Cheese production line
The technological lines manufactured by OBRAM are designed for production of various types and kinds of ripening cheeses:

- Hard (gruyère, ementaler, etc.)
- Semi-hard (Dutch, Swiss, Tilsit, etc.)
- Semi-soft
The cheeses are produced using mould technology, involving the pressing or self-pressing of cheese mass.

The line size and composition may vary and depends on the market demand (ranging from several thousand to a million liters of milk processed per day).

**Cheese production line consists of the following elements:**
- cheese vats (1)
- buffer tanks (2)
- pre-press vat (3), cheese moulding columns (4)
- final pressing system (5)
- moulds storage (6)
- moulds and lids cleaning tunnel (7)
- moulds and lids transport system (8)
- cheese brining system
Horizontal or vertical cheese vats, with various capacities, equipped with:

- non-welded knives made of acid-resistant steel, with durable blades, which minimize protein and fat loss and ensure an uniform grain size
- a system of draining off whey from the surface
- a system of heating curd with hot water
- a system of uniform spreading of process water onto the entire surface
- dynamic temperature adjustment and its measurement
- a cleaning and disinfection system
A pre-press vat receives curd, drains off whey, pre-presses protein mass and cuts cheese into portions.

The pressure on the mass block is adjustable. All the vat functions, including cheese portioning and loading into moulds, are carried out automatically and controlled by PLC.
The device consists of a vertical column in which curd moves. The system of valves gradually drains off the whey, maintaining the whey level above the cheese mass block. This condition is necessary in the production of cheese with eyes typical for Dutch-type cheeses.

The bottom part of the column is equipped with a system for cutting off the shaped cheese blocks, which are then put into the waiting moulds.
Unlike the moulding columns for Dutch-type cheeses, the construction of these columns ensures the whey draining in the first stage of the process in order to provide good contact with air. The whey draining-off rate depends on the type of cheese being produced.

Moulding columns also work together with a conveyor for feeding empty moulds and collecting ones with cheese.
Cheese moulding columns work together with the cheese vats, often through buffer tanks. Such buffer tanks ensure a uniform share of grains and whey in the curd.
The process of cheese final pressing is carried out in tunnel-shaped presses whose structure is adapted to the mould size and the configuration of the cheese-making line. Presses may be single- or multi-level, open- or closed-type (which allows cleaning in the C.I.P. system), using forced pressing (pneumatic cylinders) or cheese self-pressing. The pressing force and duration in various phases of the process are adjustable.
Moulds and lids cleaning is carried out in a four section tunnel cleaning station which consists of:

- pre-rinsing section
- proper cleaning section
- 2 sections of final rinsing

The cleaning tunnel has an integrated cleaning solution preparation system which provides appropriate temperature and concentration of cleaning solution.
Moulds and lids transport system is a set of the following devices:
- lid placer (1)
- final pressing system (2)
- lids remover, moulds turner, cheese emptying unit (3)
- moulds turner (4)
- moulds transport lifts
- moulds storage rack (5)

Complementary equipment:
- weighing system (a)
- cheese labeling system (b)
- metal detector (c)
- cheese portioning system
Cheese brining may be done in various manners: in a rack system, in a ‘river’-type system or in a mixed system.
Each of these systems consists of similar elements, the difference is just the way the technological functions are performed.

- brining vats
- cheese brining racks (containers)
- brine buffer tanks

- a system of technological installations which perform following functions:
  - brine preparation (salt dissolving)
  - brine cooling
  - controlling the temperature and concentration of the brine
  - controlling brine level in brining vats
  - brine pre-purification on mechanical filters
  - ensuring cheese movement in brine (appropriate for the ‘river’-type system or the mixed system)

- rack loading and unloading system
- remotely controlled rack transport system
- rack cleaning system
- system of brine membrane filtration

Microfiltration unit improves the microbiological quality of brine. It decontaminates and restores brine’s original form.
The automatic control system is based on PLC controllers integrated with computer software.

An operator who performs and supervises the production process communicates with the devices by means of local operator panels deployed in production areas near the equipment which comprise the production line.

With the panels, the operator can observe the process at each stage, follow the important technological parameters, modify recipes and handle emergency states.

All the power and control circuits of electrical drives are situated outside the production area in the central switchboard.

The automatic control system integrates
the operation of all the elements in the production line:

- pasteurization units
- milk buffer tanks
- tanks for cheese starter production
- cheese vats
- technological systems (valve batteries, pumps, etc.)
- moulding columns
- pre-press vats
- cheese moulds transport system
- final pressing devices
- moulds cleaning tunnel
- moulds storage racks
Thanks to the control system’s openness and extendibility, it can be integrated with other technological sections and equipment, such as:

- cheese brining system
- raw material preparation section
- C.I.P. cleaning stations
- whey processing systems
- heat regeneration systems

A very important role in the production supervision is played by the central system of data visualization and archiving.

Particular stages of the technological process are presented on a screen as separate synoptic screens.

All key parameters are monitored and archived.

The visualization system is also equipped with an advanced reporting system. Clear tables present production data, cleaning processes, etc. The reporting system is a valuable source of information necessary to optimize the production process.

The control system may be equipped with a remote servicing system, which enables immediate service assistance provided over the Internet.

The possibility of making data available to other information systems enables integration, e.g. with the production management systems or the quality management systems.

Exemplary report – mould transport system