impressed by vQm

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New protective packaging for conservation of

Peanuts

Conservation issues

Due to the oxidation of (lipid) fats and oils, peanuts are sensitive for rancidity and limits shelf-life in traditional bulk size packaging. With the introduction of fully hermetic, protective packaging with aluminum barrier film and the possibility to create & maintain modified gas conditions inside bulk-size packaging, long-term storage of peanuts is now possible. Lipid oxidation is effectively prevented by anoxic conditions and by excluding light.

> *"Accelerated tests for oxidative rancidity of blanched peanuts, blanched dry-roasted peanuts, blanched oil-roasted peanuts and shelled Persian walnuts were performed at high and low oxygen content at controlled intermediate and low relative humidities. The results confirmed and quantified the importance of oxygen content, relative humidity and roasting process in the oxidative rancidity of peanuts and walnuts. There is a potential to extend shelf-life of (roasted) peanuts and walnuts by edible coatings with low oxygen permeability or nitrogen-flushing with oxygen barrier packaging."*
>
> *Quote from study "Peanut and Walnut Rancidity: Effects of Oxygen Concentration and Relative Humidity", by Juan I. Maté, Mikal E. Saltveit and John M. Krochta:*

For small size packaging of (roasted) peanuts, the advantages of vacuum are well known and commonly applied. With vQm, the same benefits can achieve for bulk-size packaging.

> *"The relationship between vitamin E and the oxidative stability of raw and dry roasted peanuts was studied during storage at 21°C under air and vacuum. Lipid oxidation was monitored by peroxide values (PVs) and conjugated diene values (CDVs). In air, PV (meq/kg) for roasted peanuts reached 47 by 12 wk, whereas that for raw peanuts was below 2 after 38 wk. Under vacuum, lipid oxidation was significantly retarded ($P < 0.05$)."*
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> *Quote from study "Vitamin E and Oxidative Stability During Storage of Raw and Dry Roasted Peanuts Packaged under Air and Vacuum", by Jiyeon Chun, Junsoo Lee, Ronald R. Eitenmiller*

Another common issue is aflatoxin development on sterile peanuts. Water activity (a_w), storage temperature, headspace oxygen and carbon dioxide concentrations influence the growth of, and aflatoxin production by *Aspergillus flavus* on sterile peanuts. Anoxic or vacuum conditions inside packaging can inhibit aflatoxin production.

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"This study has shown that A. flavus can grow and produce aflatoxin in carbon dioxide enriched atmospheres in the presence of oxygen. It also emphasizes the combined effect of several 'barriers' to inhibit and reduce aflatoxin in MAP products containing various levels of residual oxygen."

Quote from study "Growth of and aflatoxin production by Aspergillus flavus in peanuts stored under modified atmosphere packaging (MAP) conditions", Williams O.Ellis[a], James P.Smith, Benjamin K.Simpson, Hosahalli Ramaswamy, GillesDoyon[b]

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.

