

Cheese making technology

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Classification of cheese

If the MFFB* is, %	Term I The 1st phrase in the designation shall be	If the FDB** is, %	Term II The 2nd phrase in the designation shall be	Term III Designation according to principal curing characteristics
< 41	Extra hard	> 60	High fat	1. Cured or ripened
49 – 56	Hard	45 – 60	Full fat	a. mainly surface
54 – 63	Semi-hard	25 – 45	Medium fat	b. mainly interior
61 – 69	Semi-soft	10 – 25	Low fat	2. Mould cured or ripened
> 67	Soft	< 10	Skim	a. mainly surface
				b. mainly interior
				3. Uncured or unripened***

* MFFB equals percentage moisture on fat-free basis, i.e.

$$\frac{\text{Weight of moisture in the cheese}}{\text{Total weight of cheese} - \text{weight of fat in cheese}} \times 100$$

** FDB equals percentage fat on dry basis, i.e.

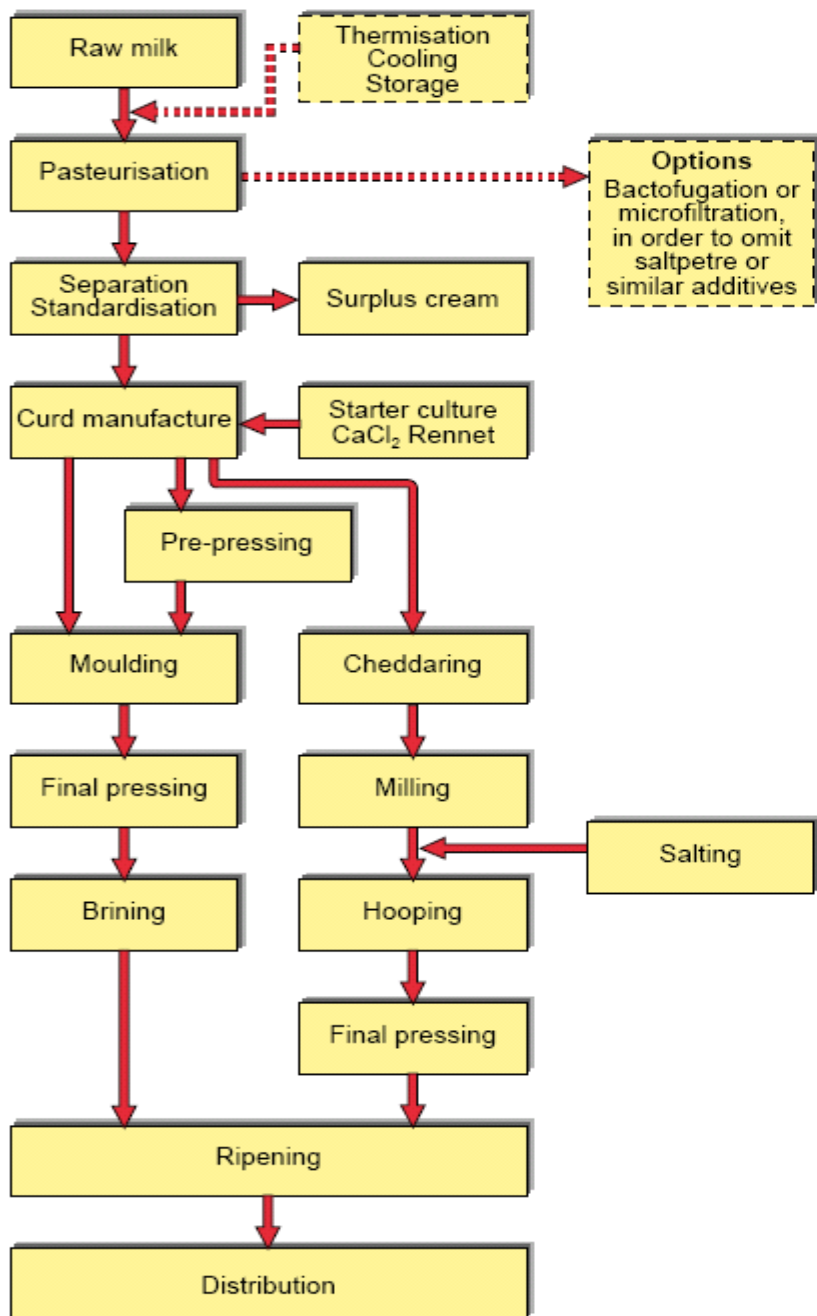
$$\frac{\text{Fat content of the cheese}}{\text{Total weight of cheese} - \text{weight of fat in cheese}} \times 100$$

