

Mechanization and Automation in Cheese Processing

Mechanization

Automation

**Continuous
Production**

Difference.....

Mechanization	Automation	Continuous Production
It is a necessary precondition for automation, but has different meaning.	A mechanized system which is controlled by an instrument fed by a programmer.	Raw materials are fed to the machine at one end and product comes out of the machine from the other end continuously

- Pretreatments of milk for cheese making like standardization, bactofugation, pasteurization, etc. were already mechanized but with the developments now every stage of cheese manufacturing is mechanized.
- Steps like starter production, curd making, cutting, cheddaring, hooping, conveying, packaging, block forming, etc. have been mechanized for continuous and automated cheese production.
- **APV and Tetrapak** are two of leading industries which manufacture and supply mechanized systems of cheese production.

Cheese Vats: Double -O-vat

- **Tetra Damrow™ Double-O-Vat and Curd Master by APV.**
- **Tetra Damrow Double-O-Vat 8** is specifically designed for the production of high quality cheese curd and whey. The vat is suitable for the production of Cheddar, Emmental, Gouda, Blue, Feta as well as Pasta Filata. Design of Tetra Damrow Double -OVat is based on the double circle principle, which ensures an optimum, efficient treatment of the cheese curd.
- **Curd Master** is another double O type vat fabricated by APV. It facilitates fast foamless filling, rapid mixing of all added components including rennet, gentle and precise cutting, fast whey draw, controlled and fast heating and cooling, vertical vat with two outlets for fast emptying, efficient and gentle stirring. It is fully automated with touch screen and the vat can be cleaned by cleaning-in-place (CIP).

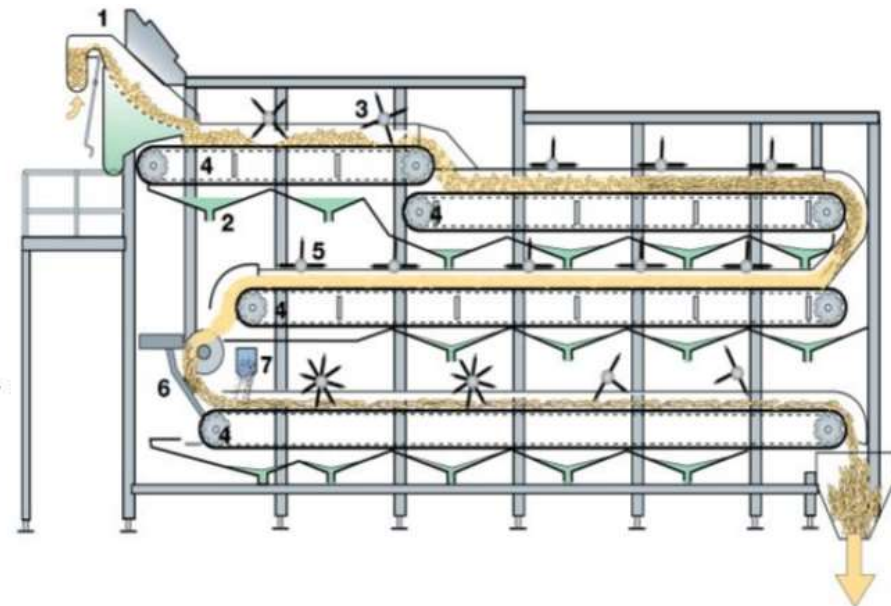
Mould Fillers

- **Tetra Tebel Casomatic is manufactured by TetraPak.**
- **It works in combination with two buffer tanks.**
- **Each column is continuously fed by a pump with curd and whey mixture from a buffer tank.**
- **Mixture is pumped to the top of the column.**
- **The curd settles under the level of whey.**
- **Via three perforated sections, whey is drained from the column. The speed of the whey drainage is controlled by adjusting drainage valves, depending on pressure measured in these sections.**
- **As the curd moves down inside the column, it is compressed progressively until curd block can be separated.**

Mechanised Cheddaring Machine

- **The Tetra Tebel Alfomatic is designed for continuous production of fused and stirred Cheddar and Pasta Filata cheese types.**
- **It is a totally enclosed machine, designed to automatically drain, acidify, texture, mill, salt and mellow cheese curd.**
- **The most common version of the machine is equipped with four conveyors mounted above each other in a stainless steel frame.**
- **The cooked mass (curd/whey mixture) is uniformly distributed on a special drainage screen where most of the whey is removed. The curd is then passed through the four conveyors one by one.**

