The Technology of Pasteurized, Sterilized and Reconstituted Milk

The Technology of Sweet Cream

by E. Eving

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U.S.S.R.
THE MINISTRY OF THE MEAT AND MILK INDUSTRY
OF THE ESTONIAN S.S.R.

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INTRODUCTION

Pasteurized milk is a milk product most widely produced and consumed. The production of sterilized milk has also been increased lately, since in certain conditions a prolonged preservation of milk qualities is essential. To level seasonal differences in supplying population of certain districts with milk, for example, in northern regions and in larger cities or settlements where periodical shortages of natural milk occur, reconstituted milk is produced. The consumer must get the milk of constant composition, meeting the requirements of standard specifications, independent of the differences in the quality and the chemical composition of the milk received by dairies. To obtain products meeting the requirements of standard specifications production technology of each product must correspond to the technological instructions. The technological instructions are based on elaborated technology, thus being a specified, shortened and adjusted variant of the production technology, in which all possibilities, all possible differences in separate production stages, depending on the use of different kinds of raw material, different machines and different conditions, are enumerated.

PASTEURIZED MILK

According to the requirements of the standard, the pasteurized milk must contain 3.2% of fat and not less than 8% of solids-non-fat. The acidity of the milk in cans and that of the bottled milk shall not exceed 22 and 21° Th respectively. The purity of milk must be that of the first group. According to the bacteriological characteristics, the pasteurized bottled milk is divided into the following groups.

Pasteurized milk	Total number of bacteria per ml	Number of Coli bacteria per ml
	not more than	not more than
Group A, either in bottles or in packets	75,000	3
Group B	150,000	0.3
Group C	300,000	0.3
Milk in cans, pasteurized	400,000	-

Until being delivered for marketing, the milk must be stored at a temperature not higher than + 8° C.

In the technology of pasteurized milk the following stages may be differentiated:

1. Collection, reception and classification of milk.
2. Preparation and standardizing of the raw material.
3. Purifying, pasteurizing and cooling.
4. Bottling and preservation.
5. Delivering milk for marketing.

Collection, Reception and Classification of Milk

Milk is a good medium for various microbes. It is sensitive to side-influences like odour and tase. The latter together with microbes may taint the milk altogether. Therefore, to obtain high-quality milk, every stage of milk handling, beginning from milking until the milk is delivered to consumers, is important. The milk received from the farms must meet the requirements of the standard specifications which must be well known to each milk producer. On receiving at the dairy, the milk from each farm is checked up separately. The milk meeting the requirements of the standard is accepted, while the milk not corresponding to them is rejected.

The milk received must be of normal colour, odour, taste and consistence. The colour of the milk should be white with a yellowish cream-coloured shade. The milk must have no side-odours. As to the consistence, it must not be viscous. The milk must contain no flakes or fat particles. It should be of only slightly viscous

consistence and have a sweetish taste. Mechanical impurities like hairs or stalks must not occur on the surface of the milk.

The degree of milk purity is determined by filtering the sample through a special device. Corresponding to the degree of purity the milk is arranged into the following groups:

I group - a completely pure milk (no precipitation on the filter).

II group - hardly visible gray particles on the filter.

III group - bigger particles (like flakes of protein, food particles, hairs or blood corpuscles on the filter).

The dairy has the right to reject the third group milk.

The milk obtained during 7 days after calving - the beestings - which contains a number of thermolabile protein fractions like albumin and globulin and has a special smack and side-odour, as well as the milk, obtained during 15 days before the end of the lactation period, is also rejected. The milk of the cow who is going dry is a bit salty and has a special "aged" taste. It contains more lipases and unsaturated fat acids which are easily hydrolysed by the latter. Products made of such milk cannot be preserved being, therefore, of a low quality.

Of the physico-chemical qualities milk fatness, acidity, temperature and density are determined. Content of proteins in milk is checked up periodically. The milk is brought to the dairies either in cans or in tank-trucks.

The milk received at the dairies is collected into tanks and then either processed on the spot or delivered to the combine. The milk is cooled down to 3-8°C, depending on local cooling conditions.

The milk is received and delivered by weight.