*** Milk intended for this type of cheese *to be pasteurised*.

Classification of cheese

Examples:

Type	Origin	FDB	MFFB	Term 1
Parmesan	I	35+	≈ 40%	Extra hard
Grana	I	35+	≈ 41%	Extra hard
Emmenthal	CH	45+	≈ 52%	Hard
Gruyère	F	45+	≈ 52.5%	Hard
Cheddar	UK	50+	≈ 5%	Hard/Semi-hard
Gouda	NL	45+	≈ 57%	Semi-hard
Tilsiter	D	45+	≈ 57%	Semi-hard
Havarti	DK	45+	≈ 59%	Semi-hard
Blue cheese	DK, F, S etc.	50+	≈ 61%	Semi-hard/Semi-soft
Brie	F	45+	≈ 68%	Semi-soft
Cottage cheese	USA	>10	< 69%	Soft



..... = Options

Cheese milk

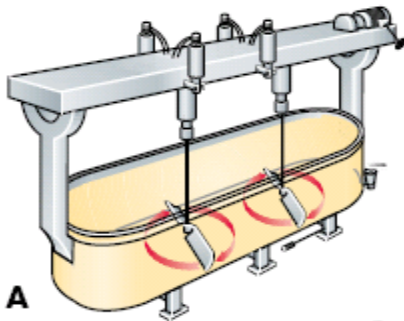
- Fat standardisation
 - Fat relative to SNF (Casein) = F/SNF (Casein)
- Pasteurisation
 - 70-72°C/15-20 s (not always employed)
 - Cooling to about 30°C = renneting temperature

Options

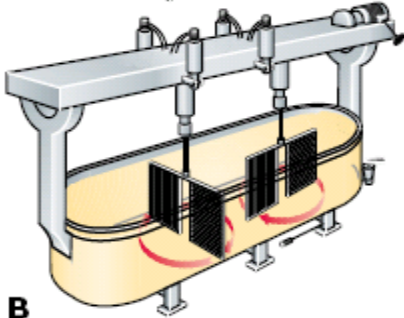
- Mechanical reduction of bacteria:
 - Bactofugation
 - Microfiltration

From milk to cheese

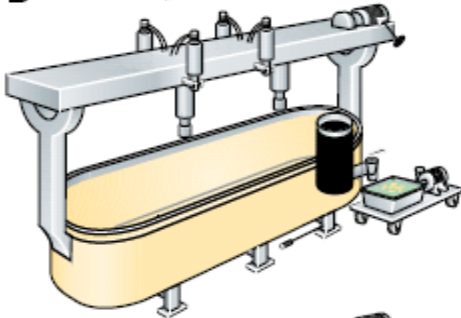
- In the cheese vat
 - Conditioning of cheese milk
 - Additives:
 - Calcium chloride
 - Saltpetre, if permitted by law
 - Starter bacteria, appropriate to type of cheese
 - Rennet as coagulant
 - Coagulum
 - Cutting into grains (curd)
 - Heating, scalding, directly or indirectly, depending on type of cheese
 - Collection of curd for pre-pressing and/or final moulding/pressing, and if required
 - brine salting
 - or for cheddar cheese
 - Cheddaring followed by milling, salting, hooping, and pressing
 - Formed, pressed, and salted cheese to ripening room storage for required time



