Making our world more productive

MAPAX® – Best for dairy products

Linde's MAPAX® portfolio meets today's food preservation challenges with bespoke gases and mixtures, application expertise and complementary installation, test and safety services.

Decomposition of dairy products

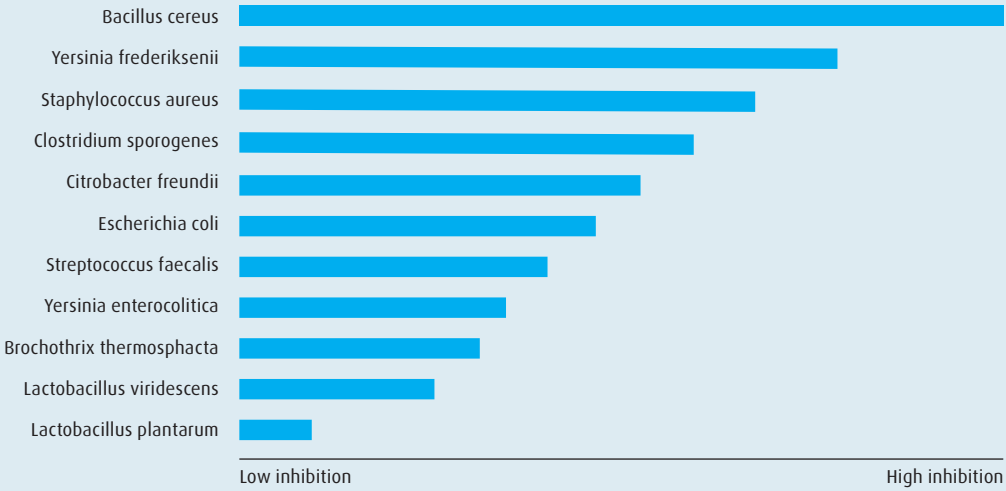
Microbial growth and rancidity are the primary causes of quality deterioration in dairy products.

The type of breakdown depends on the characteristics of the particular product. Hard cheeses with relatively low water activity are normally affected by the growth of moulds, whereas products with high water activity such as cream and soft cheeses are more susceptible to fermentation and rancidity.

Lactobacillus

Lactobacillus, which is widely used in dairy production, may also be a problem as it turns products sour by lowering their pH value. This may be further intensified by the fact that cottage cheese packages, for example, contain incorrect gas atmospheres with excessive levels of carbon dioxide.

The effect of 100% CO_2 on various bacteria



Microorganisms are inhibited to varying degrees by carbon dioxide.

Mould prevented by carbon dioxide

In the packaging of hard cheese, carbon dioxide is the most effective choice. It effectively stops or reduces microbial activity and helps to retain texture. Even carbon dioxide concentrations of just 20% strongly affect the growth of mould fungi. Lactic acid bacteria, a natural constituent of cheese, are affected very little by the surrounding atmosphere. Soft cheeses are also packaged in atmospheres with increased carbon dioxide levels and low oxygen levels to inhibit bacterial growth and rancidity. In packaging for hard cheeses, the carbon dioxide level is up to 100%, and for soft cheeses, the level is usually restricted to 20–40%. This is to prevent the package from collapsing under atmospheric pressure as the carbon dioxide dissolves into the water content.

Recommended gas mixtures for dairy products

Product	Gas mixture	Gas volume / Product volume	Typical shelf-life Air	Typical shelf-life MAP	Storage temp.
Hard cheese	80–100% CO_2 + 0–20% N_2	50–100 ml / 100 g cheese	2–3 weeks	4–10 weeks	4–6°C
Hard cheese, (sliced, grated)	40% CO_2 + 60% N_2	50–100 ml / 100 g cheese	2–3 weeks	7 weeks	4–6°C
Soft cheese	20–60% CO_2 + 40–80% N_2	50–100 ml / 100 g cheese	8 days	21 days	4–6°C

Major cheese categories – moisture content

Cheese category	Example varieties	Moisture content (%)
Unripened, soft	Cottage	not >80
	Mozzarella	>50
Ripened, soft	Camembert	48
	Brie	55
Semi-hard	Caerphilly	45
	Limburg	45
Hard	Cheddar	<40
	Gouda	40
	Emmental	38
	Gruyère	38–40
Blue-vein	Roquefort	40–45
	Gorgonzola	40–45
	Stilton	40–45

CO_2/N_2 mixes to avoid package collapse

Value-added cheeses, such as grated or sliced cheddar, are also packed in modified atmospheres. Grated cheese is usually packed in an atmosphere of 50% N_2 and 50% CO_2. The use of nitrogen avoids package collapse.

Adding cultured products to the list

Cultured products such as cottage cheese were not packaged in modified atmospheres until recently. But the demand for longer life has extended modified atmospheres to these products. The shelf-life of cottage cheese packed under carbon dioxide can be extended by a week.

Nitrogen stops cream turning sour

Cream and dairy products containing cream rapidly turn sour in pure carbon dioxide atmospheres. The gas is therefore replaced by nitrogen or a mixture of nitrogen and carbon dioxide. By eliminating oxygen, nitrogen prevents rancidity and the growth of aerobic bacteria.

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