ATMOFRY™

Extending the life of your frying oils.

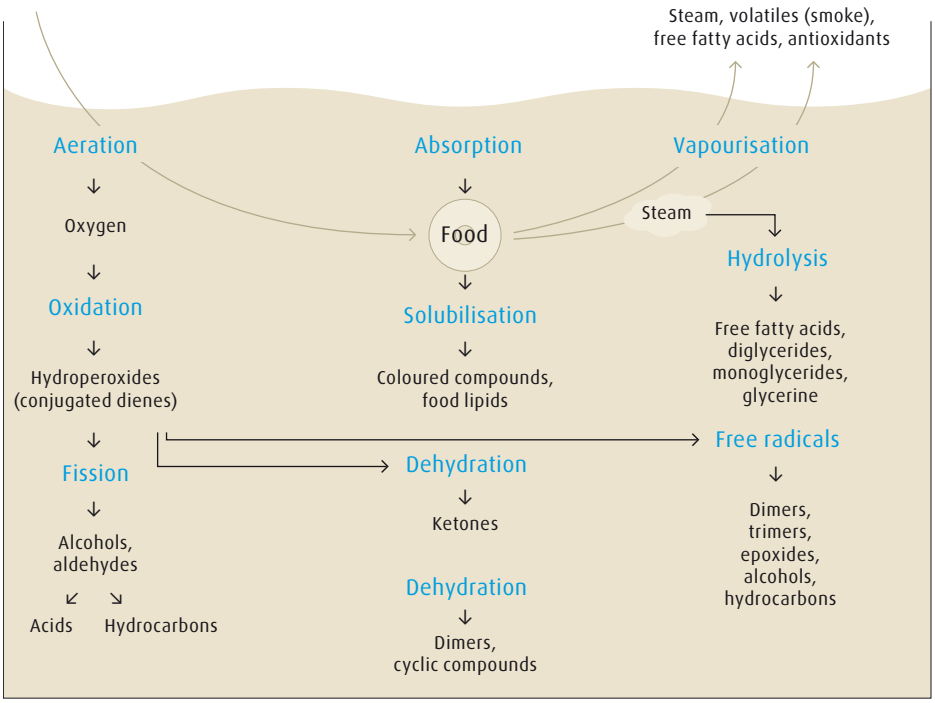
THE LINDE GROUP

Linde

The recipe for increased profitability.
Inerting of frying oils with ATMOFRY™.

ATMOFRY™, a system for the inerting of frying oils, is an innovative, efficiency-enhancing technology from Linde that clearly reduces oxidation in frying oils and thus significantly prolongs their usability and improves the quality of fried food products.

Conversion of substances during deep fat frying



During deep fat frying, oxygen, heat and water from the fried products are the main deterioration factors, they cause formation of volatile and non-volatile decomposition products such as hydroperoxides, different polar components (e.g. aldehydes, ketons and alcohols), monomers and dimers.

Steam will hydrolyse the oil and form free fatty acids and mono- and diglycerides. During storage, the oxidation rate can also be increased by several factors like light, heat, metals, salt etc.

The challenges of frying

Frying usually takes place at 160 to 200 °C. At these high temperatures, unsaturated fats – usually a major ingredient in frying oils – are particularly sensitive to oxidation. The oil becomes darker and more viscous. It begins to smoke and emits unpleasant odours which also affect the quality and taste of the food being prepared. Moreover, the build-up of oxidation products gives rise to a rubbery, hard-to-clean film on the frying surfaces. This also diminishes the heat transfer rate of the frying equipment.

Typical fried products where the oil life can be enhanced are:

- Fish fingers
- Chicken nuggets
- Doughnuts
- Meatballs
- Potato chips
- Samosas
- Egg rolls
- Etc.

The solution: ATMOFRY™

Linde's ATMOFRY™ system for the inerting of oils borrows from a technology widely used elsewhere in the food industry. In the form of micro-bubbles, nitrogen is injected through a sintered, stainless-steel diffuser into the frying oil. This can be done in the in-feed oil pipe for continuous fryers. The nitrogen micro-bubbles merge with the oxygen dissolved in the oil. Together, they rise to the surface of the oil to escape into the atmosphere. This prevents further deterioration through oxidation.

Comparison of pure unused oil, oil used in frying with ATMOFRY™ and oil used for frying without ATMOFRY™.