Reception of Milk at the Combine

The milk is brought to the combine either in cans, in tank-trucks or, by railway, in cistern cars. Before reception samples amounting to 100-250 g are taken from each lot of milk for the analyses and the quality of milk is estimated also organoleptically. Further, the most important chemical analyses are made. Then the milk is weighed and pumped into the tanks.

The milk whose acidity exceeds 19° is not used for the manufacture of drinking milk. Placed in a separate tank it is used for the production of curds.

At least once within 10 days the purity and reduction of each lot of milk are determined.

The kinds of raw materials used for the production of pasteurized milk are:

1. High-quality natural whole milk

2. Skim milk obtained from whole milk Acidity of skim milk must be not higher than 21° Th.

3. Reconstituted whole milk. Obtained from high-quality whole milk-powder produced by pulverization method.

4. Reconstituted skim milk. Acidity not higher than 21° Th. Obtained from high-quality skim milk powder produced by pulverization method.

5. Natural cream. Fat content 30%, acidity of plasm not higher than 20° Th.

6. Reconstituted cream. Obtained from high-quality cream powder produced by pulverization method.

Note: Acidity of cream plasm =

$$\frac{\text{acidity of cream Th}^{\circ} \times 100}{100 - \text{cream fat \%}}$$

7. In the production of vitaminized drinking milk ascorbic acid (vitamin C) is used. Ascorbic acid must meet the requirements of the established standard.

Not always are all the above-mentioned raw materials used. Most wide-spread is the production of pasteurized standardized milk either from natural raw milk, skim milk or cream.

After filling the collecting tank up to neccessary volume, the milk in tank is thoroughly mixed and all analyses, first of all that of fat content are made. Further, the standardizing process depends on the equipment used. If there is a centrifugal milk purifyer-standardizer, the milk is standardized by it. If there is no such device, the fat percentage is regulated by adding either cream or skim milk.

If the fat content of the milk exceeds 3.2%, skim milk must

be added. The required amount of skim milk may be calculated by the following formula:

$$\text{Required quantity of skim milk} = \frac{\text{Quantity of milk to be standardized} \times (\text{Fat content of milk to be standardized \%} - 3.2)}{3.2 - \text{Fat content of skim milk, \%}}$$

$$L_{kg} = \frac{P_{kg}\,(P_{r\%} - 3.2)}{3.2 - L_{r\%}}$$

For example, if

$$P_{kg} = 10\,000 \text{ kg}$$

$$P_{r\%} = 3.3\%$$

$$L_{r\%} = 0.05\%$$

then

$$L_{kg} = \frac{10.000\,(3.3 - 3.2)}{3.2 - 0.05} = 317 \text{ kg}$$

In case a certain amount of the milk must be skimmed to reduce the fat content and to standardize the milk, the quantity of cream to be separated may be calculated by the following formula:

$$\text{Quantity of cream to be separated} = \frac{\text{Quantity of milk to be standardized} \times (\text{Fat content of milk to be standardized} - 3.2)}{\text{Fat content (\%) of cream} - 3.2}$$

$$K_{kg} = \frac{P_{kg}\,(P_{r\%} - 3.2)}{K_{r\%} - 3.2}$$

$$K_{kg} = \frac{10.000\,(3.3 - 3.2)}{30 - 3.2} = 37.3 \text{ kg of cream}$$

must be separated while the skim milk remains in the milk.

If the fat content in the milk is less than 3.2%, either sweet cream or a certain quantity of milk of a higher fat content must be added. In this case the required quantity of either the

milk of a higher fat content or the cream is calculated as follows:

$$P^{II}_{kg} = \frac{P^{I}_{kg} (3.2 - P^{I}_{r\%})}{P^{II}_{r\%} - 3.2}$$

For example:

$$P^{II}_{kg} = \frac{10,000 (3.2 - 3.0)}{3.7 - 3.2} = 4,000 \text{ kg}$$

4,000 kg of milk containing 3.7% of fat must be added to 10,000 kg of milk containing 3.0% of fat to obtain a milk containing 3.2% of fat.

The necessary quantity of cream to be added is calculated by the following formula:

$$K_{kg} = \frac{P_{kg} (3.2 - P_{r\%})}{K_{r\%} - 3.2}$$

The cream for standardization must be homogenized at a temperature of 70-80°C and at pressures from 50 to 100 atm.

