

MAPAX[®]

Modified Atmosphere Packaging Solutions



The BOC solution with MAPAX®.

The challenge: maintaining freshness

From the very moment fruit is picked, corn is harvested or fish caught, a race against time begins. Natural deterioration and spoilage caused by internal factors like water content, pH and micro-organisms threaten both quality and shelf life. However, external factors like hygiene and temperature levels also pose a threat to product freshness. How the product is handled during processing is therefore critical. The packing stage is particularly important for prolonging shelf life and guaranteeing food safety.

The solution: Modified Atmosphere Packaging (MAP)

Modified Atmosphere Packaging, using food-grade gases and special packaging materials assists in extending shelf life and maintaining food quality.

MAP helps reduce spoilage which means fewer returns. The technology has the potential to open up new markets for fresh and chilled food while simplifying distribution logistics.



MAPAX® products and services

MAPAX® provides a range of products and services to accommodate any customer's individual site set up so you can expect the following:

- Dedicated Specialists and Customer Engineering Services (CES) team members will support and help you develop the exact MAPAX® solution for your products. This includes designing, installing and maintaining vessels or equipment in line with customer requirements and in compliance with relevant regulations.
- Portable gas mixing units and analysers are available for site trials.
- Customer Engagement Centre available to take your order, enquiry or provide technical support Monday to Friday 7.30am–5.00pm.
- Customer Engineering Services (CES) provide a 24 hour, 7 day maintenance and service offer to ensure you can continue focussing on your business.
- A large network of Gas & Gear retail outlets to provide you with product and equipment advice, support or your choice of picking up cylinders.
- Extensive gas distribution network including Gas Agents with flexible delivery options.
- BOC website with online ordering, product, equipment, industry, safety and quality information at www.boc.com.au or www.boc.co.nz

MAPAX® gases

The MAPAX® gas range has been created to meet the special quality requirements of the food industry and facilitates customers in complying with legislated Food Standards during packaging, storage and distribution.

Nitrogen N₂

Nitrogen is an inert gas and is used to exclude air – and in particular oxygen. It can be engaged as a 'balance gas' to make up the required volume in a gas mixture, helping to prevent the collapse of packs with high moisture or fat-containing foods, (the latter absorb carbon dioxide from the modified atmosphere).

Carbon dioxide CO₂

Carbon dioxide inhibits the growth of most aerobic bacteria and moulds, so the higher the level of CO₂ the longer the achievable shelf life. However CO₂ is readily absorbed by fats and water, so most foods will absorb it and in the wrong concentrations can cause film on product packs to collapse.

Oxygen O₂

Oxygen can cause food deterioration and is often an undesirable. However, it will maintain the fresh colour of red meats and also inhibits the growth of anaerobic organisms in some types of fish – so there are occasions where it can improve shelf life and quality.

Winning more time on the shelf.

With consumer expectations continually rising, good food today has to be healthy, safe, minimally processed and attractively packed. They also want more convenient, easy to serve products with good storage characteristics at the same time. That means more demands on food producers and producers of packaging machines and materials.

Spoilage starts immediately

Microbial and chemical/biochemical action are the primary reasons for food degradation. Microbial deterioration starts immediately after harvest or slaughter. Micro-organisms are found everywhere in our surroundings and so good hygiene is a key factor in any process. The exact ways in which micro-organisms induce spoilage vary, though, depending on the type of organism and the foodstuff itself.

Preserving and protecting

Conventional preservative methods that physically or chemically alter the product are being progressively replaced with ones that leave the product unchanged.

Modified Atmosphere Packaging aids in high quality and extended shelf life while retaining the original taste, texture and appearance of the food. MAP gas mixtures usually consist of the gases that make up the air we breathe: carbon dioxide (CO₂), nitrogen (N₂) and oxygen (O₂). The right mixture of these will depend upon the foodstuff and its properties.

