

New protective packaging for conservation of Milk Powders



Conservation issues

Lipid oxidation in milk powder is a important cause of deterioration during process and/or storage. Light-induced degradation reactions in milk forms a serious issue for the dairy industry. Due development in unpleasant flavors what lead to formation of volatile secondary oxidation products. Lipid oxidation is well known because of his unpleasant consequences on human healthcare. Factors like water activity, temperature, O₂ and light can influence the lipid oxidation.

Lipid oxidation in WMPs is also a major cause of deterioration during processing and storage. The reaction of unsaturated lipids with molecular O₂ results in the formation of hydroperoxides, which then break down to off-flavor compounds. Many factors are responsible for the degradation of lipids due to oxidation, and one of the major causes of this defect has been identified as the oxidation of unsaturated lipids (Cadwallader and Howard,. Lipid peroxidation is responsible for changes in the taste and odor of milk powders through the development of off-flavors, which are caused by the formation of secondary reaction products (alkanes, alkenes, aldehydes, and ketones)

Quote from, Packaging and the Shelf Life of Milk Powders, Elmira Arab Tehrany and Kees Sonneveld

Modified Atmosphere Packaging (MAP) has been shown to positively impact shelf life. In this process, nitrogen or another gas or gas mixture is used to replace the oxygen inside the bag. By packing the milk powder hermetically, you can stabilize the humidity and protect the powder from external moisture. By packing milk powder under modified atmosphere, you can increase the shelf life of the powders

It has been shown by numerous authors that if O₂ in milk powder or infant formula packages is replaced by N₂ and CO₂, the oxidation is not detectable and the peroxide value does not increase (Van Mil and Jans, 1991). Oxidation increases during storage; for example, WMP has a maximum shelf life of 6 months at room temperature (Anon., 1989). However, it was found that WMP could have a shelf life in excess of 12 months if it was packed vacuum or an inert gas such as N₂ to inhibit the development of off-flavors (Kieseker and Aitken, 1993).

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	Vacuum only	N ₂ flushed and vacuum	N ₂ no vacuum	Co ₂ flushed and vacuum	CO ₂ flushed no vacuum
Avoid oxidation	V	V	V	X	X
Stable humidity	V	V	V	ok	ok
Insect treatment	X	V	V	ok	ok

V proven beneficial

X Not beneficial

Ok No big advantages

Not rec Not recommended

Optimum conservation conditions

The combination of the vQm valve, sealed inside a vacuum-proof, high-barrier liner, along with the vQm vacuum unit allows you to:

- **Vacuum pack** your peanuts on pallet size: in a FIBC with vacuum-liner or smaller bags inside a wrapping liner
- Create **modified atmosphere (MAP), anoxic conditions**: by connecting an external nitrogen (or CO₂) supply, the vQm unit can be easily programmed for multiple cycles of vacuum followed by injection of nitrogen. By doing so, an increased nitrogen concentration can be achieved with every cycle, reducing the residual oxygen concentration inside the packaging. By doing so an anoxic environment can be created that effectively minimizes the oxidation/rancidity. When the vQm protocol "MAP vacuum" is selected, the packaging remains under vacuum, while the protocol "MAP no vacuum" will leave the packaging at (ambient) pressure once the last cycle of gas injection has been completed.



For what food applications the vQm used in general?

- The high barrier properties of the film that is used for the liner, in combination with the hermetic closure, allows you to **maintain the moisture content** of your product during the complete supply chain, from the moment of packaging. Minimize external influences on you product due to high humidity, condensation or direct water contact. If packed under vacuum, no condensation will occur on the inside of the packaging.
- By creating MAP conditions of extreme low oxygen or high CO2 concentration or by maintaining vacuum over an extended period of time, **all insects in all life stages can be eradicated**. Most quick and easy is high CO2, if the product can endure these conditions. Otherwise low-oxygen in combination with vacuum is the most applied alternative. Since the packaging is hermetic, **no re-infestation** can occur as long as it remains intact.
- Often, the quality of products is negatively affected by oxidation. By reducing the number of oxygen molecules in the packaging, this **oxidation can be minimized**. Oxidation of (lipid) fats and oils in e.g. nuts, powders, seed or brown rice is known as **rancidity**. Oxidation is also causing **decolorization** of products, e.g. dried chilies, spices or herbs.
- **Preservation of taste and aroma's**. Aroma (or smell or odor) is the sensation perceived when volatile compounds are sniffed through the nose and directly impact on the perceived taste. These volatile compounds can best be preserved in hermetic, anoxic or vacuum conditions. Products that can benefit from are e.g. dried spices, dried herbs and tea.
- Other additional benefits could be e.g. **reduction of breakage** (nuts), as the product is fixated under vacuum, **volume reduction** (fluffy powders, tea, chilies etc), **reduced temperature fluctuations** during the supply chain (under vacuum: temperature transfer is inhibited; particularly useful for e.g. green coffee when shipped in containers with big temp fluctuations inside the container (day/sun vs night).

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