At the dairies the technological scheme of standardization is usually drawn up, where the existing equipment and the quantity of milk to be standardized have been taken account of. On the basis of this scheme tables are composed, where the quantities of milk, skim milk or cream corresponding to the fat percentage can be instantly found. In this way possible errors are eliminated and there is no need to figure out the necessary values each time.

After standardizing the fat content of the milk is determined. Then the milk is cleaned and pasteurized.

2. Cleaning and Pasteurizing of Milk

The milk, either cold or pre-heated, is cleaned in the regeneration section of the pasteurizing apparatus. Centrifugal milk purifiers are the best for this purpose. Actually, a centrifugal milk purifier is a separator whose barrel and discharge unit have been changed. Its collecting vessel is of higher capacity, the apparatus has no distributing disk and the disk set has no holes in it.

Mechanical impurities are precipitated onto the vertical walls of the barrel while the clean milk is pumped by the centrifugal pump into the outlet pipe.

In case the dimensions of the barrel correspond to the required capacity, the productivity of the milk purifier is twice higher than that of the separator.

Cleaning of milk may continue for 3 - 4 hours. In case of cold milk the purifier works also well, nevertheless its productivity is lower in this case.

The total number of bacteria in cleaned milk is reduced since they are absorbed in the particles of dirt and slime which are precipitated in the dirt-collector of the barrel.

Since during preservation a dense, sticky, unpleasant layer of cream forms on the surface of milk, the homogenizing of milk is recommended. By homogenizing the size of the fat globules is reduced ten times, i.e. to 0.1 - 0.5 microns. Thus, the velocity of fat globules rising to the surface decreases hundred times, which means that there is practically no separation of fat in homogenized milk. The highest effect of homogenizing is obtained at a temperature of 60°C. In homogenizers a pressure of 100-200 atm. is usually applied.

Lately clarificators have been taken into use instead of homogenizers. The operation of clarificators is based on centrifugal forces. In a barrel of special construction the cream is separated from the milk and led into the compression chamber. Passing through the immobile pressure-disk, the fat globules are partially pulverized. The cream returns to the central pipe and is mixed with the milk. When passing through the barrel for a second time, the small fat globules are not separated but discharged through the compression chamber together with the milk. Thus, a certain part of the cream continues passing through the disk until the fat globules become so small that they do not separate from the milk any more. By the effect of centrifugal force the milk is not only homogenized but also cleaned of mechanical impurities.

Depending on the pasteurizer, the milk is pasteurized either at a temperature of 65°C during 30 minutes (a long duration pas-

teurizing) or at a temperature of 72 - 87°C during 5 - 20 seconds (a short duration pasteurizing).

When using a plate-pasteurizer, the required effect is obtained at a temperature of 72-75°C within 13 - 20 seconds. Pasteurization conditions must ensure the extermination of microorganisms and reduce the number of Coli bacteria into the admissible limits.

Pasteurization conditions must be continuously checked with the help of a thermometer or a thermograph. The responsibility for it is laid on the laboratory.

Cooling of milk down to 4-6°C takes place in the same plate machine, either in regeneration, ice water or brine-cooling sections or in separate plate- or pipe-coolers.

In producing vitaminized milk, ascorbic acid, 100, 150 or 200 g/t, in conformity with the affirmed recipe, is added to the milk either before or after pasteurization.

Pasteurized milk cooled down to 4 - 6°C, may be preserved during 2 days after milking. In industrial conditions the milk is usually preserved not over 12 hours.

Bottling, Corking, Marking

The physico-chemical as well as the organoleptical qualities of pastorized cooled milk must meet the requirements of standard specifications. The milk is bottled, packed or poured into the cans either immediately or after a short duration storage in tanks.

Bottling is carried out by means of special machines including washing machine, bottling-corking apparatus, crater and decrater and conveyer belt. Smaller bottling conveyers have no crater or decrater. In this case the empty bottles are placed into the washing machine and filled bottles are placed into the boxes by hand. At small dairies the bottles may be filled either semiautomatically or by hand.

The containers used must be clean and of required capacity. They must preserve the quality of the product. The capacities of glass or paper containers are 0.25, 0.45, 0.5 and 1 l. The capacities of milk cans are 10, 25 and 35 l.

