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Ref: MAP Machinery, Trays & Lidding Film 101

MODIFIED ATMOSPHERE PACKAGING, TRAYS & LIDDING FILM

Modified atmosphere - is the practice of modifying the composition of the internal atmosphere of a [package](#) (commonly food packages, drugs, etc) in order to improve the [shelf life](#).

The modification process often tries to lower the amount of [oxygen](#) (O₂), moving it from 20% to 0%, in order to slow down the growth of [aerobic organisms](#) and the speed of [oxidation](#) reactions. The removed oxygen can be replaced with [nitrogen](#) (N₂), commonly acknowledged as an inert gas, or [carbon dioxide](#) (CO₂), which can lower the [pH](#) or inhibit the growth of [bacteria](#). [Carbon monoxide](#) can be used for keeping the red color of meat.

Re-balancing of gases inside the packaging can be achieved using active techniques such as gas flushing and compensated vacuum or passively by designing “breathable” films known as equilibrium modified atmosphere packaging (EMAP).

Scientific terms

MAP = Modified atmosphere packaging

EMAP = Equilibrium modified atmosphere packaging

MA/MH = Modified atmosphere/modified humidity packaging

History

[Controlled Atmosphere](#) Storage (CAS) was used already in the 1930s when ships transporting fruits had high levels of CO₂ in their holding rooms, thus increasing the shelf-life of the product. In the 1970s MA packages reached the stores when bacon and fish were sold in retail packs in Mexico. Since then the development has been stable and the interest into MAP has grown due to consumer demand. This has led to advances for example in the design and manufacturing of Bacon films. New techniques are designed, like the use of [anti-fogging layer](#) to improve product visibility. From MAP a new packaging technique – EMAP has been developed.

Products

Under MA products like red [meat](#), [seafood](#), minimally processed [fruits](#) and [vegetables](#), pasta, cheese, bakery goods, poultry, cooked and cured meats, ready meals and dried foods are packaged. The three major commodity types are fruits and vegetables, meat and meat products and seafood. It has been estimated that 25-40% of all fresh produce harvested will not reach the consumers table, due to [spoilage](#) and mishandling that occurs during distribution.

Modified Atmosphere Packaging (MAP)

Modified Atmosphere [Packaging](#) (MAP) is a technique used for prolonging the shelf-life period of fresh or minimally processed foods. In this preservation technique the [air](#) surrounding the food in the package is changed to another composition. This way the initial fresh state of the product may be prolonged. It is the shelf-life of perishable products like meat, fish, fruits and vegetables that will be prolonged with MAP since it slows the natural deterioration of the product. MAP is used with various types of products, where the mixture of gases in the package depends on the type of product, packaging materials and storage temperature. Meat and fish need very low gas permeability films so for non-respiring products (meat, fish, cheese etc.) high barrier films are used. The initial flushed gas-mixture will be maintained inside the MA package. But fruits and vegetables are respiring products where the interaction of the packaging material with the product is important. If the permeability (for O₂ and CO₂) of the packaging film is adapted to the products respiration, an equilibrium modified atmosphere will establish in the package and the shelf-life of the product will increase.

Equilibrium modified atmosphere packaging (EMAP)

Among fresh-cut produce Equilibrium Modified Atmosphere Packaging (EMAP) is the most commonly used packaging technology. When packaging vegetables and fruits the gas atmosphere of package is not air (O₂ 21%; CO₂ 0.038%; N₂ 78%) but consists usually of a lowered level of O₂ and a heightened level of CO₂. This kind of package slows down the normal respiration of the product to prolong its shelf-life. Of course there are other factors, like the size of the product, severity of preparation, maturity of the product and type of tissue that have an effect to the shelf-life of an EMA packaged produce.

Technology

There are two techniques used in the industry to pack vegetables namely [gas-flushing](#) and [compensated vacuum](#). For its cheapness the gas-flushing is more widely used. In gas-flushing the package is flushed with a desired gas mixture, as in compensated vacuum the air is removed totally and the desired gas mixture then inserted. The label "packaged in a protective atmosphere" can refer to either of these; an example of a gas mixture used for non-vegetable packaged food (such as [crisps](#)) is 99.9% [nitrogen](#) gas, which is inert at the temperatures and pressures the packaging is subjected to.