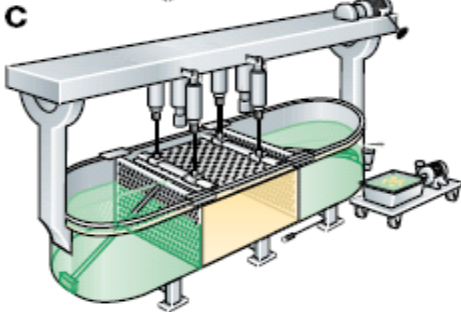
A



B



C



D

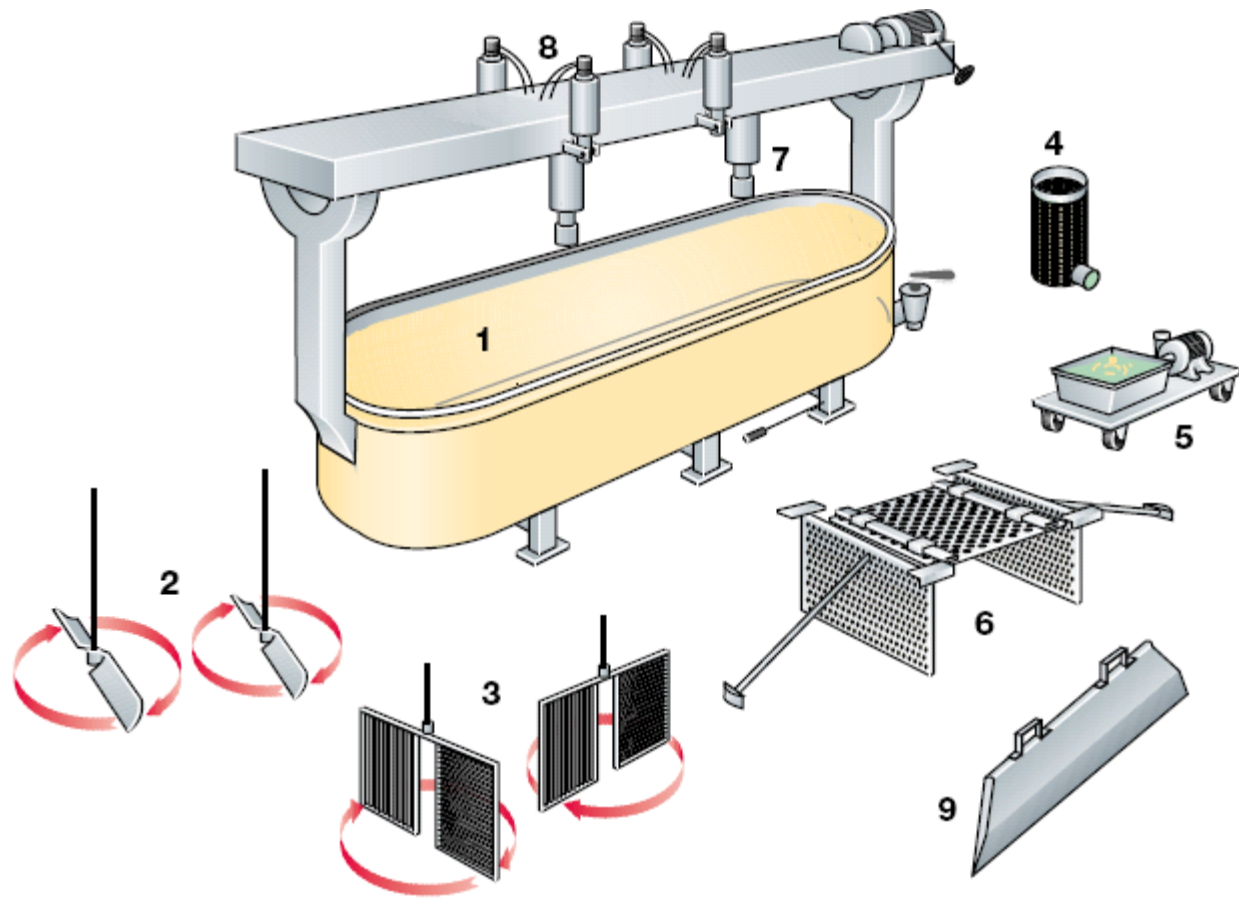
Conventional cheese vat with tools for cheese manufacture

