

Dough sheet cooling for improved quality

The use of cooling cells when producing laminated doughs, and long dough rest times, help with further processing and increase baked product quality.

+ Laminating plant suppliers offer various cooling cells and methods to cool the dough during production. Dough resting and dough cooling improve its processing properties. For example, cooled laminated doughs do not shrink or shrivel up so much. The individual layers become stabilized when puff pastry, for example, is not subjected to immediate further processing, but instead a corresponding dough resting time is adhered to. This ensures that the baked product has a larger, more uniform volume. Dough cooling and/or resting sections can be integrated into the production operation, depending on the product and customer's requirement. Different times (from approx. 30 minutes to around four hours) can be implemented in this respect. However, experts say the average is one to two hours.

Cooling cell construction

The cooling cells made by FRITTSCH GmbH in Markt Einersheim consist of cell cooling plates with fixed pipework. The plates are modularly integrated into the cooling tunnel's conveyor belt system. The conveyor belt with the dough being cooled rests on stainless steel plates which are said to be wear-free. The cooling cell has several levels. Between each level there are collection trays with a central drainage system. A run-off system ensures that water used for wet cleaning can drain away as required. The trays can also be removed for cleaning. In the Fritsch cooling system with contact cooling, the customer's own coolant fluid circulation can be used to regulate the closed cooling system's temperature. The temperature of each conveyor belt level can be regulated individually.



++ The cooling cell for the laminated doughs consists of several levels

++ The cell can be wet-cleaned

Explaining how the cooling cell works, Anna-Maria Fritsch, Head of Marketing and Process Management, says: “We use low air velocity in our cooling cells to avoid the dough

drying and skin formation. The plant controller also ensures that the dough sheet is cooled down extremely gently and efficiently, to reach the required core temperature quickly.”



++ The stainless steel plates are modularly integrated into the cooling tunnel's conveyor belt system

The advantages of contact cooling

- + the entire dough sheet cools down quickly and gently to the required core temperature, thus increasing resting times at the target temperature
- + dough development control (yeast) through fast, controlled cooling
- + stepwise cooling through individual temperature settings for each conveyor belt level
- + indirect air movement minimizes dough sheet skinning and drying out
- + no cleaning and maintenance effort on the components installed in the dough area, and no infestation by bacteria or spores (closed liquid cooling system)

Technical process description

- + Cooling power is transmitted to the dough directly
- + The cooling plates are connected to the conveyor frame and cool down the dough lying on the conveyor belt
- + The cooling plates have double-sided cooling surfaces
- + Cold air falls gently from the lower surface onto the dough sheet on the conveyor underneath (convection and radiation) = “silent cold”
- + Additional air cooling of the room, with minimized air flow, assists contact cooling +++

Interview FAQ's

+ **bbi:** How is the system started up while avoiding condensation on the structure?

+ **FRITSCH:** The start-up program controls step-by-step cooling of the complete cooling tunnel\;

1st: start-up of the air cooling systems, after a preset time and/or reaching a temperature level (adjustable software parameter)

2nd: start-up of the contact cooling plates

Generally, all the cooling systems are equipped with humidity control. The conveyors for infeed and exit of the dough are divided into two separate conveyors to avoid transport of thermal energy into the cooled area.

+ **bbi:** Does the system have a cleaning program?

+ **FRITSCH:** The system has a cleaning program with special parameters to switch off the cooling system with maximum reduction of humidity. The heat exchangers are defrosted sequentially in automatic mode. No stoppage is required for defrosting.

+ **bbi:** What happens if the line is shut down more over a certain time?

+ **FRITSCH:** After a certain time (adjustable software parameter), the cooling system automatically changes to “Stand-by” mode in which the temperatures of the air and

plates are set to a level at which freezing of the belt and dough is avoided.

+ **bbi:** How is the humidity controlled during production?

+ **FRITSCH:** The air control system constantly monitors the humidity inside the cooling chamber. If a pre-set level is reached, the system will automatically start to dehumidify the air inside the chamber until the pre-set minimum level is reached.

+ **bbi:** Can the ΔT between the cooling plates and chamber temperature be controlled?

+ **FRITSCH:** The temperature difference can be pre-set in the HMI, constantly controlled by the PLC.

+ **bbi:** How is the air flow in the chamber managed?

+ **FRITSCH:** The climate units inside the cooling and retarding chamber are equipped with stainless steel pressure walls. The air coolers are located in the middle of the space, and air flows to both ends of the chamber creating a minimal over-pressure to avoid warm air ingress from outside the chamber through the openings in the chamber. The air flow velocity is below 0.5 m/s to prevent air movement at the surface of the dough sheet, which prevents skin formation on the dough surface and drying out. +++