The bottles with pasteurized milk are capsuled by means of

aluminium-foil capsules. Name of the manufacturer and that of the product, manufacturing date, quantity in litres and price are stamped in the capsules.

Corked and marked milk bottles are placed in wooden or metal boxes or cages and conveyed into the storage-room. Until marketing the milk must be stored at a temperature not higher than 8°C.

The milk is transported to shops in refrigerator trucks or in trucks having isothermal cover.

The laboratory provides each milk shipment with the quality certificate or its duplicate.

Production technology and the products are checked up either by the laboratory or by the check department in confirmity with established instructions or state standards.

The expenditure of raw material per ton of ready products has been prescribed by corresponding norms (standards) observing of which is obligatory.

All data on the production of milk are written into the technical register which is kept according to established orders.

Marketing of milk in paper bottles or in packages has become popular lately. In this case the tare of the products is considerably lower. There is no need to wash the bottles and their breaking is excluded. The deteriorating effect of light is eliminated.

Paper containers are filled on lines O P, "Tetra pak", etc. The lines consist of synchronically operating machines, by which all operations beginning with the manufacture of the package until filling it with milk, closing and placing into the boxes, are carriedout. The machine "Tetra pak" produces tetrahedrite packages from roll-paper with polyethylen layer, in which even sterilization of milk is possible.

Tetrahedrite packages are some 3-4 times lighter than the other samples of paper containers and they may be piled into baskets.

Besides the conventional pasteurized milk, and the milk enriched with the vitamin C, milks with various admixtures like coffee, almond, chocolate, fruit and berry juice, may be produced.

STERILIZED MILK

The raw material from which sterilized milk is produced must meet several additional requirements. The milk must endure treating at high temperatures without any flake forming or coagulation of casein. The resistance of milk to heat coagulation depends on the salt composition and on the relations of the ions of calcium, magnesium, potassium, sodium, etc.

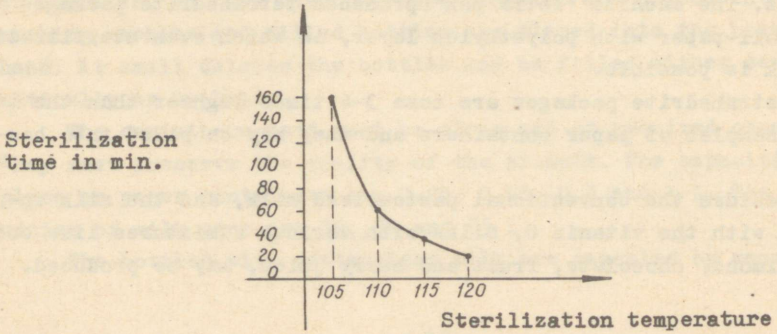
Preservability of milk is checked by a tentative sterilization and by alcohol and calcium tests. Sterilized milk is produced as follows.

The milk is heated up to temperatures from 30 to 40°C and cleaned of mechanical impurities by a centrifugal milk purifier. After cleaning the milk is heated up to temperatures from 60 to 70°C, homogenized at the pressures from 180 to 200 atm. and sterilized. Several sterilization methods may be used.

Method 1

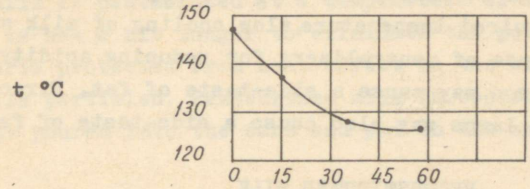
The milk is bottled, corked with metal capsules and placed in the cage of the sterilizer. The milk in bottles is heated up to the sterilizing temperature (118°C). The raising speeds of the temperature may be from 1.5 to 2.5 degrees per minute. As soon as the sterilizing temperature is reached, heating is finished and the bottles are let to stand at this temperature during 18–20 minutes.

The following graph illustrates the relation between sterilization temperature and duration.



Method 2

The milk is sterilized either in pipe- or steam-injector apparatuses at temperatures from 130 to 140°C. Sterilization time extends from a few seconds to 20 seconds.



Sterilization time in seconds

The sterilized milk is cooled down to 65-70°C and bottled under aseptic conditions. By this method a high-quality sterilized milk is obtained.