A Vat during stirring

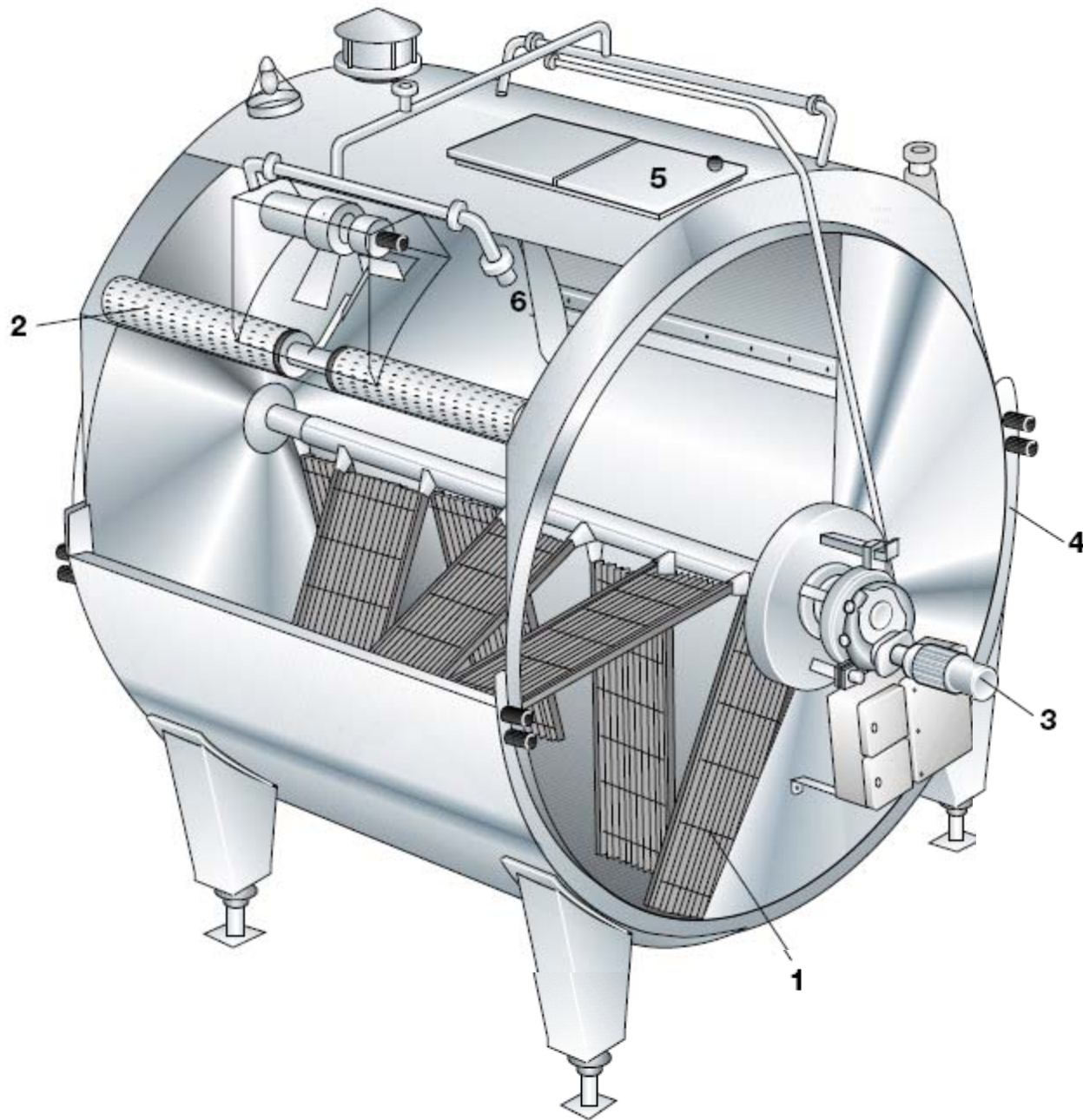
B Vat during cutting

C Vat during whey drainage

D Vat during pressing



- 1 Jacketed cheese vat with beam and drive motor for tools
- 2 Stirring tool
- 3 Cutting tool
- 4 Strainer to be placed inside the vat at the outlet
- 5 Whey pump on a trolley with a shallow container
- 6 Pre-pressing plates for round-eyed cheese production
- 7 Support for tools
- 8 Hydraulic cylinders for pre-pressing equipment
- 9 Cheese knife



