Dairy Solutions
Understanding customer needs is our business
AAK is a world leading supplier of high value-added speciality fats. In every customer relationship, our role is to contribute to the competitiveness of our customers in their respective markets. We offer a wide range of product advantages; from highly nutritional products, products developed for better functionality, taste and longer shelf life, to cost efficiency.

Company
AAK’s wide product portfolio meets customer requirements worldwide. Our customers represent a wide range of industries; Food, Infant Nutrition, Confectionery, Cosmetics, Technical and Feed. AAK’s objective is to supply innovative and creative, vegetable fat solutions for the benefit of our customers. AAK also offers a complete range of oils and fats for Dairy applications.

Quality and Food safety
AAK’s quality comprises the entire product chain – from raw material to finished product. All of AAK’s production units are certified according to international standard’s.

Research & Development
AAK’s knowledge and expertise regarding the properties of vegetable fats develop continuously through customer contacts, cooperation with research institutes and governmental authorities – regionally and globally. Our research and development take place in close coordination with the customer to meet their specific requirements.

AAK ACADEMY™
AAK’s customer training programme is organised by AAK Academy™. The Academy arranges courses and seminars for entire industries as well as for individual customers.

For further information see www.aak.com
Many dairies have in recent years entered into a rather new situation that completely changes the basic ground upon which the dairy companies traditionally have built their business. Seasonal availability and pricing of milk and milk fat has changed. In addition there is also more pronounced competition on the market between domestic dairies as well as multinational companies. The new situation puts demands on product development to launch new product lines or products with a lower price for the consumer. For both these directions of product development, the use of vegetable fats is a solution to increase competitiveness. Choosing the right kind of vegetable fat, can prove to be a successful complement to the traditional dairy operations.

AAK presents a product range of Dairy Solutions, which is an assortment of high quality vegetable fat products, with specific characteristics, to fulfil the requirements of the various dairy applications. AAK’s Dairy Solutions are developed to give equal quality of the finished products, using the same processing equipment as for ordinary dairy production.

Dairy Solutions are used as total or partial replacer of milk fat.

### The main reasons for using AAK’s Dairy Solutions:

- The same quality of the finished products as with milk fat can be reached.
- Improved nutritional profile.
- Favourable cost compared to butter fat.
- Constant quality; no summer/winter variations.
- The same manufacturing equipment as for ordinary dairy production can be used.
- Easy and convenient to use in production.
- Refined to the highest taste quality, necessary for the replacement of milk fat.
- Any ratio of vegetable fat/milk fat can be used in the applications.
- A wide range of milk fat sources and other milk raw materials can be used in the combination with the vegetable fat.
- Possibilities to develop new dairy products using tailor-made blends.

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The features of AAK’s Dairy Solutions

Good taste and taste stability
Due to its composition, milk fat has a characteristic creamy/buttery flavour, that vegetable fats lack. In order to replace milk fat with vegetable fats and still maintain the quality of the finished product, the vegetable fat must have a bland taste without any off-flavour. It also has to have good flavour stability. The bland flavour and high flavour stability of AAK’s Dairy Solutions products are based on careful selection of raw materials and appropriate, optimised refining of the oils.

Improved nutritional value
From a nutritional point of view, the high proportion of saturated fatty acids in milk fat is less desirable. Vegetable oils usually contain less saturated fatty acids and more unsaturated fatty acids compared to milk fat and they contain very little cholesterol. When using vegetable fats, in combination with milk fat or on their own, the balance between various fatty acids can be adjusted to a higher nutritional value.

AAK’s Dairy Solutions products are designed to have a beneficial nutritional profile. When necessary they can also be adjusted to fulfil different objectives. This often means that the amount of saturated fat and trans fatty acids are reduced and the mono- and polyunsaturated fatty acids are increased. By carefully selecting and combining raw materials, followed by gentle processing, they are designed to satisfy both the nutritional aspects and the functional properties of a fat for dairy application.

 Desired crystallisation behaviour
Milk fat crystallises and is stable in the beta-prime polymorph. This gives milk fat some desirable application characteristics: high crystallisation rate, good foam stabilising properties and small crystals. A vegetable fat, replacing milk fat, must conform to this crystallisation pattern, especially if used in mixtures with milk fat. Depending on the application, the desired crystallisation behaviour differs and AAK’s extensive knowledge in this area is essential in order to develop well-performing products.

