on site using PSA (pressure swing adsorption) or a permeable membrane plant. If a PSA/membrane system is used, a backup gas supply system is recommended.

## Careful evaluations ensure the perfect fit

The best supply option depends on the type of foodstuff, the production volume, the packaging line and also whether the gas is to be used anywhere else in production. It may be preferable to have pre-mixed gases supplied if production is relatively limited or if a new production facility is being started up. When production rates increase and various products are to be packaged, it may be more suitable and more economical to switch over to mixing gases on site. Then a mixer is used and the gases are supplied from cylinders, tanks or PSA/membrane systems.

Each application must be evaluated separately before decisions can be made regarding the supply options and gas mixtures. For quality assurance, regularly checking the gas mixture in the finished packages after sealing is recommended.

## Thorough quality control of food gases

Before the cylinders are filled, they are examined, checked thoroughly and pre-treated if necessary. Each unit is regularly analysed to check for cleanliness and the correct mixture ratio. In addition, various independent institutes regularly inspect gas equipment for compliance with sterility requirements.

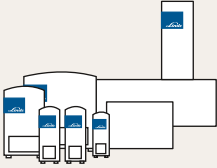
### Advantages for gas users

- Gas supply solutions tailored to volume and pressure needs
- Security of supply
- Constant quality assurance
- Traceability from source to customer
- High standards in purity



# Gas supply

Gas production centre



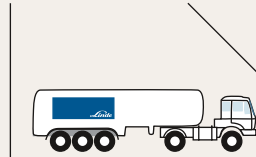
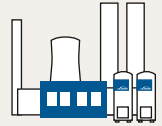
On-site supply



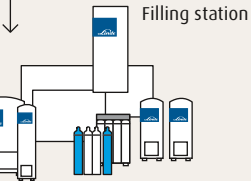
Pipeline



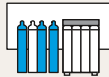
Customer



Transport of liquefied gas



Retailer



Cylinder transport



# Getting ahead through innovation

Our innovative concepts ensure that we play a pioneering role in the global market. As a leading technology company, our task is to constantly raise the bar. Traditionally driven by entrepreneurship, we are focused on developing new, high-quality products and innovative processes

Linde offers more. We create value, clear competitive advantages and greater profitability. Each concept is tailored specifically to meeting our customers' requirements – offering standardised as well as customised solutions. This applies to all industries and all companies regardless of their size.

**Linde – Making our world more productive**

## Linde Gas

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