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Utilization of Surplus Milk in the Small Dairy Plant: 1. Soft Cheeses, Spreading Types

P. A. Downs

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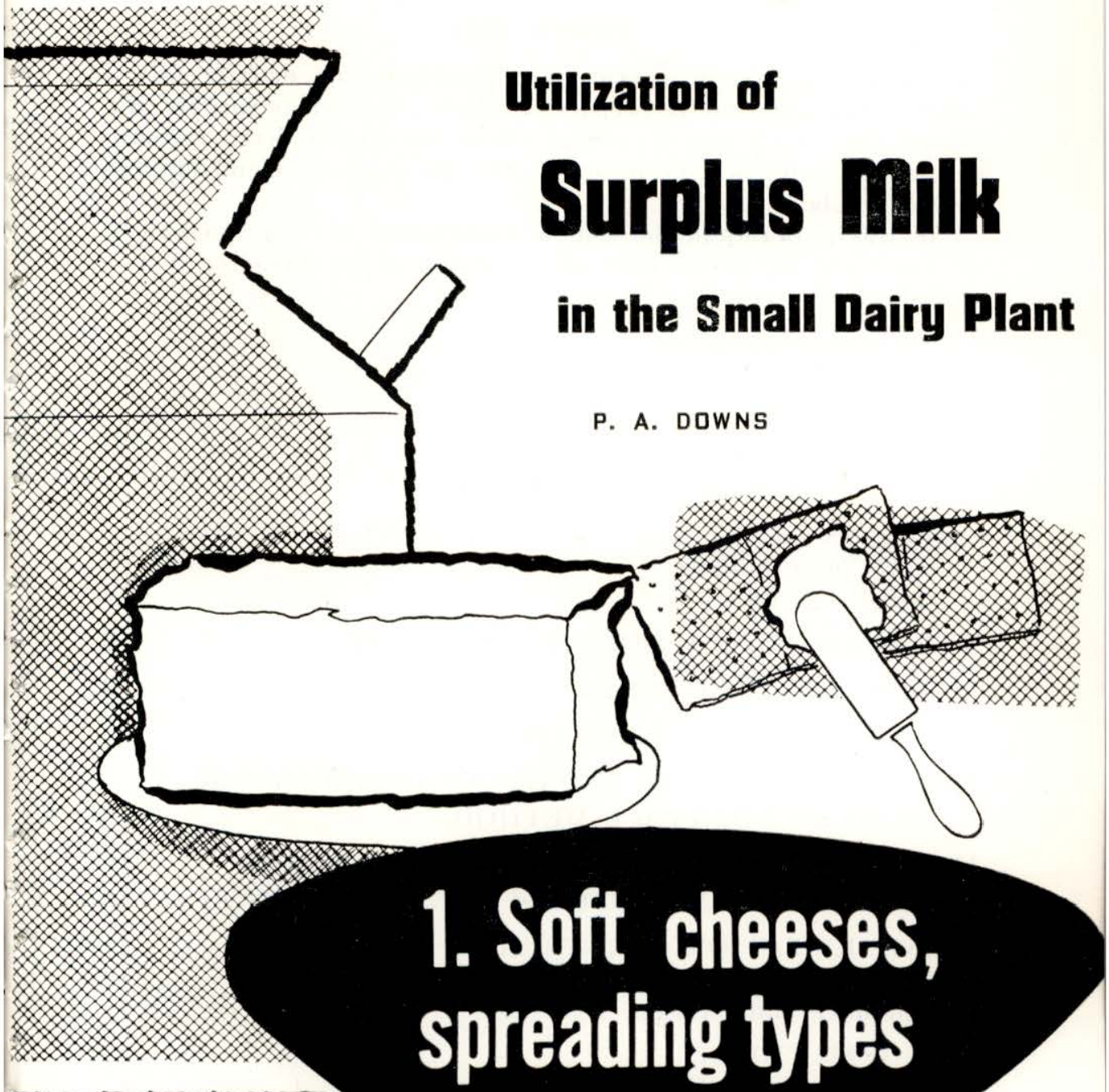

Utilization of Surplus Milk in the Small Dairy Plant

P. A. DOWNS

1. Soft cheeses, spreading types

THE EXPERIMENT STATION OF THE UNIVERSITY OF NEBRASKA
COLLEGE OF AGRICULTURE W. V. Lambert, Director; E. F. Frolik, Associate Director

FOREWORD

This is the first in a series of publications that describe how a variety of products can be prepared in dairy plants where surplus milk is a problem. Each type of product will be described in detail, methods of manufacturing will be outlined, and the equipment and supplies needed will be listed.

In this publication, the general background of cheese making is discussed and the preparation of soft cheese of the spreading type is described.

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Utilization of Surplus Milk in the Small Dairy Plant

I. Soft Cheeses, Spreading Types

P. A. Downs[1]

The production and consumption of dairy products close to the source of supply enables a more economical utilization of the milk produced. The availability of milk and milk products has a great influence upon consumption. If the consuming public can be induced to buy more dairy products by offering them a greater variety, less surplus will have to be sent to distant points. Systems that convert seasonal surplus milk into products which can be held in storage and consumed later should be encouraged whenever profiitable.

The profitable utilization of variable amounts of surplus whole milk in the small milk plant is always a problem. Any procedure that will assist the plant operator in preparing a marketable product which can be consumed locally should be considered. The procedure should utilize equipment that is available in the plant or that can be obtained at a minimum of expense. The product should be readily accepted by the consumer at a price that will return a fair profit to the plant. The product must be packaged in a convenient-sized unit that will preserve the merchandise for a reasonable period of time under ordinary refrigeration.