Accurate melting properties and consistency
Milk fat has good melting properties, being quite hard at lower temperatures and melting completely at body temperature. This is important for the mouth feel and flavour release when eating the finished product. A vegetable fat should have similar melting properties in order to replace milk fat with a maintained quality of the finished product. The consistency of milk fat and vegetable fat blends is also affected by the melting profile, influencing for example the texture and eating properties of butter blends, ice-cream and cheese.

While milk fat shows seasonal variations in hardness, the vegetable fats are produced to an even consistency throughout the year.

When air is incorporated into the products, such as whipped cream and ice-cream, the balance between solid fat and liquid oil becomes extra important for the stability. In such cases, care is taken to adjust the solid fat content at the appropriate temperatures.

Good stability and long shelf-life
The stability and shelf-life of dairy products are of course mostly dependent on the hygienic conditions in the production, and on the storage conditions. The development of rancidity has also to be considered. Hydrolytic rancidity is caused by fatty acids set free during storage and may be a problem with milk fat. Both milk fat and vegetable oils can also get rancid by lipid oxidation. The more unsaturated oils are more sensitive to this type of rancidity. Vegetable fat blends containing the nutritionally desired polyunsaturated fatty acids but with high resistance towards oxidative rancidity, are available for many dairy applications.
Dairy Solutions in dairy applications

The replacement of milk fat with a vegetable fat blend is often quite simple when using AAK products. They have been tailor-made to meet the requirements of the applications. A straight one-to-one replacement is then easily performed. In other cases there are some factors that need to be considered. Some of these are described below.

Recipe
When replacing milk fat with vegetable fat in dairy products, it is recommended to start with the currently used recipe. If butter is originally used in the recipe, a re-calculation of the fat content has to be made, as vegetable fat is 100 % fat without any content of water. A calculation is also to be made to obtain a cream with correct fat content, from vegetable fat and skimmed milk, or other milk raw material. The vegetable fat based cream is then used in the same way as ordinary cream.

Flavour and colour
In some applications the absence of a characteristic butter flavour, in vegetable fats, makes it necessary to add a flavour. Experience shows that flavour are normally not needed if the proportion of milk fat in the fat blend is more than 30-50 %.

Colouring in the form of beta-carotene is on request added to the finished product in order to meet the different requirements for the various products and markets.

AAK can add both flavouring and colouring agents to our products on request by the customer. This ensures safety and offers convenience in the customer’s production.

Processing and equipment
- The existing processing equipment can be used in most application areas.
- Only minor adjustments of the process parameters compared to ordinary dairy production.
- No expensive investments in new equipment are required.
- The productivity in the manufacturing line can be maintained or even improved.
- There will of course be a need for the installation of equipment for handling of the vegetable oil and for its incorporation into the milk or cream.

Process parameters
Process parameters need normally only minor adjustments. In some cases the vegetable fat blends crystallise more rapidly than the milk fat. The cooling time and temperature must then be adjusted accordingly to obtain a satisfactory product. In other cases, special attention should be given to the polymorphic behaviour of the milk fat and vegetable fat blends, and you should consult your AAK representative to obtain the appropriate handling instructions.

Emulsification
Manufacturing of an emulsion made from the fat is the first stage in the production of vegetable fat based dairy applications. This emulsion (vegetable fat based milk or cream) is then used as the basis for the production, see figure.

When the vegetable fat is mixed into the milk source, the result is a coarse emulsion. This coarse emulsion needs to (for some applications) be homogenised, in order to reduce the droplet size and give sufficient stability. Sometimes, for example in ice-cream and whipped cream, the properties of the emulsion are critical parameters for optimal performance in the application.
Butter-blends

Spreads, based on vegetable fat and small amounts of butterfat, are normally manufactured by using a chilled-tube scraped-surface type of equipment. For a normal dairy operation, this approach usually requires investments in new expensive equipment.

AAK’s has developed vegetable fat mixtures, Akoblend, suitable for making butter-blends with ordinary butter-making equipment.

The advantages of using Akoblend

The advantages of Akoblend can be summarised as follows:
- The same equipment can be used for both ordinary butter and butter-blends.
- The same package and wrappings and equipment as for ordinary butter can be used.
- Any ratio of vegetable fat/butter fat can be used.
- The consistency of the butter-blend can be adjusted: to obtain the desired product spreadability.
- Also a high ratio vegetable fat/butter fat gives the same consistency properties as butter.
- The uniform product quality means less variation from summer/winter butterfat.
- A wide range of milk fat sources can be utilised: creams of different fat contents or butter.
- A wide range of milk raw materials can be utilised: skimmed milk, ordinary whole milk, low fat cream, skimmed milk powder, whole milk powder or cream powder.

