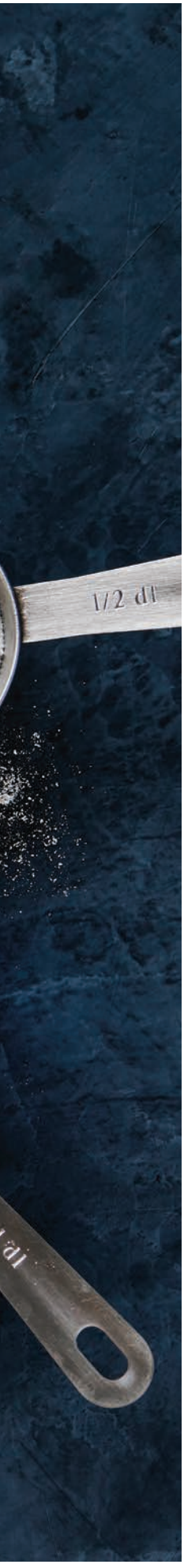
Oils and fats emulsifiers

For aeration, crystallisation, plastification,
fat reduction, spatter control and all-purpose

Palsgaard®


1 dl
1 tbl
1/2 dl



Share a century of lipids expertise

Since our founder Einar Viggo Schou invented the Palsgaard Emulsion Oil more than a century ago, Palsgaard has been helping margarine and shortening manufacturers around the world make the most of the ability to successfully mix oil and water.

A wide range of emulsifiers

Today, we offer a wide range of emulsifiers, custom-designed to meet the specific requirements of each type of margarine – from household margarines such as low-fat spreads and brick or liquid margarines for frying and baking to more technical bakery margarines, such as cake, cream and puff pastry margarines and shortenings.

The key to getting control over your margarine

Palsgaard offers much more than emulsifiers. Thanks to our application centres in Denmark, Singapore and Mexico we can work with you to find the best emulsifier composition and even help adjust your recipes and production processes.

You will be able to successfully produce all types of margarine and shortenings – and we'll gladly show you how.

Our experience has taught us that with the right emulsifiers you can control these six basic properties:

- Aeration
- Crystallisation
- Plastification
- Fat reduction
- Spattering
- All-purpose

For perfect aeration in cake margarines and shortenings

Good structure in crumb and cooperation

We do more than just supply you with the right emulsifiers. At Palsgaard we can optimise emulsifier and fat compositions in our application centres, and recommend adjustments to the processing equipment. We know how emulsifiers work in cake systems, and we focus on:

- Increasing the creaminess of the margarine or shortening, so that it is easier to incorporate more air and increase the fat distribution in the batter
- Increasing batter viscosity so that it retains more air
- Protecting air bubbles to ensure expansion during baking
- Ensuring a high number of small air bubbles to deliver a homogeneous crumb structure

We'll help you make a voluminous difference

Cake margarines and shortenings are specifically designed to incorporate air and impart stability to the batter and the final product. Palsgaard emulsifiers – alongside the optimal fat composition – let you create highly functional margarines with the qualities you desire.

The purpose of a high functional cake margarine/shortening is to provide:

- High volume in the baked cake
- Good, homogeneous crumb structure
- Soft and delicious cake

In order to obtain this, it is crucial that the margarine has a very short and creamy structure. The ideal structure is best achieved by using the right types of oils, the right processing conditions, proper tempering – and the right emulsifier.

Easy to use cream margarines and shortenings

Cream margarine and shortenings are used for cake fillings and decorations. While cream composition varies, it is generally produced by whipping margarine or shortenings together with powdered sugar, syrup or other ingredients. The role of an emulsifier for cream margarines and shortenings is to provide:

- High volume in the cream or filling
- A good, homogeneous cream that is easy to use in confectionery production and in fine bakery
- Absorption of liquid ingredients so there are no subsequent leaks

Make your products look great

Palsgaard offers you the right emulsifier solutions for your margarine and shortening so that you can create creams that:

- Have a high overrun
- Are highly stable so they do not collapse during production, cake decoration or shelf-life
- Absorb liquid ingredients so they do not leak after production
- Provide pleasant mouthfeel
- Maintain sharp, stable edges on cake decorations