**Horizontal enclosed
cheese tank with
combined stirring and
cutting tools and hoisted
whey drainage system.**

**1 Combined cutting and
stirring tools**

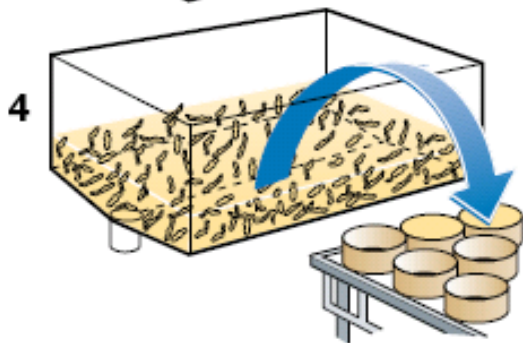
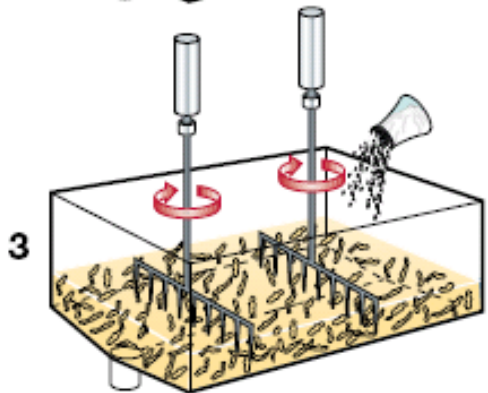
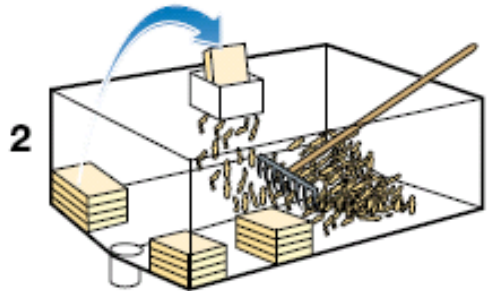
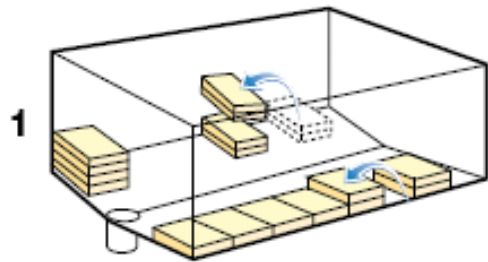
2 Strainer for whey drainage

**3 Frequency-controlled
motor drive**

4 Jacket for heating

5 Manhole

6 CIP nozzle



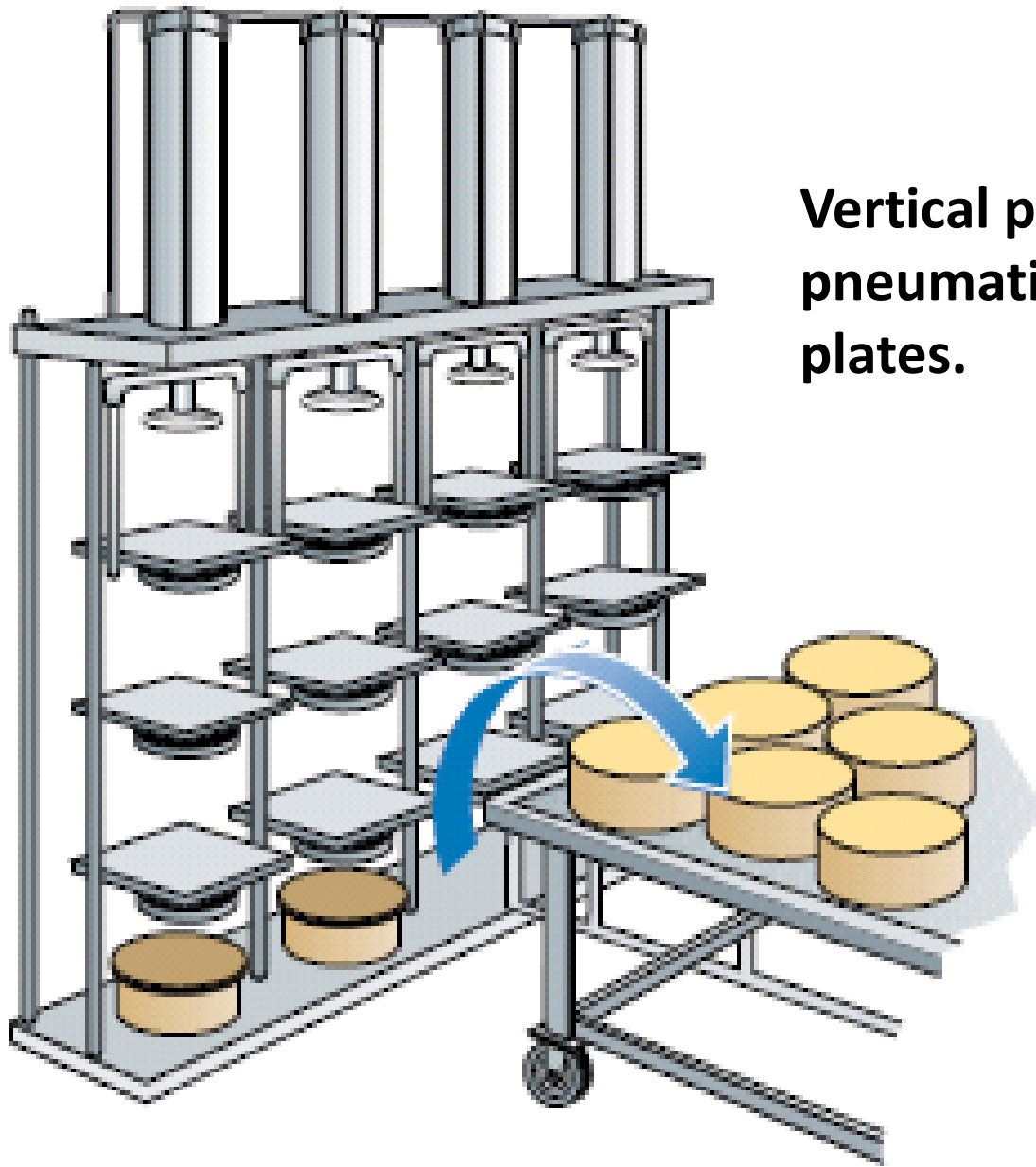
Process steps in making Cheddar-type cheese.