The preparation of different kinds of cheeses is one method of converting surplus milk into profitable products. The per capita consumption of cheese is relatively low and there are a great number of cheeses that could be made and offered to the public. In many small towns the supply of these cheeses is very limited. The small plant could fill a definite place in the community by giving the consumer something he would not ordinarily find in the market.

CHEESE IN GENERAL

How Cheese Is Made

Milk used for cheese making may come from any milking animal. The milk of sheep and goats is commonly used in Europe, but in North America the milk of the cow is generally used.

As taken from the animal, the milk containing the normal amount of fat is referred to as "whole milk." Milk from which part of the fat has been removed in the form of cream is called "partly skimmed milk," and milk from which nearly all the fat has been removed is called "skim milk."

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Cheese has been made for centuries in countries where milk has been available. Cheese making was developed to store the major portion of the milk solids for use in times of milk shortages. The kind of milk used, and the type of cheese made, often depended upon the amount of milk available, and the climatic conditions or length of time that cheese was to be stored before using. The type of people and their food habits no doubt influenced the characteristics of the cheese made.

More than 400 named cheeses are made throughout the world, as described by Sanders (*1*), but there are only about 18 different types or kinds of cheese. (One variety may be called by different names if it is made in different countries.) The 18 types may be divided into four general groups—soft, semi-soft, semi-hard, and hard cheeses.

By varying the manufacturing process, the moisture content of cheese can be controlled. Soft cheese with a moisture content as high as 80 per cent or a hard cheese with a moisture content as low as 30 per cent can be produced from the same milk. The richness, or butterfat content, of the cheese can be regulated by adjusting the fat content of the milk.

Nutritive Value

Various kinds of cheese have been popular food for thousands of years. Cheese making, originating in the home where milk was available, has become an important part of the dairy industry. During the last hundred years the cheese factories of the United States have successfully produced virtually all foreign types of cheese and several new ones.

Even though many types of cheese are available, per capita consumption in this country is only about 7.5 pounds per year. Europeans feel that cheese furnishes valuable nutrients at a reaosnable price and therefore they consume several times as much cheese as we do.

It has been pointed out that a large portion of the calcium and phosphorus of the milk are retained in cheese. Cheese also contains most of the butterfat and fat soluble vitamins contained in the milk. A small portion of the protein, nearly all the lactose (carbohydrate), and a large part of the thiamin and riboflavin content of the milk are not retained in cheese but are left in the whey.

Information on approximate nutrient content of milk and some soft cheeses is presented in table 1. It should be noted that certain nutrients have a definite relationship to other nutrients. As the fat content increases in these products the vitamin A content increases, but some of the other nutrients decrease. Cheeses which are high in water content, such as soft cheeses, contain relatively large amounts of protein when the fat content is low. If the total solids content of cheese remains constant, then as the fat content increases the protein and many other nutrients decrease and a corresponding increase in vitamin A may occur.

TABLE 1.—Nutrient content of milk and some soft cheeses.[1]

(Per 100 gram portions)

FOOD	Energy (Calories)	Water (Grams)	Protein (Grams)	Fat (Grams)	Carbohydrates (Grams)	Ash (Grams)	Calcium (Milligrams)	Phosphorus (Milligrams)	Riboflavin (Milligrams)	Vitamin A (I. U.)
Skim milk	36	90.5	3.5	.1	5.1	.8	123	97	.18	Trace
Milk	68	87	3.5	3.9	4.9	.7	118	93	.17	160
Cream (light)	204	72.5	2.9	20	4.0	.6	97	77	.14	830
Cream (whipping)	330	59	2.3	35	3.2	.5	78	61	.11	1440
Cream (heavy)[2]	511	40.9	1.6	55	2.2	.3	54	42	.08	2220
Cream (very heavy)[2]	684	22.7	.9	75	1.2	.2	30	23	.05	3090
Cottage Cheese	95	76.5	19.5	.5	2.0	1.5	96	189	.31	20
Creamed Cottage[2]	106	77.3	15.2	4.0	2.0	1.5	78	148	.19	159
Neufchatel[2]	301	60.0	11.3	27.5	2.0	1.2	80	105	.26	1135
Cream Cheese	371	51.0	9.0	37	2.0	1.0	68	97	.22	1450

[1] Values taken from—Composition of Foods—Raw, Processed, Prepared. Agricultural Handbook No. 8, U. S. Department of Agriculture, Washington, (June) 1950.

[2] Calculated from above table.

THE FUNDAMENTALS OF CHEESE MAKING

Milk is a liquid containing 12.5 to 13 per cent milk solids and 87.5 to 87 per cent water. When milk is treated with either an acid or the enzyme Rennase the milk solids and the liquid are separated into curds and whey. The curds consist of a large portion of the milk solids which are not in solution. Mixed with this mass are varying amounts of water soluble solids called whey. Since lactose, or milk sugar, is soluble in water only a small amount of this milk solid is retained when the solids are precipitated during the cheese making process. The principle of cheese making is to consolidate the curd by separating it from the whey.

During the making process, acid coagulation may be used alone as in the case of souring milk by bacterial action. This procedure is used when making acid type cottage cheese.

The enzyme action of rennet extract, from calves stomachs, is much more rapid than bacterial souring of milk. Normally 12 to 16 hours is required to curdle milk by bacterial souring, while rennet extract will coagulate milk in 30 minutes or less at 85° to 90° F., and it will act upon sweet milk (see table 2).