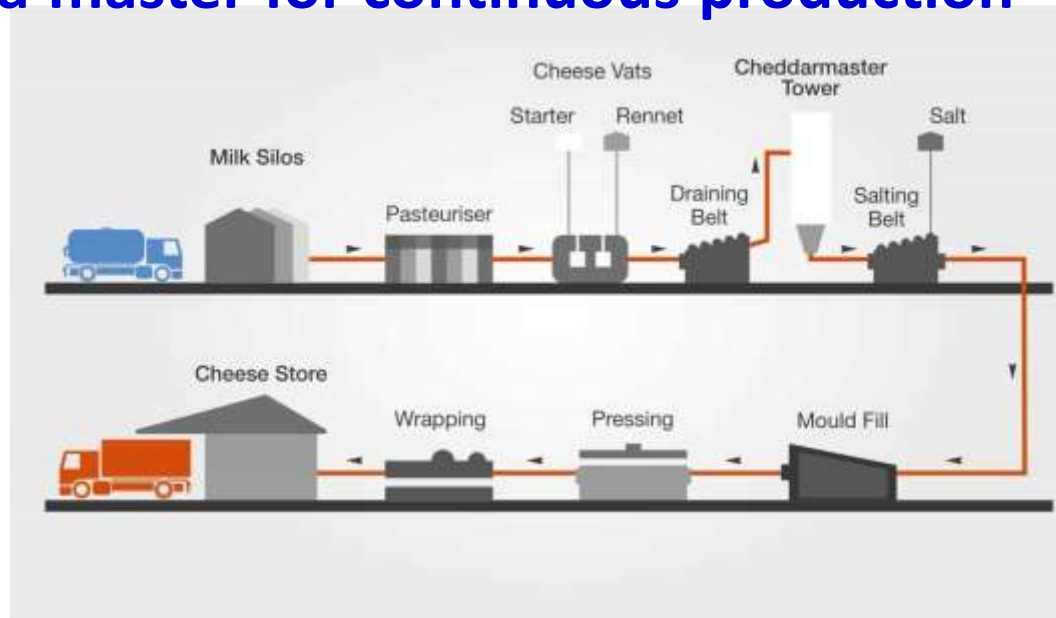
- **First conveyor----** it is equipped with stirrers to facilitate further whey removal.
- **Second conveyor---** matting and fusing starts on this conveyor.
- **Third conveyor----** the mat is inverted and cheddared. At the end of the conveyor, curd is milled.
- **Fourth conveyor----**salting takes place on this conveyor.



Mechanised system for Dewheying, Cheddaring, Milling and salting (Alfomatic by TetraPak)

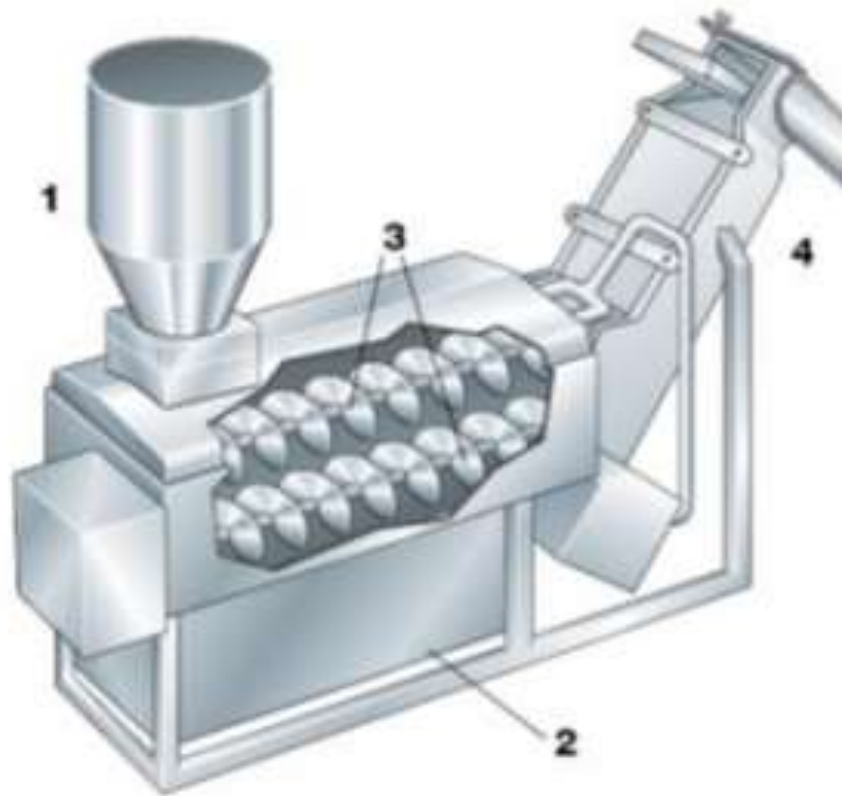
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| 1 Whey strainer (screen) | 5 Agitators (optional) for production of stirred curd |
| 2 Whey sump | 6 Chip mill |
| 3 Agitator | 7 Dry salting system |
| 4 Conveyors with variable-speed drive | |