1 Cheddaring

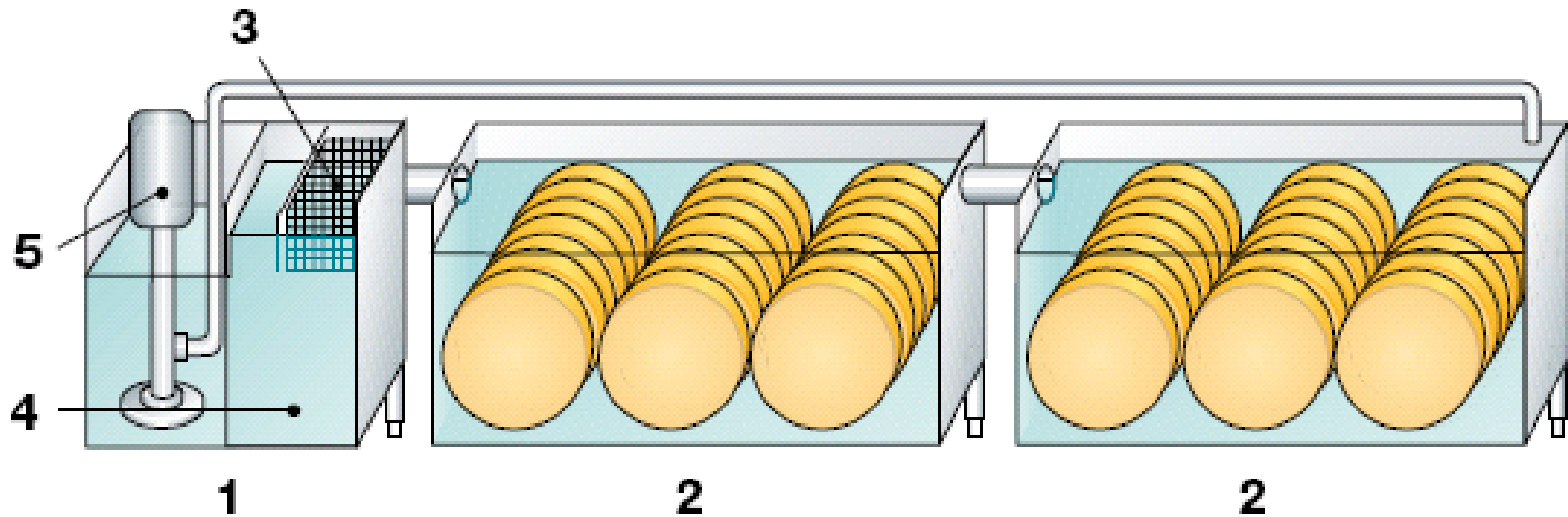
2 Milling of chips

3 Stirring the salted chips

4 Putting the chips into hoops



Vertical pressing unit with pneumatically operated pressing plates.