Most cheeses are made by the use of rennet extract, acid type cottage cheese being an exception. For some of the soft types, both bacterial souring and a very small amount of rennet are used. In others rennet is used as the principal coagulant, and the natural milk souring organisms are used to produce the desired amounts of acid during the making process.

Since rennet extract will curdle sweet milk it is possible to produce a sweet curd cheese. In this type the proteolytic bacteria that are in the milk grow faster than the acid producing types, and a peculiar odor such as in Limburger cheese results upon aging. This procedure will produce a high moisture cheese containing around 50 per cent moisture as there is no acid present to help shrink the curd. By controlling the number of acid producing bacteria that are in the milk when it is set with rennet, one can control the acid production and thus the moisture content of the finished cheese. The time taken to make the cheese and the temperature at which the curd is cooked, or heated, also affect the acidity of the whey and curd, as well as the moisture content of the finished cheese.

After the curd has reached the desired moisture content and acid condition, it is transferred to a container to drain, or in some cases to be pressed. A soft cheese having a high moisture content is drained with little or no pressure. Other cheeses with a lower moisture content are pressed to varying degrees, The bacterial flora, the moisture content, and the storage temperatures determine the characteristics of the cured cheese.

The method of making a given kind of cheese is based upon all these factors. The composition, flavor and life of the cheese produced

TABLE 2.—Characteristics of several varieties of cheese.

Kind	Type	Approximate composition			Yield per 100 lb. milk	Making time	Type of curd	How prepared		Coagulants used		Ripening time
		Fat (%)	Milk solids not fat (%)	Water (%)	(lbs.)			Drained	Pressed	Rennet	Starter lactic	
Cottage	Soft	Trace	28-30	70-72	12-14	Set 16 hrs.	Acid	Yes	No	None to trace	Yes	None
Neufchatel	Soft	20-32	18-20	55-60	15	Set 16 hrs.	Acid	Yes	Yes	Trace	Yes	None
Cream	Soft	35-38	13-14	48-52	8% milk 18-20	Set 16 hrs.	Acid	Yes	Yes	Trace	Yes	None
Coulommiers	Soft	22-44	18-21	55-60	17	Set 1-2 hrs.	Acid	Yes	No	Yes	Yes	None to several wks
Camembert	Soft	24-28	20-22	52-54	13-15	Set 1-1½ hrs.	Acid	Yes	No	Yes	Yes[1]	60 da.
Limburger	Semi Soft	26-29	26-28	43-48	11-13	Set 30 min.	Sweet	Yes	Very light	Yes	Trace	60 da.
Brick	Semi Soft	31	29	39-42	9.5	Set 30 min.	Sl. acid	Yes	Wt. of brick	Yes	Yes	60 da.
Cornhusker	Semi Hard	28-32	27-28	40-45	10-10.7	Set 30 min.	Sl. acid	Yes	Yes	Yes	Yes	2-6 mo.
Cheddar	Semi Hard	32	30	37-38	9.5	Cooked 2½ hrs. Set 30 min.	Sl. acid	Yes	Yes	Yes	Yes	3-12 mo.
Swiss	Semi Hard	27.5	33.5	39	8-9	Set 30 min. Cooked 2½ hrs.	Sl. acid	Yes	Very light	Yes	Yes[2]	6-12 mo.
Parmesan	Hard	28	42	30	Part skim 5-6	Set 30 min. Cooked 1 hr.	Sl. acid	Yes	Yes	Yes	Yes[3]	14 mo. to several yrs.

[1] Also inoculated with Camembert mold.
[2] Cultures of Lactobaccilus and Proprionic bacteria are used.
[3] Lactobaccilus cultures used.

are all controlled by temperature and the microorganisms that are allowed to grow during the making process. The holding temperature determines, to a great extent, the rate at which curing will take place. The organisms in and on the surface of the cheese grow during curing to produce the desired flavor.

MAKING COTTAGE CHEESE

Cottage cheese, sometimes called pot cheese, Dutch cheese, or schmierkäse, is a soft uncured cheese made from skim milk. When the fat content of cottage cheese has been increased to at least 4 per cent by the addition of cream it is called creamed cottage cheese.

This product is commonly made in many of our dairy plants. Many modifications of the basic process have been devised and these methods are well known. The basic process for acid type cottage cheese consists of setting freshly pasteurized skim milk with approximately 5 per cent of fresh lactic starter at 70°-72° F. for 12 to 16 hours. The curd is cut and slowly heated in the whey to a temperature of 120° to 140° F. The whey is drained off and the curd washed with cold water. After the curd is well cooled it is drained and salted at the rate of 1 oz. of salt for each 5 to 8 pounds of curd. If cheese is to be sold as creamed cottage cheese, half the weight of the curd should be added in the form of 12 per cent homogenized cream and milk mixture.

This cheese is mentioned here as an example of what has been done with a simple type of cheese in our Nebraska plants. Through the interest of local plants the production of creamed cottage cheese in Nebraska for 1955 was nearly 6½ million pounds. It is believed that with proper interest on the part of the management and with directions for manufacturing, other types of cheese can well take their rightful place in our plants. At present all other types of cheese made in Nebraska amount to less than one tenth of the cottage cheese produced yearly.

NEUFCHATEL AND CREAM CHEESE

Cream cheese is quite common in most markets. However, the very satisfactory and less expensive Neufchatel cheese is not usually available. This product offers an opportunity similar to that of cottage cheese if properly made and marketed.

