High quality nitrogen for the food industry

SULLAIR®

Always air. Always there.®

The increasing demand for fresh food produce

In today's global market place, consumers expect to receive maximum quality at minimum cost.

The food industry is no exception with demand for all types of produce to be supplied to every inhabited place on the globe. Regardless of season and location, everything from exotic tropical fruits to the staple diet of bread, rice and potatoes are expected to be available all year round and in "just produced" condition at competitive, affordable prices. Convenience and quick preparation of meals is also a high priority for the fast paced 21st century lifestyle.

Attractively presented fresh or prepared foods and combination meals, in durable hygienic packages that offer useful shelf life under normal refrigeration, have become very popular.

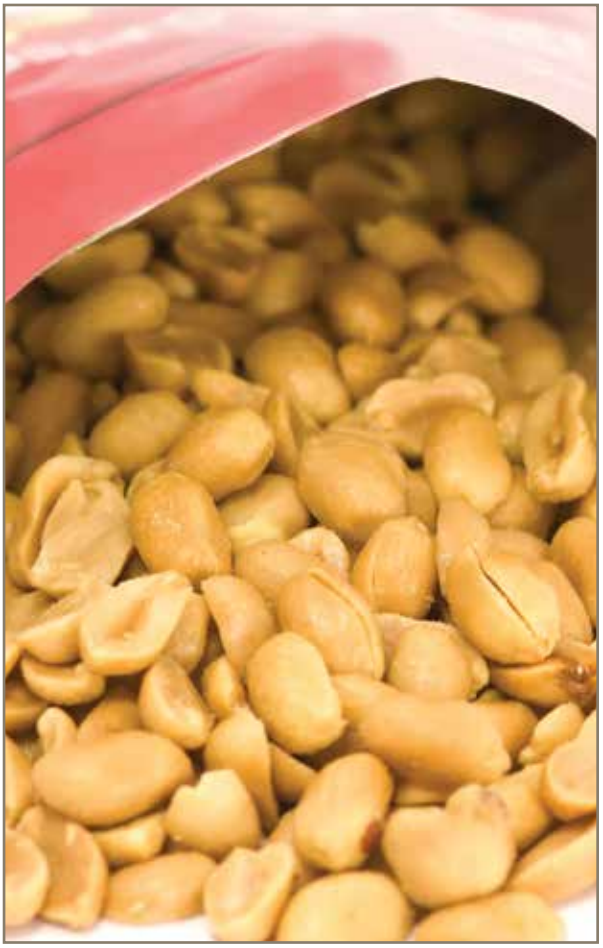
Faced with these consumer preferences and growing demand for an ever wider range of food products, retailers recognise the need for improvements in packaging technology. They need to address the spoilage problem and provide a huge diversity of new prepared foods.

Health concerns continue to drive the insistence on reducing salt, chemicals and preservatives which also places additional pressure on suppliers and manufacturers. They are expected to provide food products that look and taste like they were freshly made or just picked, despite possibly having travelled half way around the world by sea freight.

Operating in a very competitive environment, from the independent retailer to global supermarket chains realise that minimising waste by increasing shelf life, whilst ensuring the product is of prime appearance and taste, is essential to maximising what is often very narrow profit margins. This can be difficult to achieve, but satisfied, loyal, returning customers are key, and both retail and commercial outlets are insisting more and more that their suppliers satisfy these demands with minimal financial impact.

Extending food shelf life

Many foodstuffs start to deteriorate the moment they are harvested or manufactured and prepared for packaging. The cause is attack from a multitude of spoilage mechanisms such as bacteria, yeast and mould spores, either airborne or naturally occurring within the product. Moisture loss or gain, depending on the food can also be undesirable.



If these spoilage mechanisms can be excluded, prevented or their progress retarded in some way, then the natural process of food decay can be delayed, allowing more time from production to consumer without affecting quality.

This benefits everyone in the supply chain from grower, manufacturer and packer through to logistics, retailer and ultimately, the consumer.

