

How Mozzarella Cheese is made and the use of water during its production process





Milk is a valuable source of nutritional substances; through the centuries, man has wisely learnt how to use this food source in two ways:

- as a foodstuff: for direct consumption (milk as a drink);
- transformed: as an element from which it is possible to obtain dairy products (cheese, butter, yoghurt, etc.).

SPECIES	WATER %	PROTEINS %	FAT %	LACTOSE %	MINERAL SALTS %
GOAT	86.5	3.9	4.3	5.8	0.8
EWE	80.9	6	7.5	5.4	1.1
COW	87.5	3.2	3.7	4.6	1
BUFFALO	82.2	4.8	7.5	4.7	0.8

Average chemical composition of milk of different species (for 100 g of fresh milk)

What is Cheese?

Cheese is the fresh or ripened product obtained from the acid, rennet or mixed coagulation of whole or partially skimmed milk. Each dairy product is produced following a specific technological process.

What is Mozzarella Cheese?

This is one of the pasta filata cheeses that means scalded and kneaded before being aged.

Originally made in Naples from the rich milk of water buffalos. The category of "pasta filata" cheeses includes different dairy types like "mozzarella" cheese, "scamorza" cheese, "provolone" cheese, etc.



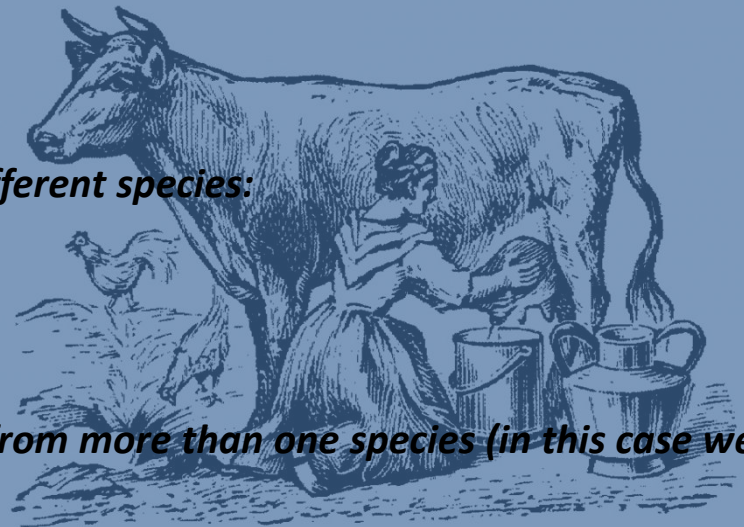
HOW IS MOZZARELLA MADE?

Let's go step by step through the mozzarella production process

RAW WHOLE COW MILK

Milk, the raw material, can be from different species:

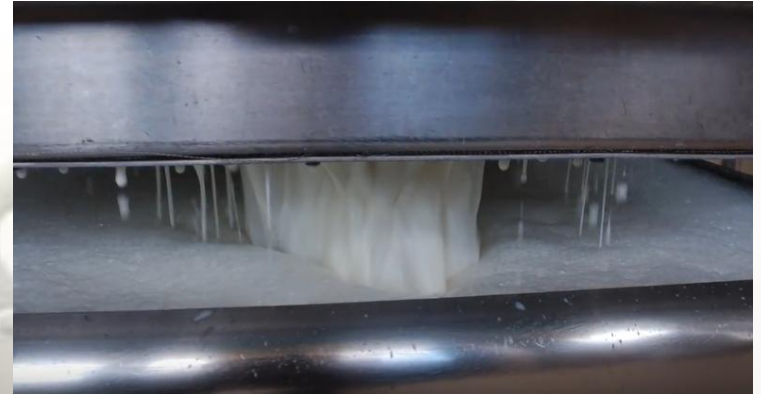
- ❖ *cow (for cow cheese)*
- ❖ *buffalo (for buffalo cheese)*
- ❖ *ewe (for sheep cheese)*
- ❖ *goat (for goat cheese)*
- ❖ *or it can be a mixture of milks from more than one species (in this case we speak of mixed milk cheese).*





FILTRATION

It is the elimination phase of foreign particles, it varies according to the types of filter as in the case of microfiltration for the elimination of microorganisms.



STANDARDIZATION

In this phase milk composition is adjusted to achieve the most economically favourable balance of the cost of ingredients and the percent transfer of milk solid components to cheese while maintaining cheese quality.