The Neufchatel process of making soft unripened cheese originated in Neufchatel, France. Whole milk was coagulated by souring as a result of bacterial action and the addition of small amounts of rennet. The curd was drained, pressed, salted, mixed and packaged. Cream cheese is a similar cheese made from milk enriched with cream and therefore contains additional fat.

The traditional Neufchatel process of making soft cheese as described by Matheson, Thom and Currie (*2*), has been modified many times, but draining the curd has remained a definite part of the process.

The definitions and standards for food (*3*) by the Food and Drug Administration have included certain modifications of the original cold pack process. One of these is the hot pack method which may be used in place of the original method.

Homogenization of the mixture and the use of a concentrate of milk, cream or skim milk products are acceptable. Pasteurization of the mixture is required during the making process by Federal law and by many state departments of agriculture. With the hot pack method the pasteurized product is run hot into the final package.

MAKING NEUFCHATEL AND CREAM CHEESE BY THE ORIGINAL COLD PACK METHOD

For Neufchatel cheese, use freshly pasteurized whole milk. This milk should contain 3.5 to 4 per cent butterfat, and have a temperature of 85° to 86° F. Place 40 pounds of milk in a clean 5-gallon can after adding ½ pint of freshly made lactic starter and 1 pound of salt. Stir well. With a clean 9-ml. cream testing pipette, place 9 ml. of rennet extract in a clean pint milk bottle. Fill the bottle half full of cold water and mix. Using the same pipette, add 9 ml. of water and rennet solution to the milk in the can and mix well.

Place a lid on the can and leave it in a room of 70° to 75° F. for 16 to 18 hours, at which time the milk should be curdled and may show ½ inch or more of whey on top of the curd.

Pour each can of curd on a piece of cotton sheeting 3 to 4 feet square, and allow to drain for 2 to 3 hours. Shake the curd and tie the corners of cloth together, making a bag. Place the bag of curd in a cold room, under light pressure, over night. Continue to press until the curd is dry enough to pack.

Pack in any type or size of container desired. Store as near 32° F. as possible as the cheese is perishable and should be sold while fresh. Each lot should yield about 6 pounds of cheese.

For cream cheese, use a mixture of milk and cream testing between 6 and 8 per cent butterfat. Follow the same method as for Neufchatel. The yield will be about 8 pounds of cream cheese per lot.

Freshly homogenized, pasteurized milk can be used if desired. Likewise milk or milk and cream mixture can be pasteurized in the can by placing it in hot water. The heating temperature is not critical, but heating the milk and cream mixture to 150° F. or above and holding for at least 30 minutes may reduce the loss of fat when the curd is drained.

The bag draining of the curd when making this type of cheese has always been a mechanical as well as a sanitary problem. However, with the development of special centrifugal separators, large producers have been able to drain the curd mixture mechanically. At the Nebraska Station, Reichart (*4*) described the use of the homogenizer in

connection with the hot pack method of bag draining which was suggested for small plant operation.

Dahlberg (5), and Dahlberg and Marquardt (6) presented the Geneva method which is a bagless method using skim milk powder and vegetable gum in addition to cream so that draining is not necessary.

MAKING NEUFCHATEL AND CREAM TYPE CHEESE BY THE NEBRASKA HOMOGENIZATION METHOD

Work carried out at the Nebraska Station and reported by Reichart and Crowe in 1941 (7) was an effort to eliminate bag draining of the curd, while still using only milk and cream in the preparation of the cheese. Milk was pasteurized and separated and the skim milk curdled by bacterial souring. The curd was cooked and drained as for acid type cottage cheese. The cottage cheese curd was combined with cream to obtain the desired composition, salt was added, and the mixture was pasteurized, homogenized and packaged hot. In this manner a satisfactory product with excellent keeping quality was produced which could be made with equipment usually found in a small plant and with surplus fresh milk and cream.