Deterioration

Foods are biological substances. Freshness and shelf life are affected by their basic properties just as much as by external factors.

Internal factors

- The type and quantity of micro-organisms
- Water content
- pH
- Cell respiration
- Food composition

External factors

- Temperature
- Hygiene
- Gas atmosphere
- Processing methods

Low temperature – a highly effective inhibitor

Temperature is one of the most important factors controlling microbiological activity. Most micro-organisms multiply optimally in the 20 to 30°C range and show reduced growth at lower temperatures. Careful temperature monitoring is therefore vital during all food handling and distribution stages. Chilling alone, however, will not solve all microbiological problems, so other defences must be resorted to, such as a modified atmosphere.

Table 1: Typical shelf life in air and using MAPAX®

| Food | In air | With MAPAX® |
|---------------------|---------------|----------------|
| Raw red meat | 2 – 4 days | 5 – 8 days |
| Raw light poultry | 4 – 7 days | 16 – 21 days |
| Raw dark poultry | 3 – 5 days | 7 – 14 days |
| Sausages | 2 – 4 days | 2 – 5 weeks |
| Sliced cooked meat | 2 – 4 days | 2 – 5 weeks |
| Raw fish | 2 – 3 days | 5 – 9 days |
| Cooked fish | 2 – 4 days | 3 – 4 weeks |
| Hard cheese | 2 – 3 weeks | 4 – 10 weeks |
| Soft cheese | 4 – 14 days | 1 – 3 weeks |
| Cakes | Several weeks | Up to one year |
| Bread | Some days | 2 weeks |
| Pre-baked bread | 5 days | 20 days |
| Fresh cut salad mix | 2 – 5 days | 5 – 10 days |
| Fresh pasta | 1 – 2 weeks | 3 – 4 weeks |
| Pizza | 7 – 10 days | 2 – 4 weeks |
| Pies | 3 – 5 days | 2 – 3 weeks |
| Sandwiches | 2 – 3 days | 7 – 10 days |
| Ready meals | 2 – 5 days | 7 – 20 days |
| Dried foods | 4 – 8 months | 1 – 2 years |

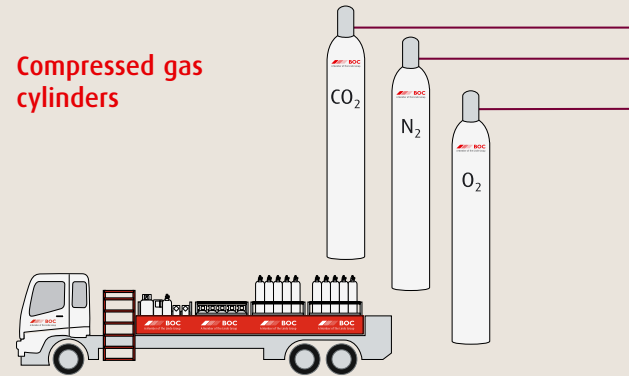


Gas supply options.

Compressed gas

BOC Food Fresh cylinders and Manifolded Cylinder Packs (MCP) have been developed for food businesses using Modified Atmosphere Packaging (MAP). Food Fresh cylinders can be supplied as single gases or as mixtures.

Compressed gas cylinders



CRYOSPEED®

BOC's CRYOSPEED® service is an intermediate offer between compressed and bulk gas. Oxygen, nitrogen and carbon dioxide in cryogenic liquid form, are stored in compact stainless steel vacuum-insulated vessels on your site and are filled by our CRYOSPEED® vehicles. With up to 2000l capacity, our storage vessels are set up for the pressures, flow rates and sizes to accommodate your business. Mix Onsite units have an integrated mixing panel to blend gas components to the required gas composition. Vessels are monitored remotely by BOC to give you peace of mind.