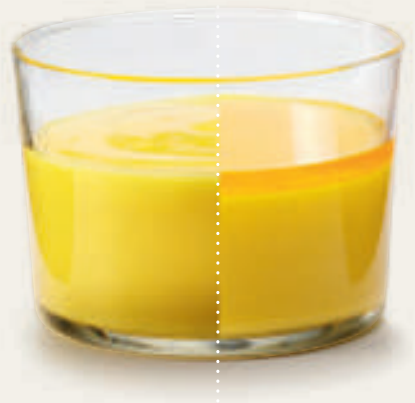
Crystal clear advantages

The potential of your product

Palsgaard offers a variety of crystallisers for promoting the crystallisation process, oil absorbing ability and thermostability. Add to that our substantial know-how in terms of production conditions and facilities required to obtain the desired crystallisation of your products.

Palsgaard crystallisers and oil absorbers are used in:

- Liquid margarine
- Table margarine
- Low-fat spreads
- Cake and cream margarine
- Puff pastry and Danish pastry margarine
- Shortenings



Liquid margarine **with Palsgaard crystalliser**

Liquid margarine **without Palsgaard crystalliser**

An extensive knowledge of the right ingredients

Making product and process come together

Oil separation during storage is a typical problem for very soft, oil-rich products such as liquid margarine and spreads. Elevated temperatures make the problem even worse, and it is difficult to solve without changing the viscosity of the finished product.

Our range of oil absorbers and crystallisers entrap liquid oil and attach it to a net of very small crystals that are created during cooling. This means no oil separation in the finished product – even when it is stored at elevated temperatures. In simple terms, these features make your product come together and stay that way.

It's all about making your product come together in the form your customers are asking for.

Advantages of cooperation

At Palsgaard, we know that there is much more to the crystallisation process than the crystallisers. That is why we provide you with world-class advice on how to secure the right processing conditions in terms of temperature, pressure and other conditions that crystallization processes in your production facilities demand.

We're determined to help our customers meet increasing consumer demands for e.g. liquid margarine without compromising product quality.

PLASTIFICATION

Putting the puff in your pastry

Key application benefits

Palsgaard offers a wide range of emulsifiers that are particularly well suited for margarines and shortenings used in high-fat and fat-reduced puff pastries and yeast-raised products. Palsgaard's emulsifiers give you the following advantages:

- Fine and stable water distribution
- Improved plasticity
- Stable emulsion during both manufacturing and baking purposes
- Good lamination and expansion in the laminated pastry

What's plastification all about?

Stretching five kilos of margarine or shortening across 500 square metres places extreme demands on plasticity. Breakage is not an option. Good lift is a must, as is perfect flake structure. Add to this the growing demand for low-fat content, and the challenges look daunting. This is where Palsgaard steps in – and creates value for our customers.

Emulsifiers do more than add emulsion and product stability. They also affect the crystallisation speed and improve plasticity as well as layer separation and lift in laminated dough systems.

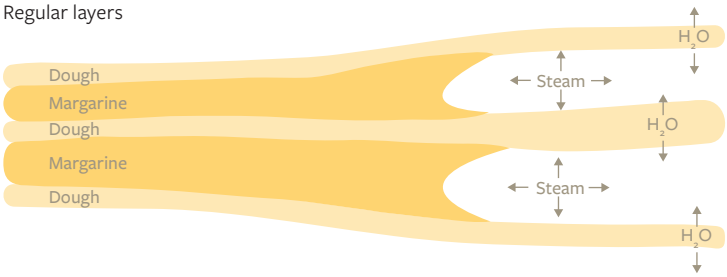
Stretching without breaking

When baking puff pastries, it is important to keep layers of margarine and dough separate until the proteins denaturise and the starches begin to swell.

The right combination of emulsifiers gives good, stable margarine emulsion during the baking process and subsequent excellent baking results.