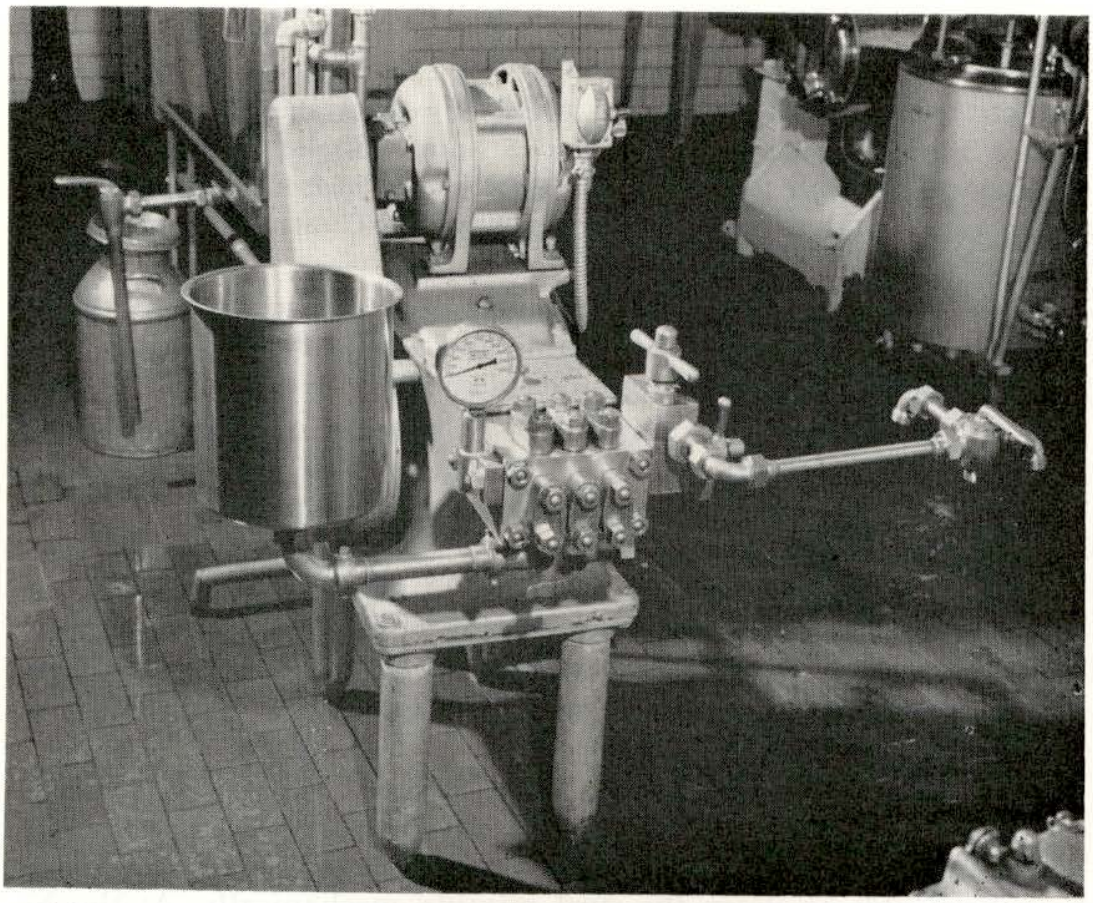

Figure 1. Homogenizer with supply tank and three-way valve for filling packages.

Dahle (*8*) and Dahle and Nagvette (*9*) in their studies of different methods of making Neufchatel and cream cheese reported favorably on the bagless or short method as studied at Nebraska.

The method does not completely meet the definitions as set forth by the Food and Drug Administration as to the order of the different steps in the process, but the same materials and steps are included in a slightly different manner.

The product, properly labeled according to Federal and State requirements, should have a ready market and offers an outlet for surplus milk in the small plant. The equipment needed is usually found in the milk plant and with proper processing and packaging a profitable product can be produced (figure 1).

An effort has been made in this publication to furnish information on how to make this product, as well as information on supplies that are needed.

It should be kept in mind that the labeling of food products should meet State requirements, and if a product is to pass in interstate traffic it must meet Federal standards declared on the label.

STANDARDIZATION OF PRODUCT

Neufchatel cheese. The Federal standards for Neufchatel cheese show a minimum butterfat content of 20 per cent and a maximum of 32 per cent. The maximum moisture content is 65 per cent.

TABLE 3.—Composition of cream.

Fat (%)	Solids not fat (%)	Total solids (%)	Water (%)
40	5.40	45.40	54.60
45	4.95	49.95	50.05
50	4.50	54.50	45.50
55	4.05	59.05	40.95
60	3.60	63.60	34.60
65	3.15	68.15	31.85
70	2.70	72.70	27.30
80	1.80	81.80	18.20

The solids content of dry cottage cheese curd, made by the long set acid method and cooked to a temperature of 130° to 140° F., has been found to be approximately 22 to 24 per cent.

TABLE 4.—Proposed composition of Neufchatel cheese.

Used	Amount	Composition					
		Butterfat		Milk solids not fat		Total milk solids	
	(lbs.)	(lbs.)	(%)	(lbs.)	(%)	(lbs.)	(%)
Cream (55%)	50	27.5	55.0	2.0	4.0	29.5	59.0
Curd	50	.....	.....	11.0	22.0	11.0	22.0
Cheese	100	.....	27.5		13.0		40.5
Standard minimum allowed by the law. 20.0							35.0
Milk fat 57.9 per cent of the milk solids.							

If we consider that cream is a mixture of butterfat and skim milk, and that the skim milk contains 9 per cent solids not fat, then table 3 gives the composition for cream of different fat content.

By the use of equal portions of well drained 22 per cent solids cottage cheese curd and cream containing 55 per cent fat, a product of the composition shown in table 4 can be obtained.

Some variation will result because of the differences in the dryness of the curd and also the variation in the composition of the milk from which the cream is separated. The proposed mixture is well above the minimum requirements for both fat and total solids.

In general it should be kept in mind that the cottage cheese curd should be well cooked and well drained. A soft, mushy curd is likely to be too high in moisture to produce a satisfactory Neufchatel cheese when homogenized.

Cream cheese. The Federal standards for cream cheese require a minimum of 33 per cent butterfat and a maximum of 55 per cent moisture.

If this type of cheese is desired the same formula can be used except that the cream should test 70 to 75 per cent buterfat as shown in table 5.

TABLE 5.—Proposed composition of cream cheese.

Used	Amount	Composition					
		Butterfat		Milk solids not fat		Total milk solids	
	(lbs.)	(lbs.)	(%)	(lbs.)	(%)	(lbs.)	(%)
Cream (75%)	50	37.50	75.0	1.1	2.3	38.6	77.3
Curd	50	.....	.....	11.0	22.0	11.0	22.0
Cheese	100	37.5	37.5	12.1	12.1	49.6	49.6
Standard minimum allowed. Milk fat 79.5 per cent of the milk solids.			35.0				45.0

Processing Method

The Nebraska homogenization method consists of blending equal weights of cottage cheese curd and heavy cream with 1 per cent salt to give the desired composition as shown in tables 1 and 2.

The mixture is heated with agitation to a temperature of 165° to 170° F. and held for at least 30 minutes. While still hot it is passed through the homogenizer with approximately 2500 pounds of pressure on a single open-type homogenizing valve. The closed-type or compressed-wire type will clog and cannot be used.