Over the past three decades, a safe, tried, tested and proven method of combating food spoilage mechanisms without the use of (or at least a substantial reduction in) undesirable preservatives, is the use of Modified Atmosphere Packaging. Sometimes referred to as “MAP” or “Gas Flushing”.

MAP is quite literally a process whereby produce is packed or stored in a “modified” form of the Earth’s naturally occurring air.

The normal ratio of gases is modified to significantly reduce or prevent the effects of spoilage mechanisms.

However it must be stressed that MAP is not a solution on its own. The shelf life of food produce is influenced by a number of factors including:

- Storage temperature
- Quality of raw ingredients
- Product formulation
- Processing method
- Hygiene standards
- Packaging Material

If any of these are lacking or substandard, the benefits of MAP can be reduced or even totally compromised.

Type and integrity of packaging

The selection of packaging materials is also of vital importance to ensure that MAP gases are internally retained at the desired level and that the transfer of outside contaminants through the pack are prevented.

There are many types of “barrier” packaging materials available and selection is very much dependent on the type of pack, product and gases to be used.

MAP Gases

The main gases used are nitrogen (N_2), oxygen (O_2) and carbon dioxide (CO_2). All three occur naturally in the air we breathe but by using them individually or combining them in the food packaging process, very beneficial results can be achieved.

Modified Atmosphere Packaging (MAP)

MAP is generally used to control four main types

Aerobic Microbes

These need air or oxygen to respire and grow.

Displacing the air in the packaging or storage process with nitrogen gas will cause a reduction in the oxygen level to a point where the bacteria are suppressed and the desired extended produce life is achieved. Some Bacillus, for example.

Anaerobic Microbes

These live without air or oxygen. Some species may even be destroyed or inhibited by very low levels of oxygen. Clostridium, for example.

Microaerophilic Microbes

These need low levels of oxygen to provide an optimum environment for growth. Some also require elevated levels of carbon dioxide, Campylobacter, for example.

Facultative Anaerobic Microbes

These can live and grow with or without air or oxygen. Salmonella species, for example.

For all of these spoilage mechanisms, a single MAP gas or mixture of two or all three will be required depending on the produce to be packaged.

Nitrogen is the most widely used gas. With the exception of raw red meat, raw offal, dark poultry cuts and hard cheese, nitrogen is used in some way for every other food that can benefit from MAP.

Benefits of using Sullair nitrogen gas generators for MAP

- Preservation of product flavour, aroma, texture and nutritional value
- Increased sales through high product quality
- Fewer product returns
- Increased production efficiency with longer production runs
- Better product colour and texture at point of sale
- Extended shelf life
- Increased export opportunities to new geographic markets

Applications

Produce benefiting from MAP:

- Potato chips, corn chips and extruded snacks
- Nuts
- Fresh chilled meats, poultry and fish
- Cooked meats, poultry and fish
- Edible oils - refining of palm and coconut oils
- Coffee and tea
- Powdered milk
- Spices, pasta and other dried products
- Pita Breads, Naan Breads and Pizza bases
- Grated cheese and other dairy products
- Fruit juices and wine
- Salads
- Fruits
- Vegetables

Typical MAP shelf life extension

Product	Gas	Shelf Life In Air	Shelf Life In MAP
Liquid Food & Beverages	N_2	3 – 7 days	1 – 3 weeks
Dried Food Products	N_2	6 months	1 – 2 years
Grated & Soft Cheese	N_2 / CO_2	2 – 3 weeks	2 – 3 months
Fresh Fruit & Vegetables	N_2	3 –6 days	1 – 5 weeks
Fresh Pasta	N_2 / CO_2	1 – 2 weeks	3 – 4 weeks
Chilled & Ready Meals	N_2 / CO_2	1 – 4 days	1 – 2 weeks
Cooked & Chilled Meats	N_2 / CO_2	1 – 2 weeks	1 – 2 months

Packaging equipment often utilising

Image courtesy of HayssenSandiacre Europe

- Vertical Form Fill & Seal, (VFFS)
- Vacuum Chambers
- Thermo Form Fill & Seal
- Snorkel Type

Image courtesy of MULTIVAC

- Horizontal Form Fill & Seal, (HFFS)
- Coffee Podders
- Inerting tunnels
- Tin Can Fillers

Problems with typical nitrogen supply methods

Obtaining a ready supply of nitrogen gas can be problematic and expensive. Typical gas supply methods include high pressure cylinders, liquid mini tanks or bulk storage vessels. However, each of these options introduces a range of problems that needs to be solved.