Poor expansion
Hard and brittle puff pastry margarine

Good expansion
Regular layers



Fat reduction in pastry and croissants

Choosing the right combination of emulsifiers enables you to reduce the fat content in margarine for Danish pastry and croissants from 80 to 50 percent while still providing a stable, dry and plastic Danish pastry margarine. During baking this emulsifier combination ensures an expansion and lamination of a 50 percent fat margarine similar to Danish pastry baked with 80 percent fat margarine. In fact, our emulsifier systems have been successfully tested in recipes with as little as 35 percent fat.

At Palsgaard's application centres, we can simulate and optimise production set-ups to get things right. We know how to optimise emulsifiers, ingredients, recipes and processes. Either way, it's all about the right combination.

Solutions for fat reductions

A tough challenge, even for the best emulsifiers

Reducing fat content in margarines places several demands on emulsifiers, as less fat and more water affects both emulsion stability and crystallisation. In bakery margarine, for example, lowering the fat content without properly introducing counter measures such as the right emulsifiers impacts margarine performance both in dough preparation and in the baked goods.

For years Palsgaard has focused on creating successful solutions for fat reduction in everything from low-fat spreads to liquid margarine, household margarine, frying margarine, cream margarine, puff pastry margarine and baking compounds.

When consumers want less, we do more

Our emulsifier solutions for low-fat and very-low-fat spreads provide key advantages:

- Fine and stable water distribution
- Reduced surface tension between water and fat phases
- Stabilised water-in-oil emulsion during emulsification and crystallisation

Changing customer demands and lower production costs are challenges that we face every day. What are the challenges that make up your day?

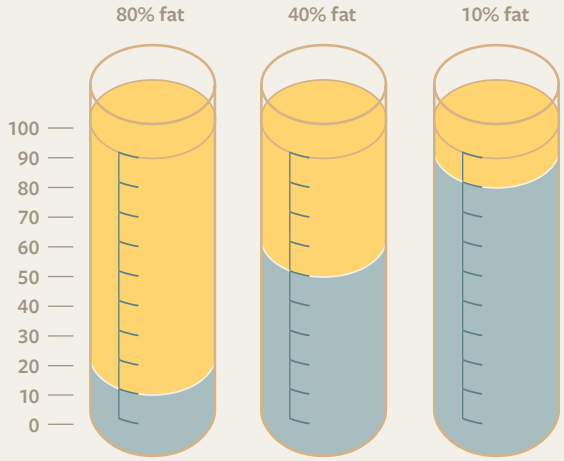
Team up with Palsgaard and let us find a solution together.

A truly low-fat spread

At Palsgaard we continue to push the boundaries of emulsifier properties so customers can grow into profitable new product categories. One innovation project has resulted in the manufacture of high-quality, low-fat spreads with only 10 percent fat.

Our solution meets these demands:

- As low as 10% fat content
- No hydrogenated emulsifiers
- No hydrogenated oils or fats
- No allergenic ingredients
- Non GMO
- No trans fatty acids (<1 percent)



The key to spatter control

Emulsifiers for frying margarine

Traditionally, frying margarines have been produced in block form. However, recently, liquid frying margarine have started appealing to consumers because it's easy to use, and, with its high content of polyunsaturated fatty acids, has a healthier profile than traditional frying margarine. And its superior frying performance makes it a great alternative to liquid oil, too.

Because it's used in many ways, consumers place plenty of demands on its performance – demands that present serious challenges for margarine manufacturers.

Palsgaard has been working with liquid margarine as a concept well before it became a consumer product, so we're truly experts in this area.

Using a combination of emulsifiers and oil absorbers, we can solve just about any challenge you may face, including:

- Stability
- Oiling out
- Viscosity
- Spattering

Let's co-create your next frying margarine

Our tailor-made emulsifier solutions for frying margarine come as easy-to-melt pellets and powders, and include non-palm and lecithin-free alternatives.

Key benefits include:

- Very little spattering during frying – also in salt-reduced and allergen-free recipes
- Good foam on the top of the molten/liquid margarine
- Good browning effect
- Even frying performance
- Emulsion stability – no oiling out
- Trans-fat-free

How would you like your frying margarine?

You may be looking to develop a trans-fat-free margarine. Or a product that's lower on both fat and costs without compromising frying properties. Perhaps you want to switch from a lecithin to a non-lecithin formulation. Or you may be looking to reduce the salt-content and remove milk solids – and preferably without affecting the spattering effect.