Akoblend meets your consistency demands

Akoblend is 100 % vegetable fat blends, refined to obtain a bland taste and very good stability. The melting characteristics are similar to butter fat. In fig. 1 the solid fat content at various temperatures is given for two different Akoblend products and for butter fat. Akoblend BE is an example of products especially suitable for blends with high amounts of butter fat (40-60 %) and will give a product more spreadable than butter. Another product in the AAK’s range, Akoblend NH, can be used to give the same consistency as butter, if a lower butter fat content is requested. Other products are available to meet any other consistency demands.

As mentioned colouring in the form of beta-carotene can be added to the finished products and sometimes also butter flavour. On request by the customer, AAK can add both flavouring and colouring to the Akoblend products.

Reduced fat content

With our latest fat, Akochurn, a blended cream can be churned to a butter blend with a 60 % fat content in comparison with regular butter, which has a fat content of around 80 %. This means that Akochurn reduces the fat content with 25 %. The process is the same as for regular butter production. No additional treatment is required. Thanks to the Akochurn fat blend’s unique properties, the butter blend is automatically churned to 60 %.

Less saturated fat

Akochurn has a significantly lower saturated fat level than regular butter fat. We are now able to increase the amount of unsaturated fat in butter blends by over 50 % compared with regular butter. At the same time, the amount of saturated fat in the blend is reduced. Our fat blend is, of course, trans-free, which means that the trans-fat level is less than 1 %. Figure 2 shows the fatty acid composition of the different products. It compares butter fat with the vegetable alternative, Akochurn.

Akochurn NT 73-32 is compared and you can see the reduced amount of saturated fatty acids (SAFA) for Akochurn and at the same time the increase mainly in monounsaturated fatty acids (MUFA). Also the poly-unsaturated fatty acids (PUFA) is increased slightly and the trans fatty acids (TFA) is reduced.
Cream applications

Properties of cream
An emulsion (cream) made from the fat, is used as the basis for most vegetable fat based dairy applications. Manufacturing of the emulsion is the first stage in the production of these products. This cream is characterised by its fat content, its stability against flocculation and coalescence, and its whipping properties. The creams are normally stabilised by a combination of particle size control, added emulsifiers and stabilisers, and the milk proteins present in the raw materials.

New opportunities with vegetable fat
The vegetable creams are used as such or as intermediates in the production of other dairy items such as butter blends, ice cream or desserts. The vegetable creams can also be fermented to cultured products like soured cream or spray dried to powders. Creams are normally classified according to their fat content, with pouring (cooking) creams containing approximately 20% fat, whipping creams 20-40% fat and "double creams" 35-50% fat. The vegetable creams are normally developed to match these qualities.

Liquid cream
Different types of products require different types of fats in order to make a successful application. Products like liquid coffee whiteners and cooking creams, where the whipping properties are less important, are formulated using Akoblend or other special nutritional blends. Akoblend is also described in the butter-blend chapter. These products fulfil the most important requirements such as, the absence of rancidity and off-flavours, and good storage stability.

Cultured creams
Various kinds of cultured creams such as soured cream, crème fraîche and smetana are produced from vegetable fat blends. Except for differences in fat content, these products vary in taste, sourness and consistency. It is important to retain these properties when replacing milk fat with vegetable fat totally or partially. It is also vital to obtain a stable cream that does not separate the water phase. These properties are obtained by using Akoplend in combination with correct processing, and possibly an additional stabiliser.

If combined products of milk and vegetable fat are produced, then ordinary cream and cream based on vegetable fats are blended to the desired proportions. This mixed cream is then homogenised, heat treated and fermented in the normal way.

Whipped cream
For different types of aerated applications such as whipped creams, toppings and aerosols, the Akotop range of fat is to be preferred. These fat blends have the correct type, and amount, of solid fat crystals for the stabilisation of air cells, in order to produce stable foams that do not shrink or release the liquid phase. The balance between liquid and solid fat in the fat globules is important in order to produce sufficient overrun, and to give stability when the globules flocculate.

The performance of the product is determined by the processing conditions and the fat, together with the choice of emulsifiers and additional stabilisers. The droplet size and cooling conditions must be optimised in order to achieve the desired whipping properties and stability.