When considering nitrogen supplies, a reliable vendor must be outsourced and valuable space in or outside the company premises needs to be assigned for gas storage. Procedures have to be established to monitor and manage the gas supply and arranging deliveries and payment for the gas must also be considered.

Additionally, safety and handling concerns need to be taken into account. The cost of addressing these logistical issues can be high and difficult to budget for, while the price of gas and supplier rates change continually. The environmental impact of truck based deliveries is another important consideration for carbon footprint reduction.

The ideal solution lies in a range of gas generation systems from Sullair, which enable users to produce their total demand for food grade nitrogen gas on their premises, under their complete control. As a result, companies can generate as much or as little nitrogen as needed, at a fraction of the cost of having the gas delivered by an external supplier.

Why gas generation is best

Being able to take control of nitrogen supplies as opposed to having to rely on a third party, can reduce operational costs significantly.

These integrated nitrogen generation systems from Sullair Industrial Division use pre-treated air from a standard industrial compressor which is essentially "sieved" so that oxygen and other trace gases are removed while nitrogen is allowed to pass through to the application as the product gas. Air separation is not a new idea, but the radical Pressure Swing Adsorption (PSA) design and control systems employed on the Sullair nitrogen generator ranges have maximised gas output and reduced compressed air consumption to achieve even higher levels of efficiency than before.

A nitrogen generation system can reduce costs by up to 90% when compared to traditional methods of supply . If a company using liquid nitrogen was to convert to gas generation technology, the new system could be expected to pay for itself in typically less than two years. For a company using cylinders, the payback period could be even earlier, less than 12 months in many cases.

The new systems can also make the workplace considerably safer for employees, eliminating the safety risks of storage, handling and changing heavy, high pressure cylinders.

Sullair nitrogen generators have many advantages over traditional nitrogen supplies:

- Enhanced safety without the need to store or handle high pressure cylinders
- Reduced downtime owing to an on-demand supply
- Cost savings following payback of up to 90%
- Food grade nitrogen at consistent flow, pressure and purity
- Compact space saving design
- Flexible modular design
- Very low cost of ownership
- No need for expensive civil works prior to installation
- Proven reliability
- Operates from a standard factory compressor for even greater energy savings


SWP 10 bar
MAX P 12bar
SWP 10 bar
NITROGEN COMPRESSED

Technological excellence

Using the latest technology, Sullair supplies both hollow fibre membranes and Pressure Swing Adsorption (PSA) nitrogen gas generators to provide a solution for every food application that requires nitrogen gas with residual oxygen levels from 16% down to 10ppm.

The Sullair range of generators include:

Please consult with your local Sullair representative to ensure selection of the correct solution tailored exactly to your requirements.

PSA nitrogen gas generators

Membrane nitrogen gas generators

Ancillary products available to complete a total food grade nitrogen solution:

- Gas mixing systems for CO_2 and or O_2 mixing capability
- Sterile Gas Filtration
- Compressed air filtration and drying equipment to provide food grade compressed air
- Gaseous CO_2 purifiers

Sullair nitrogen gas generators- food applications other than MAP

Image courtesy of ICA

Controlled Atmosphere (CA) storage

Large gas tight temperature and oxygen controlled bulk stores are typically used for fruit, vegetables and salads.

Purging with nitrogen gas removes oxygen and CO_2 which will slow product deterioration from weeks to many months.

In addition to land based CA stores, marine units provide the same level of benefit on-board specially modified cargo holds within ships, allowing the most economical transportation of perishable foods from all areas of the world.

Sparging

Nitrogen gas is passed through liquids such as cooking oils to help reduce dissolved oxygen. Diffusers are used within the oil storage vessels to ensure small bubbles of nitrogen gas are produced to achieve the best results.