Whatever your goal, you'll need a good emulsifier system, carefully crafted with the right ingredients.

Our technical experts have compiled more than 1,000 multi-parameter trials into a 'solution-engine' that can help determine how to achieve and maintain the best possible frying performance, and we're happy to share it.

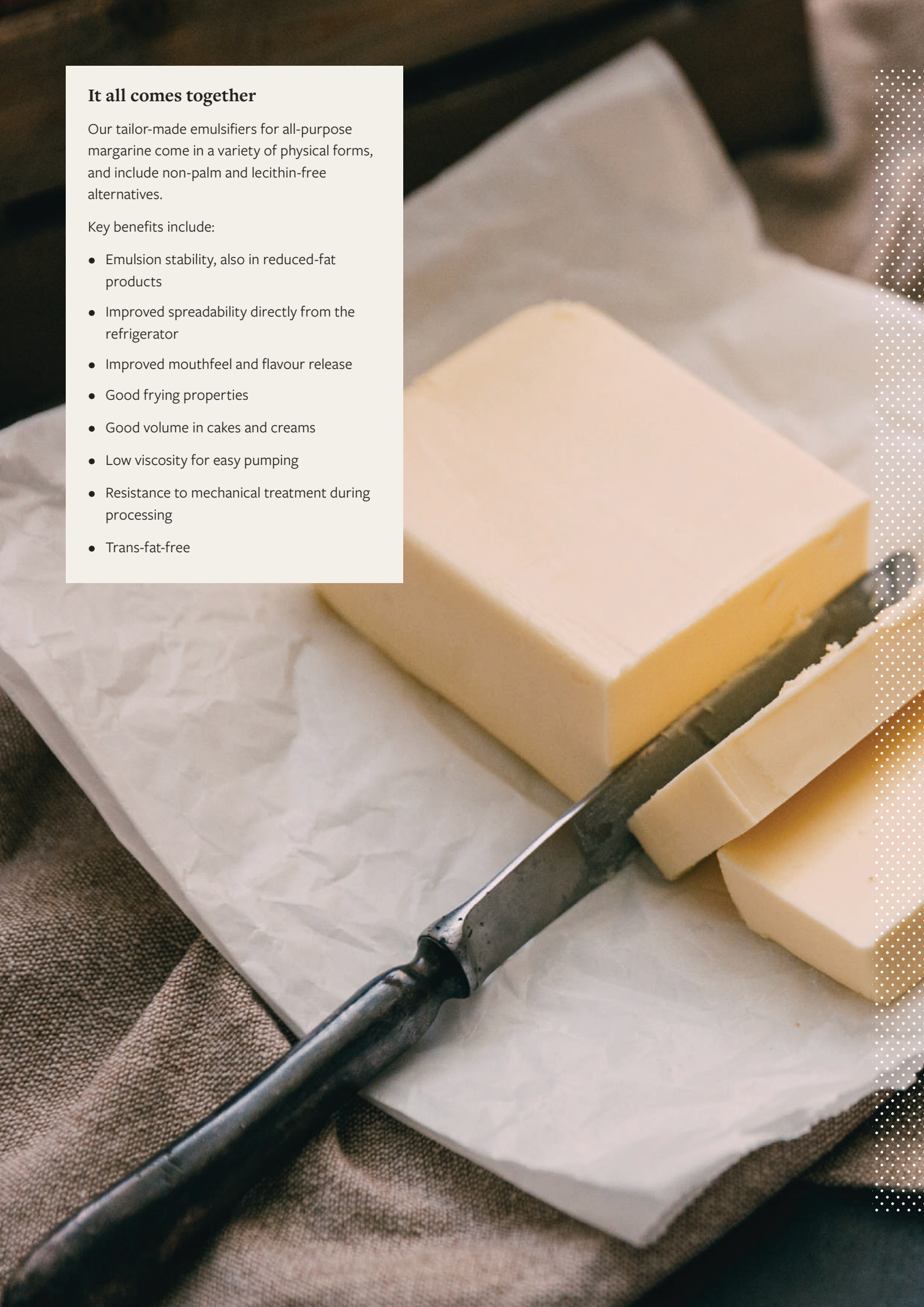
Making all ends meet in all-purpose margarines

Emulsifiers for all-purpose margarine

All-purpose margarine is a popular ingredient used in cooking, baking, and for spreading on bread. It is a versatile and affordable substitute for butter, with a longer shelf life and lower saturated fat content. However, producing all-purpose margarine can be a challenge for manufacturers due to the complex process and strict regulations.