Because of high temperatures, the milk stone consisting of proteins and minerals, is formed on the surfaces of the apparatus. Besides, a sterile bottling of milk is comparatively difficult.

Method 3

The combined method of sterilization is most used. By this method the homogenized milk is sterilized at temperatures from 130 to 135°C, cooled down to 65 - 70°C and bottled by an automatic open merry-go-round type bottling-corking machine. Then the milk bottles are placed into the conveyer nests of the continuous sterilizer (of Storch or Webster system). In the first column of the sterilizer the milk bottles are heated at first up to 100 - 105°C by hot water. Then they move into the steaming room of the second column where they are heated up to 116 - 120°C during 4 - 5 minutes. In the next column the milk bottles are cooled by means of water.

In some sterilizers air-cooling (18-20°C) is used.

In some countries the so-called upherization or super-pasteurizing has been widely used, by which the steam is conducted straight into the milk.

Sterilized milk is of white or brownish colour. It has a slight taste of boiled milk. Due to the decomposition of disulphidic con-

nections of sulphuric amino acids (cystine, metionin) and the formation of thiol-groups, the sterilized milk has a slight side-taste of boiled milk.

Brownish colour of sterilized milk which may sometimes occur, results from a too high sterilization temperature, a prolonged sterilization at a required temperature, slow cooling of milk after sterilization or the use of neutralizers for reducing acidity. Salts of copper and iron may cause a side-taste of fat. Direct sunrays or light of neon-lamps may also cause a side-taste of fat.

RECONSTITUTED MILK

Reconstituted milk is produced and consumed in northern regions and in larger cities where natural milk is not always available.

For the production of reconstituted milk high-quality whole milk powder obtained by pulverization method and having at least 95% solubility, is used in the form of water solution.

The taste and biological values of reconstituted milk made from fresh high-quality milk powder, are but slightly inferior to those of natural milk. According to literature, the digestibility of milk powder proteins is 94.6%, that of fat and carbo-hydrates are 95-96% and 95-99% respectively.

A low quality of the milk powder strongly affects the quality of reconstituted milk. Due to a lower solubility, which appears in case of non-hermetic packages as a result of unturned denaturation processes of proteins, production losses have increased.

Reconstituted milk is obtained in the following way. The milk powder is dissolved in warm water (40-45°C). If the water temperature is lower, the dissolving rate of milk powder is lower, too. If the temperature exceeds 40-45°C, clots may be formed and milk fat may partially melt.

For mixing the milk powder with water various apparatuses (like drum-mixer) are used. A required quantity of milk powder is placed in the mixer and 50% of the total water is added. The mix is filtered through gauze and led into a bath or tank where the other 50% of water is added. For a more complete swelling and dis-

solving of milk particles, the reconstituted milk is kept at a temperature of 8-10°C during 4-8 hours. After this the milk is standardized so that the fat content is 3.2% and the content of solids-non-fat at least 8%. Then the milk is homogenized at pressures from 100 to 120 atm., heated up to 40-45°C and filtered. After this the milk is pasteurized at a temperature of 75°C. Pasteurization time is now a bit longer to eliminate the possible activity of the bacteria protected from heat effect in the slightly swollen mass of milk particles. Pasteurized milk is cooled down to 6-8°, bottled or poured into the cans and put on the market.

THE TECHNOLOGY OF SWEET CREAM

The fat content of sweet cream produced for immediate consumption may be various, for example 35, 20 or 10 per cent .

Sweet cream must be obtained from fresh milk which has no smack or side-odour and the qualities of which meet the requirements of the standard specifications.

From the point of view of dairies there are two kinds of creams:

1) The cream obtained by skimming milk at the separation centre (i.e. at the creamery) and transported to the city dairy. The degree of microbial contamination of such cream may be higher and, although pasteurized at the creamery, the cream must be pasteurized for the second time.

2) The cream obtained by skimming milk at the city dairy.

Whatever the fat content of the cream is, the acidity of the plasm of the cream must not exceed 22°Th.