Pressure transfer

Nitrogen gas is used as an inert, non oxidizing motive force to convey powders and liquids where it is undesirable or not possible to employ traditional pumping methods.

Using nitrogen gas gives the additional benefit of fire and explosion suppression, often associated with powders, dust and flammable liquids.

Silo and bulk storage blanketing

Providing an inert nitrogen gas “blanket” at minimal overpressure, above food produce contained in bulk storage silos or vessels will help prevent oxidisation and contamination from possible external atmospheric sources.

Insect and larvae reduction

Storage of produce such as cereals and grains can be purged and blanketed with nitrogen gas to eradicate insects or the development of their larvae. While the vast majority of these pests are totally harmless to consumers, minimisation of their presence is often desirable.

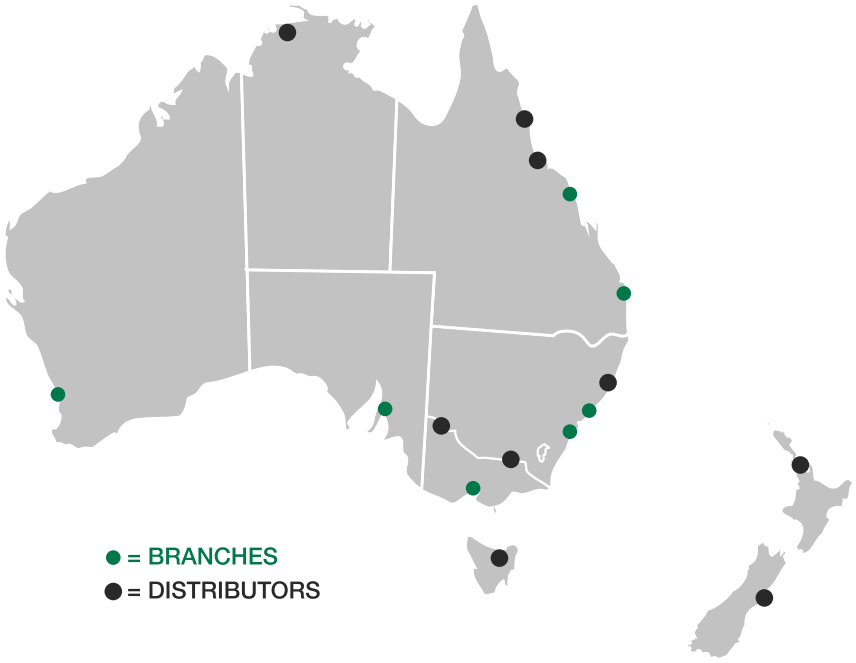
Nitrogen injection

Nitrogen gas is often used to create micro bubbles in products such as cream and certain desserts to increase bulk and improve texture. Nitrogen is used in preference to air as it is less likely to be absorbed into the product, therefore maintaining the bulk for longer, and as it is inert, it is less likely to oxidise the product and affect the taste.

Aerosol propellant

Nitrogen gas is used as an inert propellant in aerosol dispensed products such as “squirty” creams, oils and cheeses.

Sullair Australia Locations



1300 COMPRESSOR (266 773)

NSW - Sydney
21 Garner Place
Ingleburn NSW 2565

NSW - Newcastle
21 Ayrshire Crescent
Sandgate NSW 2304

Sth QLD - Brisbane
8 Prospect Place
Berrinba QLD 4117

WA - Perth
46 Sorbonne Crescent
Canning Vale WA 6155

SA - Adelaide
178 Cormack Road
Wingfield SA 5013

Nth QLD - Mackay
15 Central Park Drive
Paget Mackay QLD 4740

SULLAIR®
a division of Accudyne Industries

Sullair Australia Pty. Ltd.
324-332 Frankston - Dandenong Road,
Dandenong South, 3175

Tel: 1300 COMPRESSOR (266 773)
Fax: +61 3 9703 9000
www.sullair.com.au

facebook.com/SullairAustralia

Sullair Australia

linkedin.com/company/sullair-australia