Akotop has a bland taste and a rapid melting that contributes to a good flavour release. The crystallisation behaviour is optimised to meet the requirements for foam stabilisation and compatibility with other ingredients, including milk fat.

Akotop can with preference also be used when making flavoured products, such as chocolate or vanilla toppings. Another possibility is to make blended cream, to combine the full flavour of dairy cream with the stability and reduced fat content of a topping.

Whipped topping are complex systems placing specific demands on properties of the fat. Traditionally hydrogenated lauric fats have been used with excellent result. However since demands for non-hydrogenated fats is increasing across the entire food industry, AAK has developed a non-hydrogenated and consequently trans free product with excellent performance in whipped systems. Akotop NH100 is simply declared as "vegetable fat" in the list of ingredients.
Vegetable fat-based toppings have advantages over traditional cream-based products. They have the same or improved functionality in terms of:

- Overrun
- Form stability
- Sensory properties

These properties can be achieved even if the fat content of the product is reduced from the normal dairy product level of 36-40% to as low as 25%. This means less total fat and less saturated fatty acids in your end product than in a dairy cream. Vegetable fat based toppings has been used for different whipped applications for many years. The standard fats commonly used contain hydrogenated fats, which in most cases mean also trans fatty acids (TFA). These have recently been under more and more debate, concerning the possible adverse effects on heart health. Our new topping Akotop NH100 is a non-hydrogenated fat which means it is a trans fatty acid free product.

**Sensory properties close to dairy cream**

Our range of topping fats – Akotop – has excellent properties like overrun (the maximum amount of air that can be incorporated into the topping), form stability (how volume stable the cream is after freezing and thawing) and whipping time. Regarding the sensory evaluation our Akotop NH100 is unique with mouth-feel and melt-off close to dairy cream.

**Akotop NH100 – non-hydrogenated fat for whipped toppings**

- Non trans – TFA < 1%
- Clean label – is declared only as “vegetable fat”
- Superior mouth-feel – close to dairy based cream
- Excellent functionality – in line with the best on the market

### Our standard product range

<table>
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<tr>
<th></th>
<th>Non-hydrogenated</th>
<th>Non-trans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akotop P70</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Akotop NT70</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Akotop NH100</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Fat improves the properties of cheese

Even though cheese is built up by a protein structure, the fat plays a significant role for some important basic properties of the cheese. The fat greatly influences both the texture and flavour of the various kinds of cheeses.

Cheeses are normally manufactured by one of the two basic methods for making curd from milk, acid or rennet coagulation. Vegetable fat is used to replace milk fat in both rennet and acid coagulated cheeses.

High quality vegetable fat for cheese

It is important to use vegetable fat blends that give the same properties to the final cheese as milk fat. AAK’s speciality fats for cheese production are the Akoroma and Akocheese product ranges. These products have the correct balance between solid and liquid fat, as well as the correct consistency and melting behaviour. They also have the suitable crystallisation pattern to achieve optimal quality of the finished product in terms of consistency, appearance and shape integrity during ripening. Akoroma have a bland taste, which does not interfere with the final cheese flavour.

Akocheese is AAK’s specialised fat blend for use in all ripened cheeses. This vegetable fat blend gives an improved flavour development in the cheese during ripening compared to other fat blends. It is used much in the same way as Akoroma, but gives a more premium cheese taste.

Another method used is the mixing of a protein blend with a vegetable fat, producing a processed cheese analogue. Akoroma is used for this application.

Fresh cheese

This group comprises quarg, cottage cheese, cream cheese and fromage frais, among others. They are primarily produced by acid coagulation and are ready for consumption without ripening. These types of cheeses can successfully be produced using Akoroma.

Hard and soft cheese

Most major international varieties of cheese are included in this group. They are mainly produced by means of rennet coagulation. A wide variety of starter bacteria are used, and in most cases the cheeses are fully developed only after some time of ripening. In this group the cheeses can be successfully made from vegetable fat, using the Akoroma and Akocheese range.

Processed cheese

Processed cheeses exist mainly as spreadable cheese and as blocks, slices and grated cheese. They are commonly manufactured by heating hard cheese together with melting salts in an agitation pan. This procedure breaks down the protein structure of the original cheese and produces a stable emulsion. Butter or vegetable fat, like Akoroma, is added during the melting process to achieve the desired texture of a cheese spread.