The acidity of the plasm may be calculated by the following formula:

$$H_{pl} = \frac{H_{\text{in cream}}\ ^{\circ}TH \times 100}{100 - K_{R\%}}$$

where

H_{pl} = acidity of cream plasm

$H_{\text{in cream}}\ ^{\circ}Th$ = acidity of cream in Thörner degrees

$K_{R\%}$ = per cent of cream fat

3) For the manufacture of sweet cream containing 10% of fat, high-quality cream powder obtained by pulverization method may be used.

Manufacturing process of pasteurized sweet cream includes the following stages:

1) Preparation of raw material.

2) Standardization of cream.

3) Pasteurizing and cooling.

4) Bottling or packing, corking and marking.

5) Storing and transportation.

1. Preparation of the raw material consists in pre-heating the milk up to 35-40°C. It is necessary to check up whether the separator has been correctly assembled and lubricated. Before actuating the separator, the barrel must be released from the brake. The separator must be started slowly and gradually. The time interval from starting until reaching full speed is about 5 minutes.

If on starting the separator vibration or impacts occur, the barrel must be stopped and the causes of the trouble must be liquidated. Only then the separator may be started again.

As soon as the barrel rotation speed corresponds to that required by the certificate, the milk may be fed to the separator. The first portions of obtained skim milk must be fed once more into the separator, since the fat content in them is still comparatively high.

The operation of the separator must be even. The number of rotations must correspond to that required by the certificate. The speed of rotation must not exceed the required number of rotations per minute.

The inflow of milk must be even. The separator can work continuously about 1.5 - 2 hours, then either a parallel separator is actuated or the work is discontinued for washing.

Before stopping the barrel, some skim milk must be fed into the separator to press out the cream.

Then water of 35-40 degrees is fed in to wash the separator.

After switching the motor out, the barrel must come to a stop by itself. Braking is not recommended since it conduces the separator getting out of working order.

After stopping all parts of the separator which were in contact with milk, such as the barrel, the receiving tank, the regulator chamber and the float, the cream receiver-collector and skim milk collector, must be dismantled, thoroughly washed and disinfected.

The fat content in skim milk after the separation must not exceed the permitted norm (which is 0.05%). Otherwise the causes of it must be found and eliminated.

A bad fat separation usually results from lower than required speed of the barrel rotation, separation of milk the temperature

of which is below 35-38°C at a productivity intended for warmer milk, clogging of the barrel, a reduced number of plates, an incorrect assembling or an inadequate maintenance of the separator.

During separation the fat content of the cream must be continually checked up.

The yield of cream per ton of milk may be calculated by the following formula:

$$K_{kg} = \frac{1000\ (R_{\%P} - R_{\%L})}{R_{\%K} - R_{\%L}}$$

where

K_{kg} = quantity of the cream obtained in kg;

$R_{\%P}$ = fat percentage of the milk to be skimmed;

$R_{\%L}$ = skim milk fat percentage;

$R_{\%K}$ = cream fat percentage.

The milk expenditure per ton of cream is calculated by the same formula, multiplying the second half of the formula by the coefficient k = 1.00664.

The qualities of the received sweet cream are determined by the laboratory. Then the cream is filtered, weighed and treated in conventional manner.

Cream powder, if used, must be preliminarily dissolved in warm water, then filtered and added to the whole amount of cream.

Standardization of Cream

If the fat content in cream is either higher or lower than desired, the cream must be standardized. In the first case a certain calculated amount of whole milk or skim milk must be added to the cream, in the second case cream of a higher fat content must be added.

The required quantity of milk for standardizing the cream with a higher fat content, is calculated by the following formula:

$$(L)\ P_{kg} = \frac{K_{kg}\ (R_{\%K} - R_{\%\ norm.\ c.})}{R_{\%\ norm.c.} - R_{\%p}}$$

where

(L) P_{kg} = quantity of skim milk or whole milk to be added, kg;

K_{kg} = quantity of the cream to be standardized, kg;

$R_{\%k}$ = cream fat percentage;

$R_{\%\ norm.c.}$ = desired fat content of cream;

$R_{\%p}$ = fat content of the milk or the skim milk used for the standardization.

If the fat content of cream is lower than desired, a cream with a higher fat content must be added. In this case the required quantity of cream is calculated by the following formula:

$$K_{kg} = \frac{K_{kg}\,(R_{\%\ norm.c.} - R_{\%k})}{R_{k\%} - R_{\%\ norm.\ c.}}$$

where

$K_{k\ kg}$ = quantity of the cream of higher fat content;

$R_{k\%}$ = fat percentage of the cream of higher fat content.