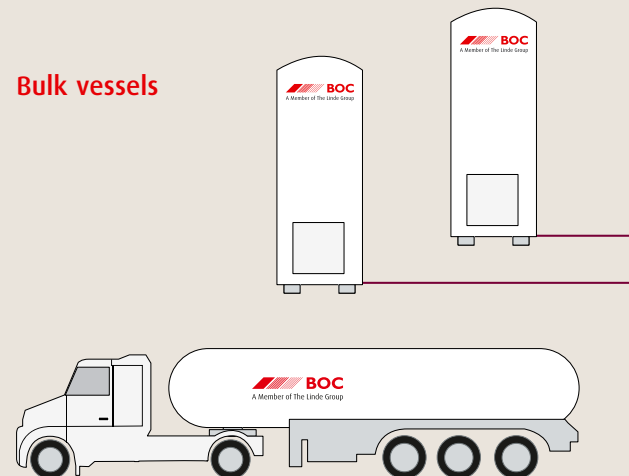
CRYOSPEED® Cryotank/GASMATIC® vessels and Mix Onsite units



Bulk

High gas volumes can be stored in BOC bulk cryogenic vessels (>2000l capacity). These are installed on your site, providing a continuous and secure supply of oxygen, nitrogen or carbon dioxide. A mixing panel is used to blend gas components to the required gas composition.

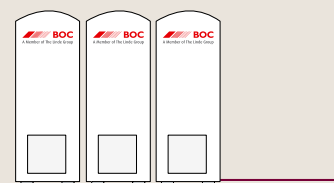
Bulk vessels



On-site generation

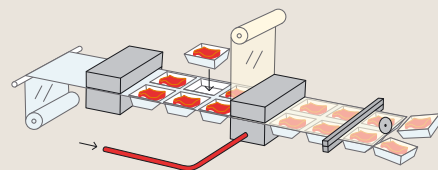
For those needing generated nitrogen, the BOC ECOVAR® mini range provides an on-site generation solution at a range of pressures, flow rates and purities. On-site generation requirements are assessed on a site-specific basis to ensure the resulting set-up will cater for your needs now and in the future.

On-site generation

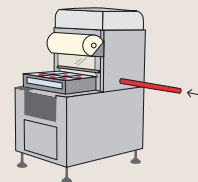




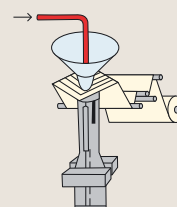
Thermoformer



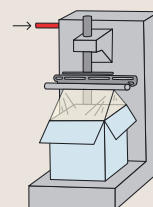
Tray sealer



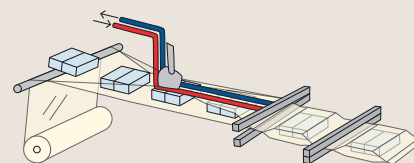
Vertical form fill seal



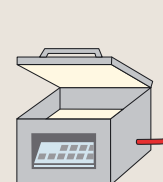
Bag sealing machine (bag-in-box)



Horizontal flow wrapping



Vacuum chamber



Packaging machines using MAP technology.

Unique solutions empowering customers

BOC is more than a gas supplier. Our MAPAX® service is founded on close cooperation with packaging suppliers and machinery manufacturers. This collaboration enables us to meet demands for efficient and cost-effective packaging of foodstuffs. Highlighting advantages of MAP technology and adapting methods to each application ensures we can offer solutions that make it possible for customers to develop new products for new markets.

Packaging process using MAP technology

There are five main groups of packaging machines used with MAP technology, for different kinds of product. The basic mode of operation is the same for all of them. First, a pack (either produced on site or prefabricated) is filled with the product. Then the air in the package is replaced by a modified atmosphere. Finally, the package is sealed. These steps can be carried out manually or automatically.

Gas flushing vs vacuum extraction

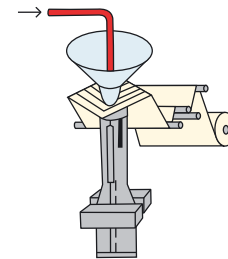
Atmosphere modification is achieved by gas flushing or vacuum extraction, followed by gas injection. The amount of gas needed depends on the type of machine.