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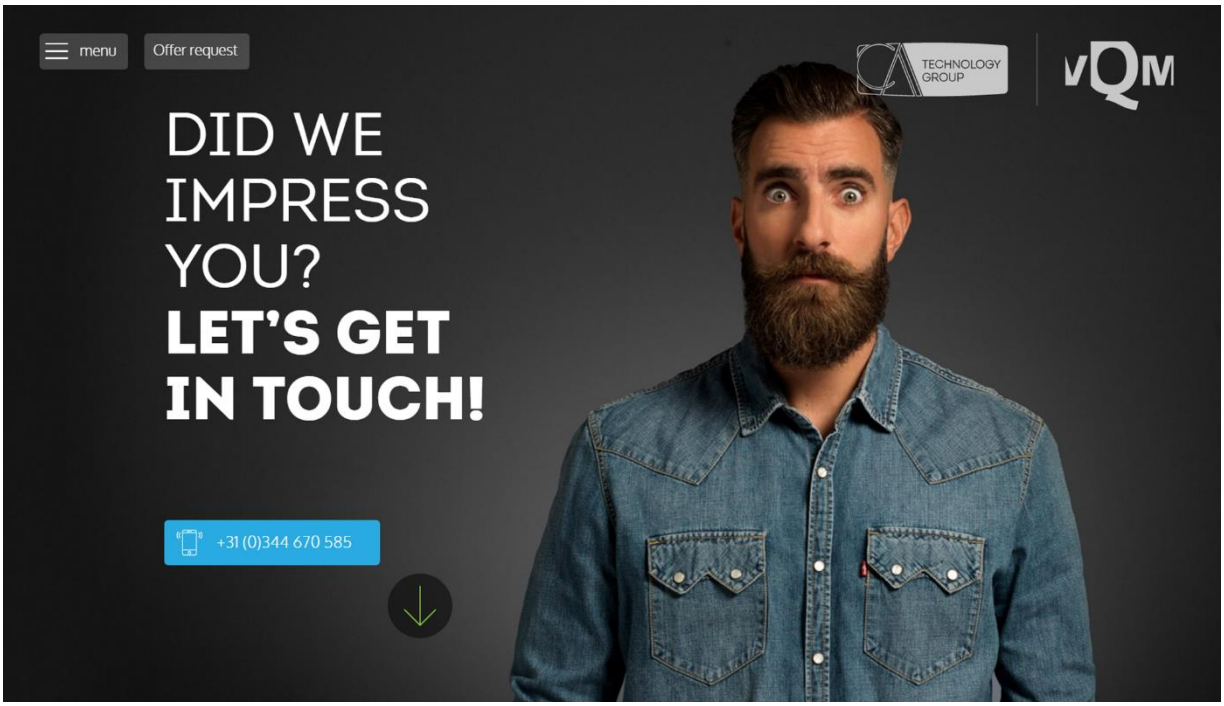
For what food applications the vQm used in general?

- 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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Ghent, 17 July 2000

Herewith I send you the report concerning the vacuum storage of peanuts at 30°C. This is the second report after 3 months of storage.

Kind regards,

Liesbeth Jacxsens
researcher prof. Debevere

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Storage experiment of peanuts at 30°C

1. Aim of the experiment:

The vacuum packaged peanuts were stored at 30°C, normal relative humidity (around 60%) and in a dark environment. The critical properties of peanuts (peroxide number as value for oxidation, water activity and water content) were determined after 3 months of storage. The first package was opened in June 2000 (after 1.5 months of storage). Before opening the package, also the remaining O_2 and CO_2 will be measured.

The possible redistribution of the moisture during storage was determined by measuring the water activity and the moisture content of the peanuts, placed on the surface of the package and in the middle of the package.

All analyses (accept the gas analysis) were conducted in duplicate.

2. Materials and Methods:

The water activity was measured by the Novasina Thermoconstanter at 25°C. The water content was determined using the classical gravimetric method in which the difference in weight between the humid and the dried product (dried at 105°C) was measured. The water content is expressed as % H_2O on dry mass basis (g H_2O per 100g dry matter). These are the units applied in literature (% H_2O s.s., g H_2O/100 g de substance sèche). All these determinations were conducted in duplicate.
Before opening the package, the gas concentration (% O_2, % CO_2 and % N_2) was measured by means of gas chromatography.
The peroxide number was titrimetric determined after extraction.

3. Results:

The gas composition in the package after 3 months of storage at 30°C was 2.10% O_2 – 1.50% CO_2 – 96.40% N_2.

In the Table below an overview is given of the measured water activity (± standard deviation) and the moisture content (± standard deviation) (% H_2O s.s.) of the peanuts placed on the surface of the package and in the middle of the package.

Place in the package	**a_w ± standard deviation**	**% H_2O s.s ± standard deviation**
middle	26.30 ± 0.56	1.74 ± 0.02
surface	26.25 ± 1.62	1.69 ± 0.03

No significant difference was found in both water activity and moisture content of the peanuts situated on the surface or in the middle of the package.