Brine bath system with containers and brine circulation equipment

1 Salt dissolving container

2 Brining containers

3 Strainer

4 Dissolution of salt

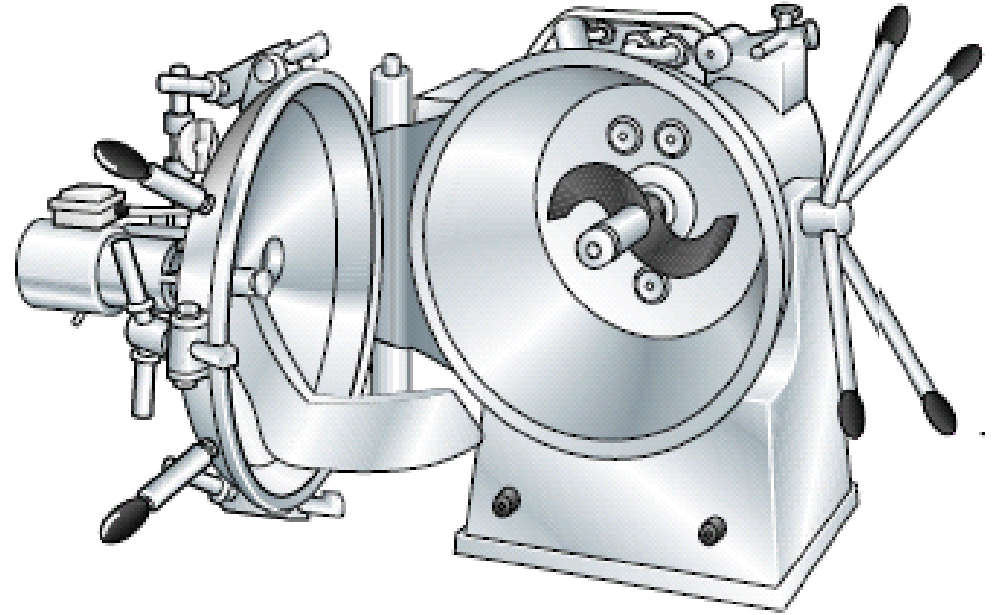
5 Pump for circulation of brine

Salt content in different types of cheese

	% salt
Cottage cheese	0.25 – 1.0
Emmenthal	0.4 – 1.2
Gouda	1.5 – 2.2
Cheddar	1.75 – 1.95
Limburger	2.5 – 3.5
Feta	3.5 – 7.0
Gorgonzola	3.5 – 5.5
Other blue cheeses	3.5 – 7.0



Cooker for processed cheese



Cooker, open and tilted for emptying

Low moisture Mozzarella cheese (Pizza cheese)

Milk composition for Mozzarella is adjusted to suit the type of cheese. Milk is pasteurized and cooled to 32 to 35°C. Milk or whey culture of *S. salivarius subsp. thermophilus* and *L. delbrueckii subsp. bulgaricus* or *L. helveticus* is used at about 1 to 2% level. It is important that strains used should ferment lactic acid rapidly and tolerate high temperature 48.8 to 54.4°C.

Add 2 to 3 oz/1000 lbs of milk coagulant to set milk in 30 min. Acidity of milk at setting should be about 0.18%. Cut the curd using 3/8-inch wired knives. Let the curd stand for 5 to 10 min and then start to stir gently, turn steam on, and cook slowly, one degree rise during the first 5 min, 1.5°C rise during the second 5 min, and then at the rate of 0.550C per minute until 43.3 to 46.6°C is reached depending on the culture used. The titratable acidity of whey at the end of cooking should be about 0.13%. After the cooking has ended, it is stirred, first gently and then vigorously for about 40 min. until the whey acidity reaches about 0.19%. The whey is then drained. When the whey acidity reaches 0.30%, it is milled. The milled curd is molded in hot water at 74 to 82.2°C and then formed and released into cold water to firm up.

The brined cheese is dried and shrink wrapped. It is ready for use right away or it can be cured. Mozzarella cheese is also manufactured by acidification with citric acid or vinegar in place of starter culture.