Learning freezing times lines and processes

The freezing process is a combination of the beneficial effects of low temperatures at which microorganisms cannot grow; chemical reactions are reduced, and cellular metabolic reactions are delayed. Michael Hase, area sales manager with Heinen, explains features of freezing equipment supporting these processes.

The freezing process normally takes place at the end of the processing line, meaning that freshly-made products are directly then frozen, to keep their properties and freshness. Freezing times are product specific, so they will vary according to the types of baked goods. Longer freezing times trigger weight loss. Quick freezing means less weight loss of the product. For example, smaller products can be frozen in a matter of minutes, while for more delicate textures, like cakes, freezing can be a matter of hours. Failing to maintain correct freezing times can demage the product. The best indicator of the correct timings for each types of products is experience, which is what makes the process extremely product-specific and challenging.

INNOVATIONS IN CONTINUOUS FREEZING

Heinen shares how continuous freezing can be optimized when handling baked goods, a processing sequence taking place right after the production line, and before packaging. As each product has its specific freezing time, freezing times need to be tested and accurately determined before sizing a freezing system. The heat content of the product about the undergo freezing is also a factor that must be known as it impacts the specifications required from the continuous freezer. According to how hot the products are, the energy needed to cool and freeze them can be calculated. Air flow and air velocity also influence this. Correctly evaluating all these factors will determine the appropriate freezing process.

In the case of versatile lines, manufacturing different types of products, more variables must be taken into consideration to determine freezing. For example, in the case of a line producing dough ahead of the freezer, making croissants or Danish pastries, Heinen have to calculate what would be the size of the machine, taking into consideration all the products. The most challenging product is the one that will determine the specifications/settings of the freezers, and all the remaining ones in the manufacturer's production line will benefit from using the same machine without any problems. Such an example of a more difficult product is that of croissant: if a line fits normal croissants and also filled products (with chocolate or cream filling, jam or fruit), the fruit ratio must be assessed in relation with the dough, so specific product know-how is key.

In addition to these factors that determine requirements from the freezing equipment, freezers can be customized according to production capacities (kg/hour to be frozen), the width of the line in front of the freezer, the space available in the production facility. Production cycles (uptime hours of the production line, which could range from 8, 16 or 24/7) also play a role in determining the configuration that best suits the plant.

DEALING WITH DEFROST

Other options that can be accommodated include a specific cleaning system or defrost system. For example, in continuous production, defrosting can be done automatically. Basic systems imply operation downtimes to defrost the machine; this is a solution that suits 8-16-hour production uptimes with no impact.

There are increasingly more bakers who want to produce for 16 hours at a time, or even an entire week before without stopping for defrosting. There are also equipment solutions to meet these demands, for example, automatic defrost during the production process, that does not require stopping the machine. Periodically (weekly), complete defrosting and cleaning should be performed.

Energy costs can be estimated according to this, and also taking into consideration how many kg/hour are processed. Energy-saving features are possible: the biggest energy consumers in a freezer are the ventilators, because a high air volume and air speed are needed for the freezing process. When determining the size of the ventilators to be installed, Heinen opts for 100% capacity or even a bit over, which can run efficiently with a lower speed. "When you reduce the speed of the fans, you start saving energy tremendously. Running ventilators with frequency converters is of huge help to save energy" explains Michael Hase.

The custom-built freezing equipment is developed taking into consideration all these factors that determine its design entirely.

OPERATION CONTROLS

Control panels allow setting the temperature; the PLC of the machine is connected to that from the refrigeration plant so that both communicate. Available options include setting retention time, temperature, air/fan speed. The PLC also features a recipe manager, for when different types of products are produced on the line, with various freezing times, or fan speed requirements. A user-friendly interface allows choosing the correct settings automatically, by simply selecting the product processed, for example, croissants. Normally, foodstuffs should be frozen at -18°C; however, when dealing with baked goods, a temperature of -12°C/-10°C may suffice. More sensitive products, like pretzels or croissants, can be damaged if deep-frozen, which could cause them to become frail, which causes broken extremities during packaging.

As freezing is a trial-and-error learning process, and it becomes more challenging when different products are manufactured on the line, Heinen can also assist with knowhow regarding specific requirements in freezing, cooling, proofing. •

Michael Hase, area sales manager, Heinen

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