

## **Freshline<sup>®</sup> Liquid Nitrogen Injection Solution (LIN-IS)**

*A tailor-made temperature control system for coating, mixing and forming applications*

Consumers today want convenient, high quality, easy-to-prepare dishes. In order to meet these demands, food processors are finding new ways to innovate. One particular trend is the coating, mixing and forming of frozen and chilled products.

This is why we have developed a specially-designed liquid nitrogen injection solution which can be retrofitted to new or existing mixers, buffers and any type of stainless steel vessel.

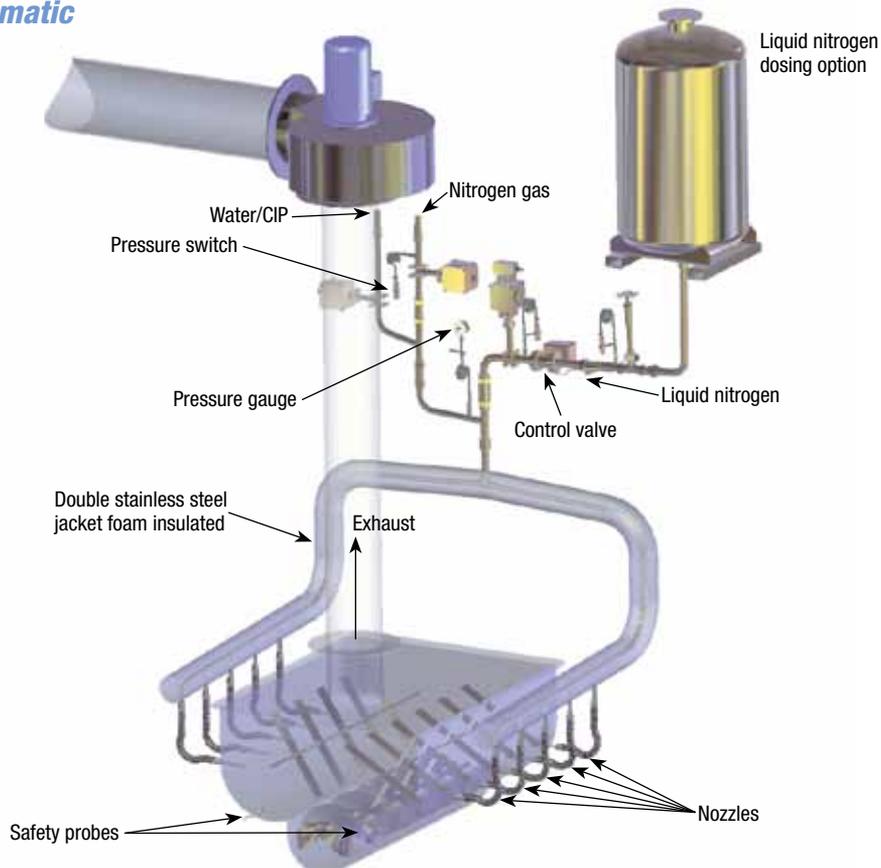
### ***Benefits of liquid nitrogen (LIN)***

Compared with traditional mechanical equipment, liquid nitrogen systems reduce moisture loss, individually quick freeze products (so no clumping) and avoid water crystal formation, leaving a much higher-quality end product. Liquid nitrogen systems can bring about a rapid drop in temperature and, therefore, a very efficient chilling solution. This can be used effectively to control temperature, giving you high-quality products and repeatable and reliable processes.

### ***Advantages of Freshline LIN-IS***

- Consistent and repeatable cooling process
- Prevention of microbial growth
- Reduced aroma and flavor loss
- Improved visual appearance
- Optimum liquid nitrogen usage
- Simple to operate, clean and maintain
- Cost-effective
- Designed to your specifications
- Complies with latest hygienic design standards
- CIP option available

## Freshline LIN-IS Schematic



## $N_2$ versus $CO_2$ – dispelling the myths

There have been many claims over the years that, compared with liquid nitrogen, the use of carbon dioxide as a refrigerant for the cooling and mixing of meat products can have certain effects on microbial shelf-life, color and dehydration.