Another method used is the mixing of a protein blend with a vegetable fat, producing a processed cheese analogue. Akoroma is used for this application.

Cheese production using Akoroma and Akocheese

The production of vegetable fat based cheese starts with the emulsification of vegetable fat in skimmed milk. The size and uniformity of the fat globules are important parameters for the final quality of the cheese. The obtained recombined milk is then used in the ordinary cheese making equipment.

There are also variations to the mentioned production methods. For example, a fresh cheese spread can successfully be produced by mixing ordinary skim milk quarg with Akoroma and water in a Stephan cooker.
Other dairy applications

Milk
Milk for consumption can be made from skimmed milk, a suitable vegetable fat, and food emulsifier. Besides price the main reason for making such a product is the nutritional value. Vegetable fats are then used to incorporate high amounts of mono- and polyunsaturated fatty acids or to decrease the amount of saturated fat. We recommend Akoblend for this application, as it is very low in saturated fat and high in monounsaturated fat.

Cultured milk products
Yoghurt is one example of products that can be made by recombination using a suitable vegetable fat together with skimmed milk, or dry ingredients and water. This is especially useful for high-fat creamy dessert yoghurts. Akoblend is used for this application. Yoghurts with specific health claims, functional food, may be formulated combining above mentioned fats together with specific formulated products from AAK.

Dairy desserts
Milk and cream based desserts, like mousse and puddings, can be made from a vegetable fat based milk emulsion. The fat influences the rheological properties, like viscosity, of the dessert as well as contributing to the desired sensory profile.

Condensed milk
Sweetened condensed milk is used both for consumption and for industrial purposes. The products are made by recombination of skimmed milk powder, sugar, water and fat. The fat can be either vegetable fat or butter oil. The Akoblend range is used for this application.

Milk and cream powder
Powdered dairy products, such as whole milk and cream powder, can also be made from vegetable fat. An emulsion, based on milk raw material and vegetable fat, is spray dried in the same way as when making dairy milk powder. The fat content in the emulsion recipe is calculated from the requirements of fat content in the final product. The Akoblend products are suitable for these applications.

Functional ingredients
To even create a better nutritional profile of the end product, specific functional ingredients can be added.

Vividol and Specidol are the product range for these applications. Vividol ready to use Phytosterol. Specidol with high amount of omega 3.

Ice-cream
AAK’s range of speciality fats for ice-cream is called Akomix. The Akomix products are refined to the highest taste quality which is of utmost importance in ice-cream. They have the correct balance between solid and liquid fat at different temperatures to be able to replace dairy fat with a maintained nice, creamy consistency and eating properties of the ice-cream.

The Akomix products differ from most other vegetable ice-cream fats with their unique, nutritional profile. It means that the amount of saturated fat and trans fatty acids is reduced and the content of mono- and polyunsaturated fatty acids is increased. This composition improves also the properties of the ice-cream as well as reduced shrinkage and improved melting resistance.

From a physical point of view, ice cream is a very complicated product. Selecting the right ingredients is of outmost importance. A part from emulsifiers and stabilizers, the fat plays an important role in helping to achieve the desired eating qualities.

Replacing milk fat by vegetable fats not only reduces costs, it also makes the texture of the ice cream easier to adjust to the demands specified. Vegetable fats have the important advantage over milk fat that they make it possible to balance the content of
saturated and polyunsaturated fats in the composition and to reduce the cholesterol level.

**Health trends**
A strong health trend which focuses on saturated fat levels is running through the whole food industry. At present, ice cream production is based on milk fat or a vegetable alternative, such as coconut oil or Akomix (AAK ice cream product range). Ordinary milk fat contains fairly high levels of saturated fat, around 65%, and coconut has an even higher level of saturated fat, over 90%. This should be compared to a saturated fat level of 60% and down to 30% in the Akomix range. Normally, a reduced level of saturated fat means that hardness and the fat's ability to form a good structure is more difficult. In the Akomix range, by selecting the right fat components, it has been possible to eliminate the risks that somewhat softer fats will create in the end product.

**Benefits of using Akomix**
Akomix is customized for ice cream production, and provides end products with different properties, such as hardness, melt off and creaminess. At the same time, Akomix ensure a better fat composition in the end product and reduce costs compared to using milk fat or coconut oil.