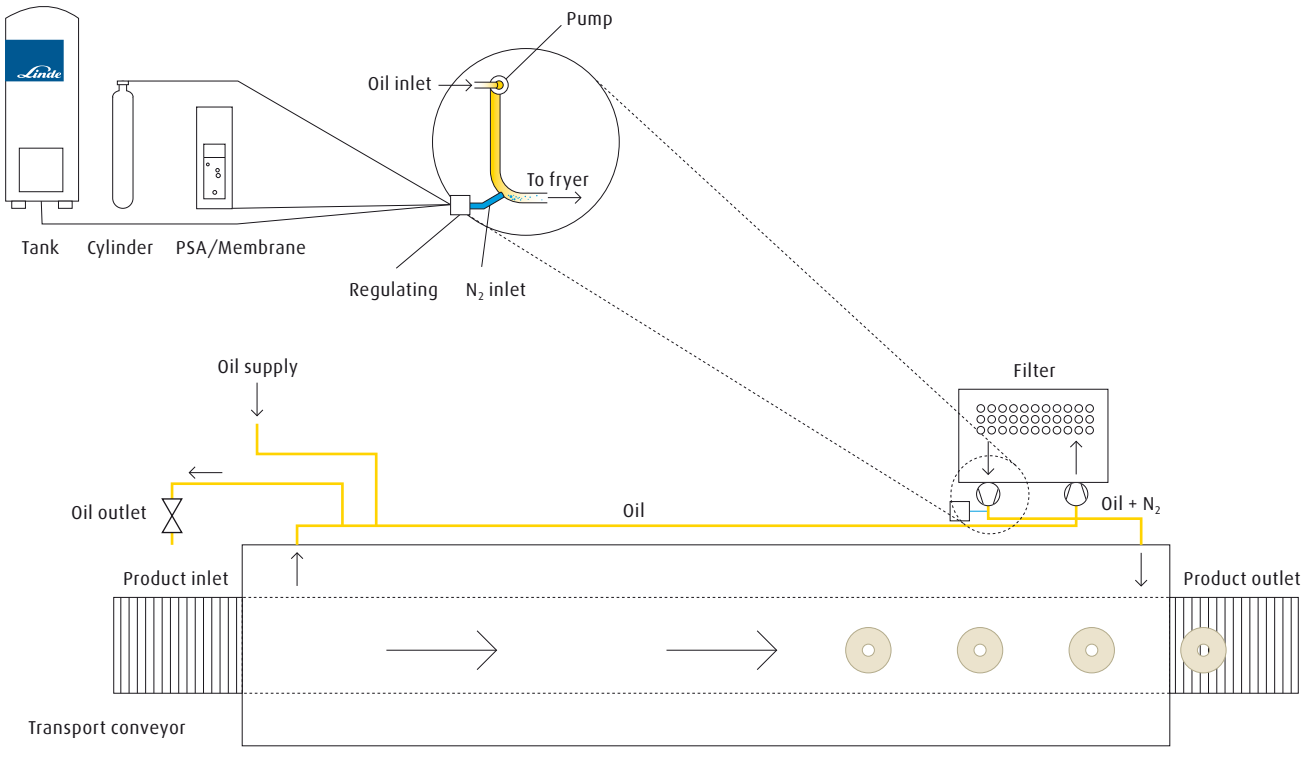
A broad range of advantages. ATMOFRY™ improves oil quality and saves costs.

Nitrogen is tasteless and odourless, with no effect on the oil or on the food being prepared. It is widely used in the food and drink industry to inhibit oxidation in processing, packaging and storage. Using nitrogen to retard oxidation of the frying oil has in many cases actually doubled the life of the oil. In addition, because the oil stays fresher longer, products will also keep a more uniform quality.

The system is most cost-effective with continuously used fryers and fryer volumes of 100 litres and above. Commercially available analyses for free fatty acids (FFAs) and polar components (PCs) are usually applied to quantify the useful life of frying oil.

During storage, the oil can be further protected by a cushion of nitrogen in the headspace of the storage vessel. While significantly extending the life of your frying oil, using ATMOFRY™ will also help you in other ways.

Frying system with external filter and ATMOFRY™



Fryer (top view)

The ATMOFRY™ experience. Easy installation, better products, lower costs.

System installation and nitrogen supply

The installation of the system is simple, usually carried out with minimal disruption of your normal production schedule. The gas supply and control system can be installed off-line without affecting production. Installation of the diffuser into your frying system can be performed at your convenience and whenever no oil is running through the system.

Nitrogen can be supplied in the form of cylinders, an on-site tank, or from an on-site production source. As a rule of thumb, the required total nitrogen flow in m^3/h is around 3.5 times the total frying oil volume in cubic metres.

Customers' experiences

ATMOFRY™ has already opened many food producers' eyes to the cost savings that are possible by extending frying oil life. Apart from these significant cost savings, ATMOFRY™ customers have reported enhanced product quality and lower oil consumption in general.

ATMOFRY™ improves the quality of your food products and reduces maintenance work on frying systems.

All the benefits at a glance

Linde's innovative ATMOFRY™ technology is a multi-benefit solution:

- → Extended life and usability of the frying oil
- → Significant cost savings
- → Enhanced product quality
- → Easy installation
- → Reduced smoke and odour problems

Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

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

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimisation, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – ideas become solutions.

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