The material should be fed to the homogenizer, without strainer, by gravity or low pressure. The first time through the homogenizer will result in a blended mixture of the ingredients. The product is collected in containers and after the original mixture has gone through the homogenizer the first time it is run through the second time. It

is desirable that the supply tank not be allowed to become entirely empty in order to prevent air from getting into the homogenizer. As the material leaves the homogenizer the second time it is ready to be packaged. This can be accomplished by running the hot mixture directly from the delivery pipe into the package. The package should be sealed at once and allowed to cool. After cooling for 12 to 24 hours at refrigerator temperatures the product is ready for sale.

Equipment needed. No special equipment is needed other than suitable containers for packaging. The homogenizer is found in most small plants. A suitable supply tank can be arranged as shown in figure 1 to feed the product to the homogenizer.

The equipment for heating and agitating can be varied to suit the conditions in the plant and amount of product to be made. The temperatures and time given are not critical and simple methods can be used for heating. Small amounts of the mixture can be heated by placing the container in a tank of hot water. Steam-jacketed kettles or vats with good agitation can be used for larger amounts.

Suitable containers or pipeline should be available for transferring the hot mixture to the supply tank of the homogenizer. It is usually advisable to agitate the mixture the first time to prevent a large curd particle from clogging the pipe leading to the homogenizer.

Homogenization. The homogenizer is started after filling the supply tank with hot water and the homogenization pressure is adjusted to 2500 pounds pressure. By watching the water level in the tank a supply of hot cream and curd mixture can be added just as the last of the water leaves. In this way the mixture will start through without sucking air. The mixture should be well agitated as it feeds to the homogenizer and more added to prevent the machine from running out of mixture. If the supply does run out it may be necessary to start again with hot water and proceed as before. Sometimes the particles of curd will cause a valve to stick, but usually it will operate after a short time.

Care should be taken to see that the packings are tight and that the homogenizer is in good working condition. The process should be carried on as rapidly as convenient so that the mixture will be hot when it reaches the final package. Passing the mixture through the homogenizer the first time smoothes the curd, making it possible with the second homogenization to produce the desired body in the finished product.

Containers and Packages

The basic requirements of a satisfactory package are (a) that it withstand the temperature of the hot material at the time of packaging; (b) that it be easily sealed when filled; (c) that it be of such a nature that the seal will not be easily broken when handled in storage or sale; and (d) that it be of desirable size (figure 2).

Bulk containers. The parakote or parafilm-type heat sealing plastic pouch has been satisfactory. For packaging cheese in two-pound quantities, we have used the parakote 11⅞ x 11 inch pouch. Before the pouch is filled, it is placed in a thin wooden box with inside measurements of 2⅝ x 2¾ x 8½ inches. This forms the package. A lid is nailed on after the liner has been sealed around the cheese by pressure of the fingernails. The pouches are preformed by the manufacturer to fit the desired size of box (figure 3).

Use of the parakote or parafilm pouch with wooden boxes that are removed before sale of the cheese and used several times is about one-fourth as costly as individual plastic containers. Unprinted pouches approach one cent per pound of cheese packaged and boxes that are used several times are estimated at three cents per pound—a total of four cents. This type of package is much more economical, but not as desirable for certain types of retail trade. Suitable 8-ounce plastic containers cost aproximately one cent per ounce, smaller sizes more and larger sizes slightly less. The package should suit the type of trade being served and be priced accordingly. The two-pound size has been quite satisfactory, but larger sizes could be used if the market could handle them.

Retail packages. A glass or plastic package that can be filled directly from the homogenizer or from a container is popular in some markets. The package should be so designed that it can be easily sealed and labeled. Several types are illustrated in figure 4.

This type of container should be filled with hot cheese, sealed at once and allowed to cool. The seal should not be broken until the consumer is ready to use the product.

Small plastic pouches like those shown in figure 5 are also suitable. The four pouches illustrated give aproximately half-pound packages. In this type of package, it is often easier to mark the weight of the contents on the package after the pouches are filled than to weigh an exact amount into each unit.

The product can be labeled by sticking labels on the outside of the package or by using printed pouches or containers. A simple method of labeling cheese packaged in plastic containers is to cover the surface of the hot cheese with a small circle of parakote. A printed label can be placed on this circle underneath the cover before the package is sealed. The circle must not be too large to prevent the lid from sealing properly. The lock-on type lid seems to adapt itself to this kind of labeling.