HEAT TREATMENTS - Pasteurization is a process, named after scientist Louis Pasteur, that applies heat to destroy pathogens in foods. For the dairy industry, the terms "pasteurization," "pasteurized" and similar terms mean the process of heating every particle of milk or milk product, in properly designed and operated equipment.

MILK ENTERS



HEATING

MILK LEAVES



COOLING

During this process water flows through pipes to heat and cool the milk



COAGULATION

*In this phase milk is transformed in **curd**, i.e. from a liquid it becomes gel-like.*

There are three distinct types of coagulation:

- ❖ by rennet (rennet is added to the curd – it is called renneting),*
- ❖ by acid (the milk is left to become sour until it reaches $\text{pH} = 4.6$; at these conditions the caseins and milk proteins precipitate)*
- ❖ mixed (acid with the addition of a small quantity of rennet).*



The initial milk acidity, the temperature, the quantity of rennet used, the enzymatic composition of the rennet and the protein contents of the milk are usually the main factors that influence the coagulation process.



MATURATION

*(to get to an optimal condition,
wait until correct acidity in curd for stretch)*

Curd maturation (or acidification) is carried out only during the production of stretched curd ("pasta filata") cheeses (mozzarella, scamorza, caciocavallo): all these cheeses are characterised by an "elastic" string curd.



DRIPPING AND CUTTING OF CURD

With the cutting, the curd (a whole mass) is transformed in granules of different sizes depending on the kind of cheese that one wants to obtain:

- ❖ *large granules (nut, hazelnut size) = high percentage of water = soft, fresh cheeses;*
- ❖ *small granules (rice, corn size) = low percentage of water = hard, ripe cheeses.*

There is a vast range of tools used for the cutting process: knife, metal curd-knife, etc.





STRETCHING

This phase is carried out only during the production of stretched curd ("pasta filata") cheeses (Mozzarella, Scamorza, Caciocavallo) which are characterized by an "elastic" string curd.

*During the stretching
water gets a
temperature
of 80°- 90° C*

*How much
water?
3 litres per kilo*



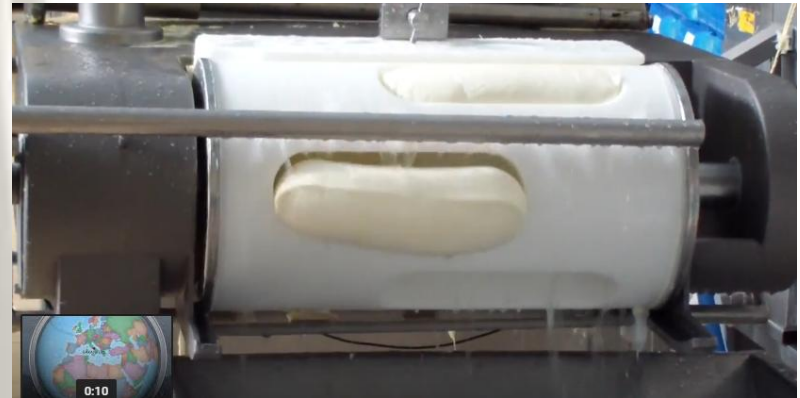
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SHAPING: *Shaping is a phase of “pasta filata” cheeses: the mass is worked into the desired shape (spherical, spherical with small head, braids, small knots, etc.). Instead, for all the other types of cheeses, after the breaking and scalding (when necessary), the curd is put into appropriate moulds where it obtains its final size and shape.*



BRINE: *The cheese can be salted when already dry (the salt is sprinkled directly on the cheeses) or brined (the cheeses are kept in a salty solution for a period of time that depends on their weight; usually 12 hours per kilo).*



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*After shaping
water is used to
cool from 60° to
10° C the product
before packaging*



PACKAGING: Water is
the liquid in which
mozzarella is packed.



For 100g mozzarella 150ml of water is needed



*During the process
for making
mozzarella cheese
Milk and Water
are used in the
ratio of 1:3 in
some cases 1:4*

Here are just few important hints to avoid waste and pollution.....

- Make water conservation a management priority
- Train employees how to use water efficiently
- Appoint a water-waste supervisor
- Survey water use and waste production in the plant.
- Establish waste load reduction goals for your plant
- Orient employees toward preventing pollution, and train them how to do their jobs in a way that will reduce the discharge of wastes from your plant
- Reduce water use; remember that water used in a plant becomes wastewater that must be treated.
- Collect solids from floors and equipment by sweeping. Shovel the wastes into containers before actual cleanup begins. Do not use hoses as brooms.



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