In gas flushing, the air in the pack is progressively replaced by a continuous gas stream that gradually replaces the air surrounding the food product before the package is sealed. Since this is a continuous process, the packaging rate can be high.

In the vacuum process, air is extracted from the package and the resultant vacuum is broken by injection with the desired gas mixture. This two-step process is slower than the gas flushing method. However, because the air is almost totally removed, the control of residual oxygen levels is better than gas flushing.

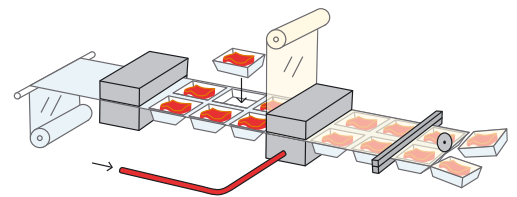
Vertical form fill seal

A film is formed into a tube which is pinched together at one end, the other end being sealed over an injection pipe. Product is portioned out into the tube, which is then sealed at the other end and cut off. Gas is continually fed through the tube to purge the air. This type of machine is mostly used for powdered and bulk products such as coffee, potato chips, grated cheese, salads, milk powder, peanuts as well as diced foodstuffs. Gas flushing may sometimes be necessary before packing.



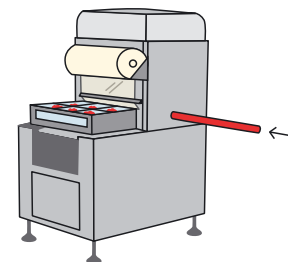
Thermoformer

Film is heat-formed into a tray on a lower conveyor belt and the product is then added. Air is extracted, gas injected and the loaded package is sealed by welding on a film from an upper conveyor belt. This machine is suitable for meat, fish, smallgoods and prepared foods.



Tray sealer

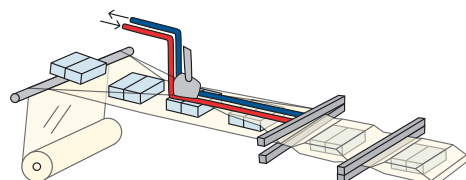
The tray sealer can be operated manually, semi-automatically (illustrated here) or continuously. This machine is similar to the thermoformer but the bottom trays, into which the product is placed, are readymade rather than formed during the process. A wide range of trays can be used with the tray sealer. This type of machine can be used for most food products, e.g. ready meals, salads, meat and fish.





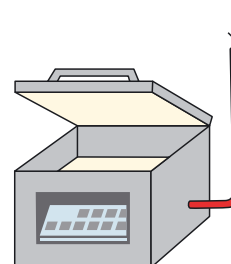
Horizontal flow wrapping

The foodstuffs are fed into a horizontal flowing tube that is constantly formed by a packaging machine. The tube is sealed and cut off along both sides of the product. Gas is flushed through the resulting bag, purging the air. This is quick and the machine uses less complex film materials than the thermoformer. It is typically used with bakery products, sausages, cheese and pizza.



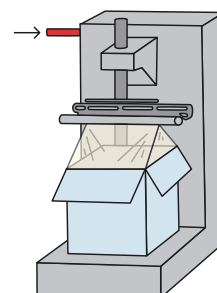
Vacuum chamber

The product is inserted into prefabricated bags or trays. The packages are placed in a chamber from which the air is extracted and the pressure equalised with gas. The packages are then sealed by welding. This machine type is suitable for small production volumes at a relatively low cost.



Bag sealing machine (bag-in-box)

Prefabricated bags are filled with product. A snorkel probe is introduced into the bag and air extracted. Gas is then fed in, the snorkel is removed, and the bag is sealed. This type of equipment is used for large packages of meat, poultry and fish.



— gas in — air out

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