- In the production of Mozzarella cheese, where salting is not required before stretching, a machine with two or three conveyors is sufficient.
- The other mechanized system for Cheddar cheese making is manufactured by APV. It has been given the trade name of Cheddar master. It is used for curd draining, cheddaring, milling, salting and mellowing. Available in the capacity ranging from 1000 -9000 kg/h of cheese curd. APV also manufactures Mozzarella master for continuous production of Mozzarella cheese.



Cooking And Stretching of Pasta Filata Types Of Cheese

- **Pasta Filata (plastic curd) cheese is characterized by an elastic string curd obtained by cooking and stretching cheddared curd.**
- **Cheddared curd is worked in hot water at 82-85 C until they are smooth, elastic, and free from lumps. This step is necessary to develop elasticity in cheese.**
- **Continuous cooking and stretching machines are used in large-scale production.**
- **Temperature and level of cooking water are continuously controlled.**
- **Cheddared curd is continuously transferred into hopper or cyclone of machine, depending on method of feeding-screw conveyor or blowing.**



- 1- Feed Hopper
- 2- Container for temperature controlled hot water
- 3- Two counter rotating augers
- 4- Screw conveyors

Continuous Stretcher for Mozzarella cheese



Processing Lines for Some Varieties of Cheese



Continuous Cheddar Cheese making

- **Standardized and pasteurized milk is received in the vat where it is ripened, rennet is added to form curd, and curd is then cut and cooked. These stages are completed in this vat.**
- **Double–O-vats are mostly used to perform all these operations.**
- **Cooked curd and whey mixture is then pumped to cheddaring machine where dewheying, cheddaring, milling and salting take place.**
- **Curd is then fed to the block forming machine where the milled curd fuse together and blocks of uniform shape and size are formed.**
- **Blocks are sealed by vacuum sealer, weighed, packed in cartons and kept for ripening.**

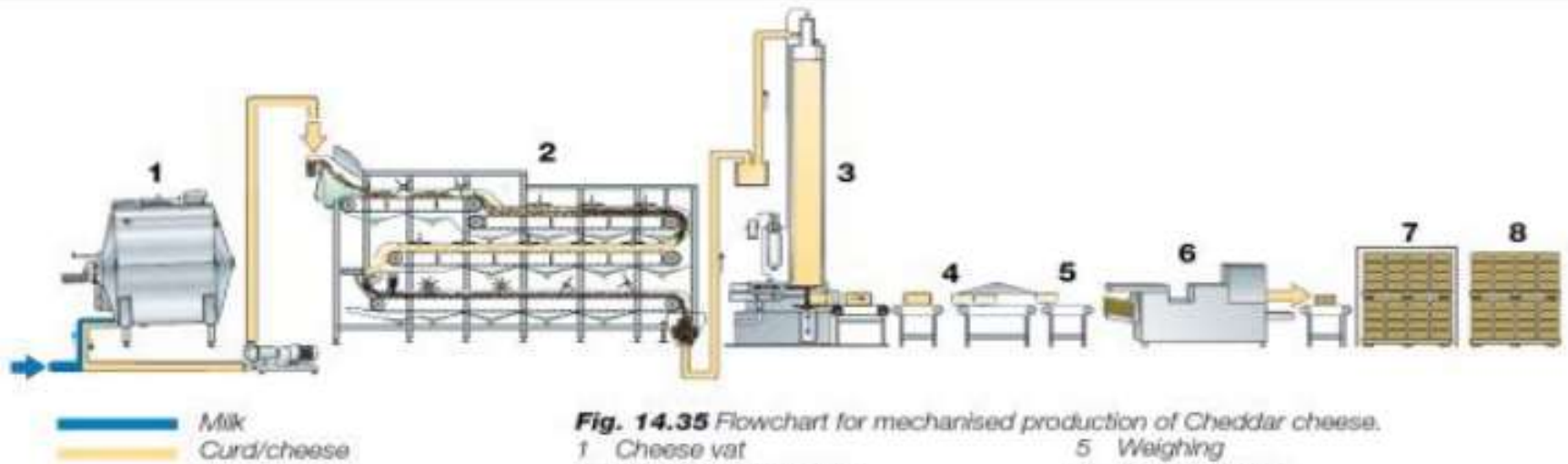


Fig. 14.35 Flowchart for mechanised production of Cheddar cheese.