Gases

The atmosphere in an MA package consists of N₂, O₂, CO₂. It is the altered ratio of these gases that makes a difference in the prolongation of shelf life. By reducing the O₂-level and increasing the CO₂-level, ripening of fruits and vegetables can be delayed, respiration and [ethylene](#) production rates can be reduced, softening can be retarded and various compositional changes associated with ripening can be slowed down.

Oxygen is essential when packaging fresh fruits and vegetables as they continue to respire after harvesting. The absence of O₂ can lead to [Anaerobic respiration](#) In the package which accelerates [senescence](#) and spoilage. Too high levels of O₂ do not retard respiration significantly and it is around 12% of O₂ where the respiration rate starts to decrease. So oxygen is used in low levels (3-5%) for positive effect. When packaging meat and fish, the high CO₂-levels are effective bacterial and fungal growth inhibitors. In the case of vegetables and fruits, CO₂ is not a major factor since CO₂-levels above 10% are needed to suppress fungal growth significantly. Unfortunately higher levels than 10% of CO₂ are working phytotoxic for fresh produce. Nitrogen is used as a filler gas since it neither encourages or discourages bacterial growth.

Packaging Films

When selecting packaging films (web substrates) for EMAP of fruits and vegetables the main characteristics to consider are gas permeability, water vapour transmission rate, mechanical properties, transparency, type of package and sealing reliability. Traditionally used packaging films like [LDPE](#) (low density polyethylene), [PVC](#) (polyvinyl chloride), [EVA](#) (ethylene-vinyl acetate) and [OPP](#) (oriented polypropylene) are not permeable enough for highly respiring products like fresh-cut produces, mushrooms and broccoli. As fruits and vegetables are respiring products, there is a need to transmit gases from and to the package. Films designed with these properties are called [permeable films](#). Other films, called barrier films, are designed to prevent the exchange of gases and are mainly used with non-respiring products like meat and fish.

EMAP films developed to control the humidity level as well as the gas composition in the sealed package are beneficial for the prolonged storage of fresh fruits, vegetables and herbs that are sensitive to moisture. These films are commonly referred to as [modified atmosphere/modified humidity packaging](#) (MA/MH)films.

Quality assurance of MAP packages

Although Modified Atmosphere Packaging is a well-established process, it is a good practice to maintain tight [quality assurance](#) through [package testing](#). Incorrect oxygen levels, empty gas cylinders and bad sealing bars can cause imprecise gas blends and poor package seals that can result in product spoilage. Routine package testing with headspace gas analysers, on-line gas analysers and leak detectors assures package quality, hence helps ensuring the shelf life.

CPET trays, Stock items

Seal-N-Serve dual-ovenable trays have a wide temperature range from -40°F to +400°F. Do not use under broiler or in toaster oven. Available in black and white. When using trays in conventional oven, always place trays on a cookie sheet. Trays should be removed from the oven on the cookie sheet.

Polypropylene trays, Stock items

Cost effective microwaveable-only trays for use in temperatures ranging from 0 to +260°F. Available in black.

Paperboard Tray for freezing & heating, bakery, read-to-eat meal.

Primary paperboard tray formed of vergin fiber with no hidden chemicals and particular hygiene, specifications for foodstuffs that are to be frozen, cooked or reheated and consumed in the same package. Paperboard tray will not lose its shape.

BENEFITS :

Environment-friendly and recyclable.

Excel in convenience and hygiene.

Non-stick and Non-scratch properties.

Leak proof and grease resistant.

Suitable for freezing down to -40 °C and heating up to 204 °C

Ideal for use in the microwave and conventional ovens.

Trays and lids can be printed.

Ideal for semi-prepared food or consumable baking products as food are baked directly in the Paperboard Trays.

No more tray washing

APET - refers to the material used to make some of our trays. Most of our A-PET trays are clear and are used for cold foods. They cannot be put into a microwave or an oven.

C-PET - refers to the material used to make some of our trays. Our C-PET trays are available in multiple colours, and they can be heated in microwaves and ovens.

Tray sealers - Compact, simple and robust, our tray sealers are made to be used. Teamed up with our line of trays, your food has never looked this good before.