One of the primary challenges in producing all-purpose margarine is achieving the desired texture and consistency. Margarine must be solid enough to hold its shape but also soft enough to spread easily. Achieving this balance requires careful blending of different oils, emulsifiers, and stabilisers, which can be a time-consuming and costly process.

Team up with Palsgaard to find out how we can help you succeed.



It all comes together

Our tailor-made emulsifiers for all-purpose margarine come in a variety of physical forms, and include non-palm and lecithin-free alternatives.

Key benefits include:

- Emulsion stability, also in reduced-fat products
- Improved spreadability directly from the refrigerator
- Improved mouthfeel and flavour release
- Good frying properties
- Good volume in cakes and creams
- Low viscosity for easy pumping
- Resistance to mechanical treatment during processing
- Trans-fat-free

More appealing margarine starts here

Margarine is produced from oil and water. As oil and water are properly mixed together, a dispersion of water droplets in oil is formed, but when mixing stops, the phases (oil and water) start to separate.

However, when an emulsifier is added to the system, the droplets remain dispersed, i.e. equally distributed, and a stable emulsion is obtained for a longer time. Margarine is a partly stable emulsion, glued together by crystals.

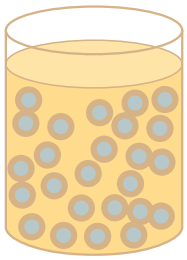
Any emulsifier consists of two main parts: a water-loving hydrophilic part and an oil-loving hydrophobic part. The hydrophilic part aims to the water phase and the hydrophobic one to the oil phase.

The emulsifier positions itself at the oil/water interface and, by reducing the surface tension, has a stabilising effect on the emulsion.

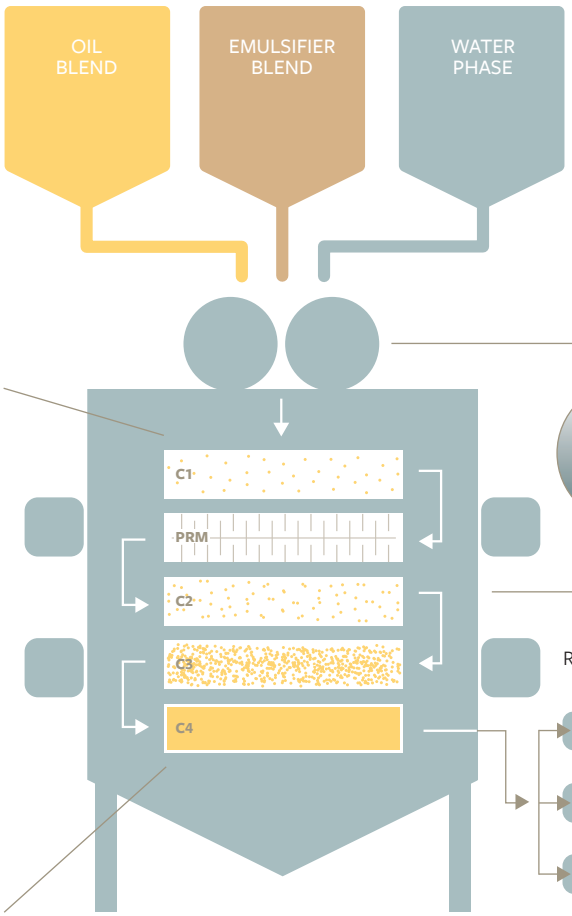
Innovation starts with experts

Take advantage of our unique insights into consumer trends and specific local requirements, and choose Palsgaard for your next innovative project. Our experienced food technologists are experts at solving challenges within aeration, crystallisation, plastification, fat-reductions, spatter control and all-purpose in addition to equipment limitations, or ingredient availability – and they are happy to share their know-how. With application centres in Denmark, Mexico and Singapore, help is never far away.