**Reduce saturated fat**
In the product development phase it has been relatively easy to reduce the level of saturated fat down to 40% and still retain the desired properties of the ice cream. The step down to 30%, the level of Akomix LS 30 was far more challenging and required the knowledge of advanced fat technology. Akomix has significantly lower levels of saturated fat and considerably higher proportions of mono- and polyunsaturated fat. Neither product does, of course, contain trans fats. Akomix LS range provides the end product with an excellent structure and consistency. From a sensory point of view, AAK have created a fat which improves the creaminess of ice cream and provides an excellent taste experience.
Vegetable oils and fats – some basics

Vegetable oils and fats are extracted from oil-containing seeds, beans or nuts. Vegetable oils and fats consists of 100% fat, without any water, in contrast to butter, which normally contains 80-83% fat and water.

Vegetable fat and milk fat have basically the same chemical structure. They are triglycerides with a glycerol molecule linked to three fatty acids (figure 1). However, most vegetable oils and fats differ from milk fat in composition, since they do not contain any significant amounts of short chain fatty acids. The chain length and the degree of unsaturation of these fatty acids are characteristic for the individual fats. The more unsaturated and/or more short chain fatty acids the fat contains, the lower the melting point of a fat.

Vegetable fats contain tocopherols (Vitamin E), which are natural antioxidants found mainly in vegetable sources.

Identification

Iodine value, refractive index and gas chromatography (GC) are methods used to identify a fat.
- Iodine value gives a measure of the degree of unsaturation. The higher the value the more unsaturated fatty acids the fat contains.
- Refractive index is characteristic for each fat.
- Fatty acid composition is determined by gas chromatography and specifies the different fatty acids in a fat.

Physical properties

The physical properties of a fat are determined by its composition in combination with its thermal history, described by the polymorphic behaviour (figure 2).
- Solid fat content, SFC, measures the ratio between solid and liquid fat at different temperatures. Data like hardness, heat resistance and melting off properties can be described from these analyses (figure 3).
- Melting point is determined according to different standardised methods. These can give different values since fats are melting within an interval and have no distinct melting point.

Degradation of fats

Oxidation and hydrolysis are the two main reactions in fat degradation. Hydrolysis will occur in the presence of water. Fatty acids and mono- and diglycerides are formed. The longer fatty acid chains from vegetable oils do not give rise to off-tastes. An exception is lauric fats (e.g. coconut and palmkernel oil) where free lauric fatty acids (C-12) develop an unpleasant soapy taste.

In the oxidation process, oxygen is added to a double bond in an unsaturated fatty acid. The more unsaturated a fat is the more sensitive it is to oxidation. Oxidation of fats result in development of unpleasant off-tastes.

There are mainly four environmental factors that increase the rate of fat oxidation
- Heat
- Light
- Oxygen from the air
- Trace metals copper and iron

The degradation of fats is measured with chemical and sensory methods.
- Peroxide value gives the amount of primary oxidation products.
- Oxidation stability index, measured by for example the rancimat method, is an indication of the ability of a fat to withstand oxidation. It can be measured at different temperatures. The most frequent are 110 and 120°C
- Free fatty acids, FFA shows the amount of free fatty acids.
- A Sensory test is used for the final and decisive control before a fat is ready for delivery to customers. This test is performed by a panel that is specially trained for these kind of tests.
- A bland flavour in the fats is particularly important when replacing milk fat with vegetable fat.

Handling of fats

There are different matters to consider in the handling of fats. Oxidative deterioration is the main risk to be aware of. However, properly handled fats can be stored for a long time. Unlike many food products, for instance cream and butter, vegetable fats have not any micro-biological activity, as they do not contain any water. For the same reason, hydrolysis of vegetable fat is normally not a problem. Melted fat should be stored at 10-15°C above the melting point of the fat. Solid fat packed in boxes or drums should be stored cool (room temperature or below) in an odourless place.

Figure 1. Triglyceride

![Figure 1. Triglyceride](image1)

Figure 2. Polymorphic behaviour of fats

![Figure 2. Polymorphic behaviour of fats](image2)

Figure 3. Solid Fat Content

![Figure 3. Solid Fat Content](image3)
Recipes for producing 1000 kg of 45+ semi hard cheese

**Ratio vegetable fat/milk fat 50/50**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>Milk standardised to 1,5 % fat</td>
<td>985 kg</td>
</tr>
<tr>
<td>Akoroma</td>
<td>15 kg</td>
</tr>
<tr>
<td>Starter</td>
<td>Acc. to suppliers recommendations</td>
</tr>
<tr>
<td>Rennet</td>
<td>Acc. to suppliers recommendations</td>
</tr>
<tr>
<td>CaCl2</td>
<td>+</td>
</tr>
<tr>
<td>NaCl</td>
<td>Brine salted</td>
</tr>
</tbody>
</table>