Cream or milk are added to the cream to be standardized before pasteurizing. When using cream powder it is necessary to homogenize the mixture. Homogenizing of fresh cream which is obtained by separation at dairy or at its subnetwork, and which is used for making 10 or 20 per cent cream, is recommended. Homogenizing must be carried out before pasteurization, recommendably at temperatures from 70-80°C and at pressures from 50 to 100 atm.

Pasteurization and Cooling

Cream pasteurization temperature depends on the construction of the pasteurizer and of the fat content of the cream.

In the modern plate and tube pasteurizers the cream containing 10% of fat is pasteurized at temperatures from 78-80°C, the cream containing 20 or 35 per cent of fat at temperatures from 85 to 87°C. Pasteurization time extends from 15 to 30 sec.

In blade and barrel pasteurizers pasteurization is carried out at a temperature not lower than 85°C. Blade mixer pasteurizers show the lowest effect of pasteurization. In these apparatuses the depth of the cream layer is uneven and the stay of separate cream particles in the apparatus fluctuates from 4 to 80 sec. In some cases it has been tried to prolong the effect of thermal conditions by employing heat storage cells and intermediate tanks. The latter enables to prolong the standing of cream at the pasteurizing temperature, depending on the capacity of the tank, until 5 min.

Pasteurization temperature must be continuously checked up either by a thermometer or by thermograph.

At any pasteurizer or cooler a rapid raise of temperature up to the pasteurizing temperature and a rapid cooling down to at least + 6°C, is essential.

Bottling and Corking

Standardized, pasteurized and cooled cream is estimated organoleptically, its physico-chemical properties are determined and compared with the requirements of the standard specifications. If the qualities of the cream meet the requirements of the standard specifications, the cream is bottled. Pasteurized cream is bottled into glass bottles or packed into paper packages which are covered with polymer materials permitted by the state sanitary inspection institutions.

The containers used must ensure the quality of the product as well as the constancy of the quantity, and have capacities from 0.25 to 0.5 l.

The containers must be washed and their correspondence to the requirements of cleanliness must be checked up.

The bottles filled with cream are closed by means of aluminium capsules. Paper bottles are closed either by means of special clamps or weld seams.

On the metal capsule or on the side of the package or bottle must be printed or stamped:

1) name of the manufacturer;

2) name of the product and its fat content, in per cent;

3) manufacturing date;

4) price.

Filled and corked bottles or packages are placed into the box or cage and conveyed to the storage room.

Until marketing, the cream must be stored at temperatures not higher than 8° C.

Cream must be transported to the shops by closed refrigerator trucks or in trucks having an isothermal cover.

Characteristics of the Product

Produced cream must meet the requirements of the state standards. For example, according to the standard of Russian Socialist Federative Soviet Republic cream must meet the following requirements.

Organoleptical qualities:

Taste and odour - pure, without a taste or odour not characteristic of cream, with good pasteurization taste, sweetish.

Consistency - uniform, without protein flakes or fat clots.

Colour - white with yellowish shade.

Physico-chemical properties:

Fat content, %	10	20	35
Acidity, Th° not higher than	19	18	17

Sweet cream must not contain pathogenic microbes. Microbiological characteristics of sweet cream must meet the following requirements:

1. Total number of microbes per ml — not more than 200,000
2. Titre of Coli bacteria — not less than 0.3 ml

Sweet cream must not contain conserving substances.

All data on the production and analyses of cream must be written into a register according to established order.

Norms of raw material expenditure, which take into account

the losses of cream, milk, skim milk or fat during manufacturing, are established.

For example:

To produce 1 t of cream containing 10% of fat, 2.91 t of milk containing 3.5% of fat is needed.

To produce 1 t of cream containing 20% of fat 5.83 t of milk containing 3.5% of fat is needed.

To produce 1 t of cream containing 35% of fat, 10.20 t of milk containing 3.5% of fat is needed.

Э. Эвинг

Технология производства восстановленного, стерилизованного и пастеризованного молока

Технология производства сливок

Ротапринт ЦБТИ ЭССР. Заказ № 2367-II020/II02I. I50.