The process in margarine production



MARGARINE
WATER/OIL EMULSION



C1
Initiation of crystallization. Mixing and minimization of water droplets.

PRM
Mixing and agitation of the crystallized margarine. Resting time for crystallization.

C2
Scraping off the crystallized margarine from the surface of the tube chillers.

C3
Scraping off the crystallized margarine from the surface of the tube chillers.

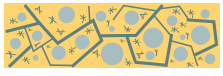
C4
Crystallization and removal of recrystallization heat.

Time scale

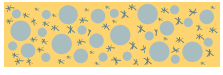
Time:	Processes:	Fat structure:
Sec.	Super cooling	
0-10 min.	Crystallization	
1-10 min.	Aggregation	
3-10 min.	Network compaction	
Min. - month	Recrystallisation Polymorphic transition	

Palsgaard emulsifier products

E471 Palsgaard® DMG
E471 Palsgaard® MDG
E472b Palsgaard® LACTEM
E472c Palsgaard® CITREM
E475 Palsgaard® PGE
E476 Palsgaard® PGPR
E477 Palsgaard® PGMS
Palsgaard® Integrated products (combined)
Palsgaard® fat crystallisers, None or E471



Primary crystal bond structure (firm)



Secondary crystal bond structure (plastic)

	Lipid souce	Product form	Emulsifier	Product name
Aeration	Rapeseed	Powder/pellets	E471	Palsgaard® DMG 0091
	Palm oil	Powder/pellets	E471	Palsgaard® DMG 0093
	Palm oil	Powder/pellets	E471	Palsgaard® DMG 0097
	Rapeseed	Pellets	E471	Palsgaard® DMG 0291
	Sunflower	Paste	E471	Palsgaard® DMG 0295
	Sunflower HO	Paste	E471	Palsgaard® DMG 0298
	Palm oil	Paste	E475	Palsgaard® PGE 1105
	Sunflower HO	Liquid	E475	Palsgaard® PGE 1155
	Sunflower HO	Liquid at 25°C	E471, E475	Palsgaard® 1388
Crystallisation	Rapeseed	Powder/pellets	None	Palsgaard® 6111
	Palm oil	Powder/pellets	None	Palsgaard® 6112
	Rapeseed	Pellets	None	Palsgaard® 6113
	Palm oil / rapeseed	Powder	None	Palsgaard® 6115
	Rapeseed	Powder/pellets	None	Palsgaard® CrystalPromoter 6117
	Palm oil	Pellets	None	Palsgaard® 6118
	Palm oil / rapeseed	Powder	E471	Palsgaard® 6120
	Rapeseed	Powder/pellets	E471	Palsgaard® OilBinder 6121
	Rapeseed / palm oil	Powder	E471	Palsgaard® 6151
	Rapeseed	Powder	E471	Palsgaard® 6160
	Rapeseed	Powder	E471	Palsgaard® 6173
	Rapeseed	Powder/pellets	E471	Palsgaard® CrystalPromoter 6191
Plastification	Rapeseed	Powder/pellets	E471	Palsgaard® DMG 0091
	Palm oil	Powder/pellets	E471	Palsgaard® DMG 0093
	Palm oil	Powder/pellets	E471	Palsgaard® DMG 0097
	Palm oil	Pellets	E471, E475	Palsgaard® 1302
	Rapeseed / palm oil	Pellets	E471, E475	Palsgaard® 1304
	Sunflower HO / palm oil	Block	E471, E475	Palsgaard® 1311
	Palm oil	Pellets	E471, E475	Palsgaard® 1315
Fat reduction	Sunflower HO	Paste	E471	Palsgaard® DMG 0298
	Sunflower	Paste	E471	Palsgaard® DMG 0295
	Castor oil	Liquid	E476	Palsgaard® PGPR 4175
	Castor oil	Liquid	E476	Palsgaard® PGPR 4190
	Rapeseed	Powder/pellets	None	Palsgaard® 6111
	Rapeseed / palm oil	Powder	E471	Palsgaard® 6151
Spatter control	Palm oil	Pellets	E471, E472C	Palsgaard® 0170
	Rapeseed	Pellets	E471, E472C	Palsgaard® 0172
	Vegetable fat blend	Powder/pellets	E472C	Palsgaard® Citrem 3203
	Sunflower	Liquid at 25°C	E472C	Palsgaard® Citrem 3212
All-purpose	Palm oil	Pellets	E471, E472C	Palsgaard® 0170
	Rapeseed	Pellets	E471, E472C	Palsgaard® 0172
	Vegetable fat blend	Pellets	E471, E322	Palsgaard® 0184
	Vegetable fat blend	Powder/pellets	E472C	Palsgaard® Citrem 3203
	Sunflower	Liquid at 25°C	E472C	Palsgaard® Citrem 3212
	Vegetable fat blend	Pellets	E471, E322, E472C	Palsgaard® 3237