**Procedure:**

Heat Akoroma to 55°C. Heat 100-200 kg milk to 55°C. Add Akoroma to the milk while agitating. Sufficient agitation to emulsify the fat and avoid separation is important, but also not to agitate so much that air is incorporated into the emulsion. The addition of fat should be slow. Homogenisation at low pressure. The suitable homogenisation pressure varies from equipment to equipment. An alternative can be to circulate with a centrifugal pump. HTST pasteurisation 72°C 15 sek. Normal cheese making procedure.

Recipes for producing 1000 kg of butter-blend

**Ratio vegetable fat/butter fat 40/60**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Cream (40 % fat)</td>
<td>1200 kg</td>
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<tr>
<td>Skimmed milk</td>
<td>480 kg</td>
</tr>
<tr>
<td>Akoblend</td>
<td>320 kg</td>
</tr>
</tbody>
</table>

The melted Akoblend is dispersed into the mixture of cream and skimmed milk, pasteurised and cooled. After maturing for 4-16 hours the blend cream is churned.

**Ratio vegetable fat/butter fat = 90/10**

<table>
<thead>
<tr>
<th>Ingredient</th>
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<tbody>
<tr>
<td>Cream (40 % fat)</td>
<td>200 kg</td>
</tr>
<tr>
<td>Skimmed milk</td>
<td>1080 kg</td>
</tr>
<tr>
<td>Akoblend</td>
<td>720 kg</td>
</tr>
<tr>
<td>Butter flavour</td>
<td></td>
</tr>
</tbody>
</table>

The melted Akoblend is dispersed into the skimmed milk, homogenised, pasteurised, cooled and then mixed with cream. After maturing for 4-16 hours the cream blend is churned.

Recipes for producing 1000 kg of soured cream with 20 % fat

**Ratio vegetable fat/milk fat 75/25**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>Akoblend</td>
<td>150 kg</td>
</tr>
<tr>
<td>Cream (40 % fat)</td>
<td>125 kg</td>
</tr>
<tr>
<td>Skimmed milk powder</td>
<td>15 kg</td>
</tr>
<tr>
<td>Stabiliser*</td>
<td>4-8 kg</td>
</tr>
<tr>
<td>Skimmed milk</td>
<td>702-706 kg</td>
</tr>
</tbody>
</table>

**Procedure:**

Dry mixed skimmed milk powder and stabilisers are added to skimmed milk while agitating. After a non-agitated hydration period the milk is heated to 60°C. Melted Akoblend is carefully added at the same temperature while agitating continuously. Dairy cream (40°C) is blended into the emulsion. Homogenisation at 150/50 bar is followed by heat treatment at 90-95°C for 3-5 min. Fermentation is carried out at 18-23°C until pH 4,5. The soured cream is cooled, packed, and kept in cold storage before distribution.

*For example modified starch, guar gum, or/and pectin. Stabilisers to be used according to instructions from the supplier.
Recipes for producing 1000 kg of whipping cream

**Oil phase:**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akotop</td>
<td>300 kg</td>
</tr>
<tr>
<td>Emulsifier (monoglyceride, lactylated monoglyceride, lecithin)</td>
<td>10 kg</td>
</tr>
<tr>
<td>Colouring agent (beta-carotene, 30 %-solution)</td>
<td>0.02 kg</td>
</tr>
</tbody>
</table>

**Water phase:**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skimmed milk</td>
<td>684 kg</td>
</tr>
<tr>
<td>Stabiliser*</td>
<td>6 kg</td>
</tr>
<tr>
<td>Flavouring agent</td>
<td></td>
</tr>
</tbody>
</table>

**Procedure:**

Stabilisers are added to heated (40-60ºC) skimmed milk while agitating. Let the stabiliser hydrate. Melted Akotop with added emulsifier and colouring agent is then carefully pumped into the milk at the same temperature while agitating continuously. Sterilise 4 sec at 137ºC, cool to 75ºC. Homogenisation at 150 bar or in two stages at 150/30 bar. Cool rapidly to below 10ºC. Keep the whipping cream cool for at least 10 h before whipping.

*For example guar gum, carrageenan. Stabilisers to be used according to instructions from the supplier.*
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