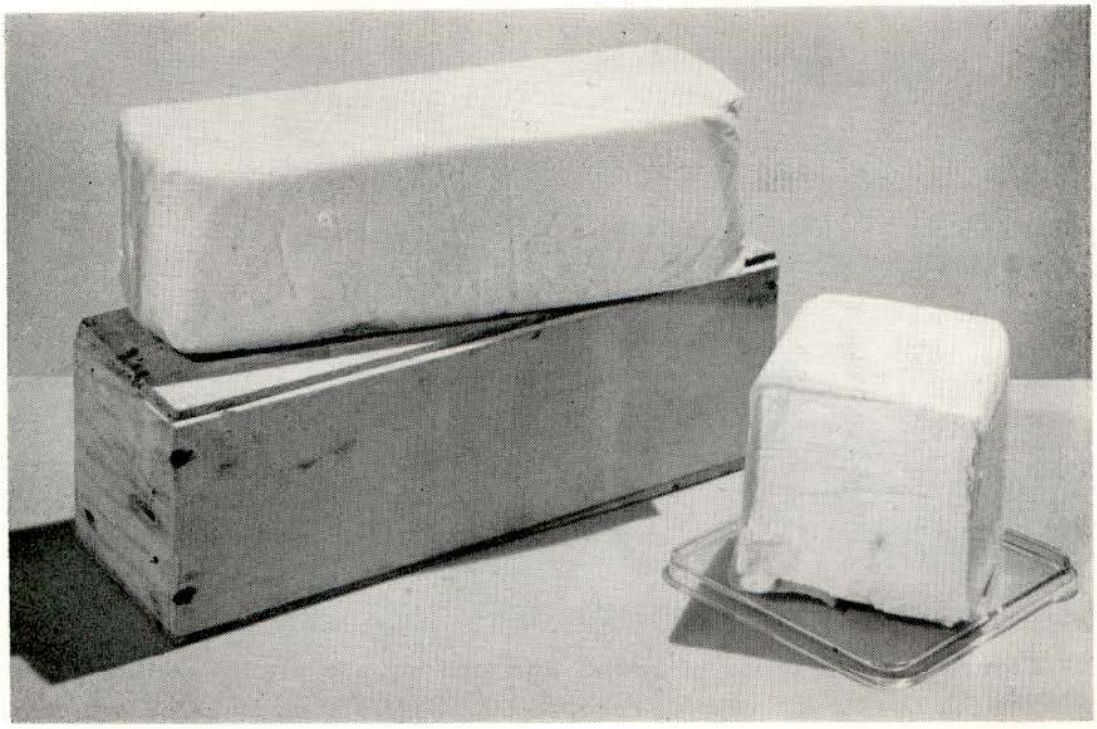

Figure 2. Two pounds of cheese in plastic pouch with wooden box, and a section of the plastic covered package.

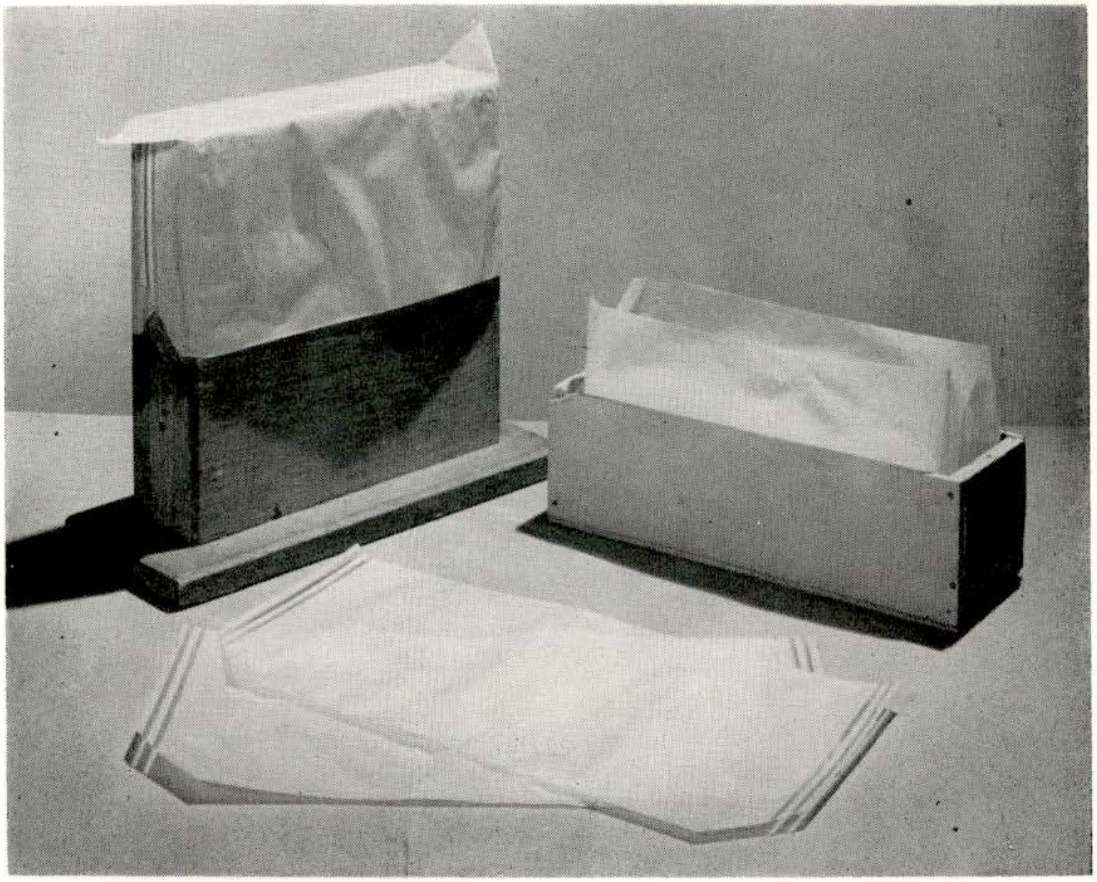

Figure 3. Block for forming pouch and formed pouch in box ready to be filled with cheese.

Figure 4. Two types of round and one square plastic container for cheese.