Palsgaard® Citrem

Citric acid esters of mono and diglycerides (CITREM) are widely used in food industry for various applications. Citrem stabilises oil-in-water emulsions in various food products such as baked goods, margarine, coffee whiteners, and ice cream. It can also function as a dough conditioner in bread and pastry products, improving their texture and shelf-life. In frying margarine, Citrem creates small water droplets nicely dispersed in a stable emulsion, which results in reduced and controlled spatters when the margarine is used in frying or cooking purposes.

Palsgaard® DMG

Distilled monoglycerides of fatty acids (E471) are emulsifiers produced from glycerol and fatty acids of vegetable origin, like sunflower, rapeseed, palm, etc. Distilled monoglycerides are commonly used in various food and non-food applications. The main function of DMG in margarine is to create a stable emulsion of water droplets equally dispersed in oil.

Palsgaard® PGE

Polyglycerol esters of fatty acids (E475) are emulsifiers produced by esterification of polyglycerols with vegetable based fatty acids. Polyglycerol esters are widely used in the food industry as they combine hydrophilic and lipophilic properties in the same molecule. PGE is used in margarine because of its ability to create air in the emulsion and stabilise it.

Palsgaard® PGPR

Polyglycerol polyricinoleate (E476) is an emulsifier made from glycerol and fatty acids, based on castor (vegetable) oil. PGPR is strongly lipophilic emulsifier, soluble in fats and oils, and insoluble in water. It is used in low fat spreads and other types of fat based food as an emulsion stabiliser.

Palsgaard® Integrated products

Palsgaard® 0170, Palsgaard® 0172, Palsgaard® 0184 and Palsgaard® 3237, are well-balanced emulsifier blends, which are designed to create a stable emulsion, with small water droplets which are nicely dispersed in the emulsion. These products are suitable for household general purpose margarines, which can be used for a broad range of applications such as baking, frying and as breakfast margarine. Palsgaard® 0170 and, Palsgaard® 0172 are lecithin-free.

Choose ingredients that do good

Palsgaard is committed to acting responsibly for the good of our planet, consumers, the local communities we are a part of, and our employees. Consumers are also increasingly conscious of environmental challenges and other CSR-related topics, and all **Palsgaard emulsifiers for margarine** live up to our high standards for sustainability.

- Produced in CO_2-neutral factories
- Sourced sustainably from RSPO SG-certified palm or non-palm sources
- Produced with minimum waste, and minimum consumption of energy and water
- Handled by a responsible supply chain that lives up to all international standards

To learn more about our efforts within CSR, please visit **www.palsgaard.com/CSR**

Bringing good things together for over a century

The modern food emulsifier was invented by the founder of Palsgaard, Einar Viggo Schou, in 1917. Since then, we have never stopped developing and improving our products, and it is part of our DNA to keep developing yours. Bringing together your unique challenges and our drive for perfection is the recipe for a successful collaboration, and for great products that consumers love.

We also bring together the know-how of a century with a deep sense of responsibility for future generations. That's why all our production sites are CO_2-neutral and why we go to great lengths to live up to the relevant UN Sustainable Development Goals.

Learn more about our heritage and values at
palsgaard.com

Palsgaard®
Heart working people