Recent research carried out by Air Products has ascertained that although the uptake of carbon dioxide by meats is rapid, if it is removed from a carbon dioxide atmosphere, the desorption of the dissolved gas is equally rapid. For this reason, it seems highly unlikely that a chill process using carbon dioxide, on its own and without subsequent MAP packing, would have any effect on the shelf-life of meat products.

Similarly the treatment of meat with carbon dioxide has no known effects on the pigmentation of the meat. Carbon dioxide and nitrogen can both lead to the loss of oxygen from the surface, reducing oxymyoglobin to myoglobin. Chilling in a carbon dioxide atmosphere would lower the pH of the meat and lead to some lightening of the color. This is unlikely to be significant in comparison to other MAP techniques and will again revert to the pre-chilling condition as carbon dioxide evolves from the meat after chilling.

Comparing dehydration rates between the two refrigerants is difficult because the processes employed are not identical. However, based on

the rate of change of the surface temperature of the product alone, similar chilling equipment will produce less dehydration with a nitrogen refrigerant because of the faster reduction of the surface temperature. The refrigerant gas employed would not affect the amount of vapor that can be carried away from the surface.

Research carried out on behalf of Air Products by Dr. C.J. Kennedy of Nutrifreeze Ltd August 2006. For a copy of the paper, please email [guthriej@airproducts.com](mailto:guthriej@airproducts.com)

## A complete solution

We don't just supply the injection; we work closely with our customers to create a complete customized solution, meeting the highest safety and hygiene standards. This can include:

- liquid nitrogen network from control valve to injectors

- LIN supply to control valve
- control systems
- mechanical and electrical modifications
- exhaust systems
- process support

Air Products has over 10 years of experience retrofitting nitrogen on many types of mixers and grinders. We can also work with your vessel supplier to make the modifications prior to delivery to your site to help save you time and money.

## Controlling temperatures in the meat industry

In recent times, an increasing number of high capacity meat mincing machines are being used to deliver the growing demand for burgers and other formed products. However, the heat generated by these machines during the mincing process often means that subsequent forming of the meat product can be difficult.

Currently, this problem can be addressed by mixing in frozen meat product with the fresh, but the results are not always reliable. In addition, the quality of the minced product is considerably reduced because the frozen meat does not provide enough cold to even out the temperature.

The Freshline liquid nitrogen injection system can

be used to control the temperature of the meat itself through controlled injection of liquid nitrogen into the product during mincing. The nitrogen injection is regulated, providing the cold that is required at all times and adjusting the gas consumption to the requirements of the process. This results in improvements in the quality of the minced meat, as the fat is not broken up and the cuts are regular and even.

- The mixes are more even, as the time taken to make them does not need to be shortened as the temperature increases.
- Bacteria are inhibited by changing the contact atmosphere of the meat (no oxygen).
- The appearance of the meat is improved by

avoiding the formation of metamyoglobin resulting from excessive exposure to oxygen in the air.

The system helps enable repeatable and consistent product for forming.

This is just one industry example of where the Freshline LIN-IS can enhance your process. This solution is also suitable for soups, sauces, mixed vegetables, fish and seafood, chicken and many other products.



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### *Ask Air Products...and expect more*

Whether your packaging, cooling, chilling or freezing applications include bakery goods, fruit and vegetables, poultry, meat, seafood, ready meals or anything in between, Air Products' Freshline solutions offer you the high-purity gases and equipment, the international supply capability, and – most important – the unmatched industry experience and technical support to help you succeed, just about anywhere in the world. We can help you improve your productivity, lower your costs, maximize your returns, and, as a result, help make you more competitive in a very competitive market.

### *For more information*

For more information on the Freshline liquid nitrogen injection system or any of our Freshline offerings, call Air Products today to speak with a food industry specialist, or visit us at the website below.

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