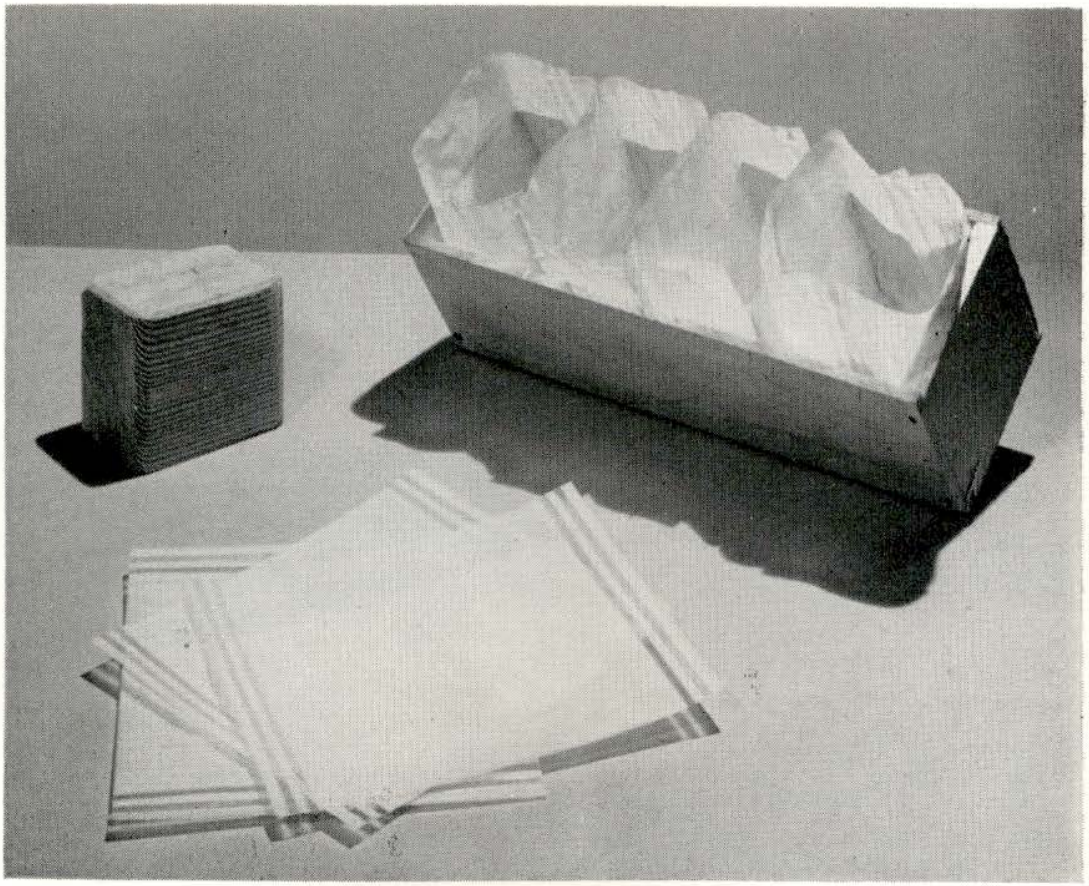

Figure 5. Small pouches, block used for forming them, and four pouches in box ready to be filled.

FLAVORED CHEESE

Flavored cheese may be produced by adding the proper amount of flavoring materials to the mixture as it is being heated or to the finished cheese after it leaves the homogenizer. In the latter case the homogenized material must be collected in a container, mixed with the flavoring material and then placed in the final package.

Blue cheese flavor. This variation can be produced by adding approximately 10 per cent of well ripened blue cheese to the mixture as it is heated. It is then processed in the usual manner. The package should be labeled "with blue cheese added."

Cheddar cheese flavor. A pleasing cheddar flavor can be produced by adding approximately 30 per cent of well aged, snappy flavored cheddar cheese to the mixture as it is heated. It is processed in the usual manner and should be labeled "with cheddar cheese added."

Other flavors. Other flavoring materials can be added to the finished cheese after it leaves the homogenizer. The desired amount of cheese is collected in a suitable container and the required amount of the flavoring material is added. The package should be labeled "with—— added."

Suggested amounts of materials to be added:

Pimiento—approximately 3 per cent of finely chopped, well drained canned pimiento, or approximately 1 per cent of peeled pimiento flakes. Cheese color may be added if desired.

Pickle relish—approximately 3 per cent of finely chopped pickle relish after it has been well drained.

Vegetable—approximately 1 per cent of creamed cheese vegetable blend

Olive and nut—approximately 3 per cent of finely chopped stuffed olives and pecans in equal portions.

Cheese may be flavored to suit the demand of the local market by the use of garlic salt, pineapple, or any other flavor that seems desirable to the manufacturer for his particular market.

Advantages of the Homogenization Method

The pasteurization and packaging of the product while hot increases the keeping quality. Soft cheese is a perishable product and therefore should be kept under refrigeration. Storage temperatures approaching the freezing point lengthen the life of the product and help maintain the pleasing flavor.

When made as described, and placed in sealed containers, this cheese should keep for two weeks or more in a well refrigerated storage. This enables the small plant to make a reasonable quantity

at a time. While the plain type cheese has been in greatest demand, the periodic sale of flavored cheese has met with consumer interest.

The amounts to be made will have to be adjusted to fit the market demand. In some localities large quantities are utilized by bakers in making a cheese cake. This should furnish an additional outlet for surplus milk through the manufacture of this product. The methods outlined in this publication may help solve the problem of surplus milk in some dairy plants.

SUMMARY

The making of cottage cheese should be a part of the operation of all small plants.

The manufacture of Neufchatel or cream cheese, either by the cold pack or homogenized hot pack method, can be a profitable means of utilizing surplus milk.

While the cold pack method is quite simple, it produces a cheese that has a much shorter storage life than that made by the hot pack method.

When packed hot into sealed containers, the homogenized product will keep satisfactorily for several weeks.

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