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|---------------------------|------------------|
| 1 Cheese vat | 5 Weighing |
| 2 Cheddaring machine | 6 Carton packer |
| 3 Block former and bagger | 7 Palletiser |
| 4 Vacuum sealing | 8 Ripening store |

Processing line for Cheddar cheese manufacturing

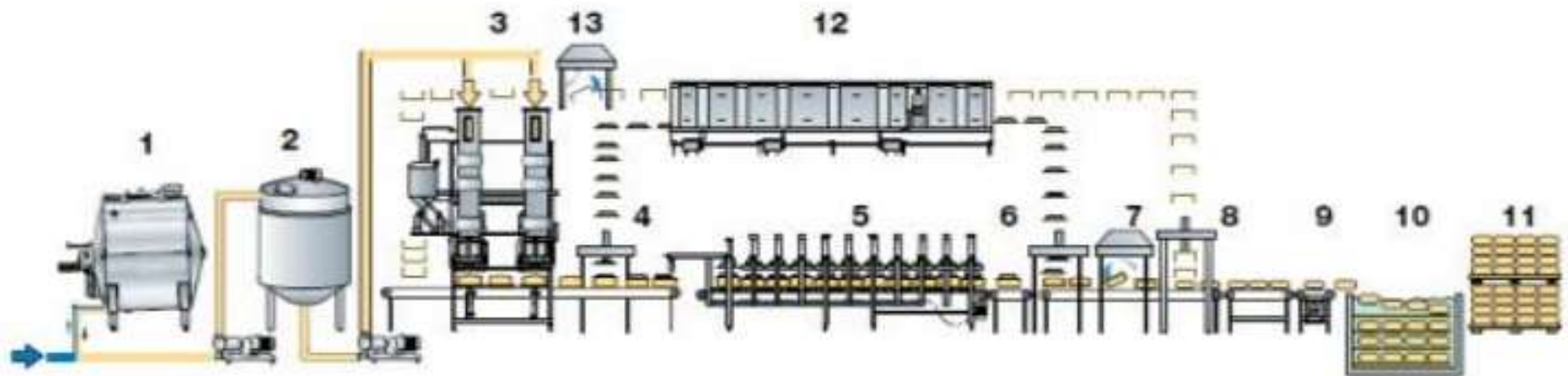
Continuous Gouda Cheese making

- ❑ Peculiar step is cooking curd in whey through addition of about 20% hot water.
- ❑ Before addition of water, about one third whey is drained.
- ❑ This process of heating curd with whey and hot water is called scalding.
- ❑ In mechanized system of Gouda cheese manufacturing, the standardized milk is taken in vat (1) and all other steps upto scalding are carried out in this vat.
- ❑ After scalding, content of vat is transferred to a buffer tank (2) so that the contents of more than one vat can be stored in the tank till further processing.
- ❑ This tank is equipped with agitators and is jacketed to supply chilled water in case activity of starter organisms need to be curbed down.
- ❑ Curd is then pumped to the pre-pressing machine (3) like Casomatic (TetraPak), where whey is removed and blocks of cheese are also formed.

A fully mechanized system also comprises of:

- Mechanical lidding (4) of the moulds
- Transfer of moulds to conveyor or tunnel presses
- Filling and emptying of the presses
- Transport of moulds via a de-lidding station (6), a mould turning device (7), mould emptying system (8) and weighing scale (9) to an advanced brining system (10).

Processing line for Gouda cheese manufacturing



- 1 Cheese vat
- 2 Buffer tank
- 3 Casomatic pre-pressing machine
- 4 Lidding
- 5 Conveyor press
- 6 De-lidding
- 7 Mould turning

- 8 Mould emptying
- 9 Weighing
- 10 Brining
- 11 Ripening store
- 12 Mould and lid washing
- 13 Mould turning

— Milk
— Curd/cheese