

include open design for easy cleaning and maintenance access, modular design: 1, 2, or 3 cylinders and low cost for maintenance. Capacity ranges up to 3,000 lit/h. It is simple to operate, and features all stainless steel wash down construction.

In a recent Gram freezer, the mix is pumped in at 2.2° to 3.3°C, the overrun is automatically adjusted, with the smart mass flow meters and air flow correction. The controls also monitor and allow automatic operation of parts during the CIP mode. The freezers offer faster start up with less waste and a consistently high-quality product. The employee can start the freezers up in the morning and set your recipe and you can basically let the freezers run all day long and monitor the process and be confident of its performance while focusing on the rest of the operations.

The condition under which ‘Gelato’ is dispensed from the freezer is critical. Some gelato freezers are capable of discharging product at temperatures as low as -12.8°C (typical ice cream draw temperatures are -6.6 to -4.4°C). Some freezers adjust dasher speed in response to changes in temperature. Gelato maybe dispensed semi-soft from the freezer into pans, in which it is presented for viewing at the point of consumption in special “dipping” cabinets designed for enhanced viewing of multiple products. Added eye appeal is created by artistically distributing particulates or syrups appropriate to a particular flavor over the surface. Additional appeal is created by sculpting the surface into fanciful shapes.

32.2 Overrun Accuracy

To control overrun, one method is the barometric pressure feature, another is a mass flow meter that helps compensate for air in mix, which is particularly problematic in rework. Barometric air pressure changes can result in up to 6.0% change in the amount of air that is dissolved into the ice cream. So having a freezer that can automatically compensate is very beneficial. Another concern that is addressed by new features in continuous freezers is of air pockets in the mix. Such phenomena are a fairly common problem when reworked ice cream mix is introduced to the freezer. Most manufacturers think that a standard mass flow meter will solve the problem, but unless it is sensitive to density, it only makes the problem worse. What is actually needed is a sophisticated mass flow meter with accurate density measurements that tells you how big is the flow change so that we can use that information to compensate for the air in the mix.

Some of the features of recently fabricated continuous ice cream freezers involve constant overrun; optional automatic viscosity and overrun control, two dasher choices tailored to customer’s product and various options to meet production needs. It is all stainless steel frame with capacity up to 1060 lit./hr. capacity.

32.3 Cryogenic Hardening

Most ice cream products have to undergo a hardening phase after they are formed, and the most common tools for achieving this are tray hardening tunnels or spiral hardeners.

When individual half liter packages of vanilla ice cream were immersed in liquid nitrogen at -320°F (-160°C) for 1 min, bagged together in groups of 8 packages and placed in hardening cabinet at -9°F (-12.8°C), the product had good body and texture. A center temperature of -30°F (-1.1°C) in half liter package could be reached in less than 5 min. with outer temperature of the product at -250°F (-121°C) or lower. One minute immersion per half liter of ice cream was considered the maximum treatment to which ice cream could be subjected without adversely affecting its body and texture. Liquid nitrogen requirement was 0.56 kg per kg of ice cream to be hardened. The ice cream hardened in such manner was decidedly whiter in appearance compared to the one that was hardened slowly. However, after 2 week storage pronounced shrinkage was evident.

The Cryoline CS spiral acts as a heat exchanger, in which the liquid nitrogen is sprayed directly on the product, thus efficiently extracting heat from it. The cold gas generated is circulated around the products and the 28 m^2 belt, the gas is then extracted by the exhaust system. The freezer uses a disposable plastic film which travels through a conventional freezing tunnel in contact with cold plates. The chilling for these plates is generated by the vaporization of liquid nitrogen at -196°C , giving very fast and effective freezing to the contact surface of the product.

32.3.1 Nitrogen refrigerated hardening tunnels

In Sweden, there is an ice cream factory where ice cream cones at the rate of 14,000 – 16,000/h is sprayed with liquid nitrogen for hardening. The cones are pre-cooled by exhaust nitrogen in the first section and finally frozen in the second section.

Delight the customer by analyzing and reviewing customer feedback and provide new varieties and flavours

32.4 Quality Policy

- Delight the customer by analyzing and reviewing customer feedback and provide new varieties and flavours.
- Monitor and measure all the process parameters and reduce the in process rejection level.
- Increase the market share and customer's base.
- Meet delivery schedule as committed.
- Train the employees continually and improve upon retention period.
- Reduce the down time of plant and production equipment and improve productivity.

- Be always in compliance with ISO 9001-2008 and HACCP management system.

The mission of the ice cream plant is development, implementation and maintenance of an Integrated Management System based on the following standards:

- ISO 9001 (Quality Management System),
- ISO 14001 (Environment Management System),
- ISO 22000 (Food Safety Management System),
- OHSAS 18001 (Occupational Health & Safety Audit System),
- HACCP Codex Alimentarius (Hazard Analysis Critical Control Points) principles and other norms and regulation concerning the food industry

The waste water that comes out of the dairy plant is treated in Effluent Treatment Plant to reduce the BOD and COD of the waste. Such treated water is utilized for watering the gardens and farms.

32.4.1 Emphasis on Food Safety

HACCP procedures are refined every year. The company runs quality assurance tests in its lab and sends samples to a third-party lab. Everything gets tested twice.

All the employees of ice cream plant are fully trained and certified for their job responsibilities and participate in an annual safety review. Most companies publishes a monthly newsletter (i.e. 'Scoop on safety') to reinforce safety tips and procedures. Enhanced ergonomic features in the new layout and equipment include conveyors at comfortable heights for less lifting and an overall improved environment.

The people there have been well trained in aspects of personal hygiene, from using cutlery to how to use the washrooms. Anyone going into the production area must have a shower and change into a set of clothes given by the dairy plant. Each time they step out, they need to do this before they go back in.

The company may plan a "robust" HACCP plan and a thorough emergency contingency plan is in place. The company ensures a very stringent vendor qualification program. Through the HACCP program, a robust vendor evaluation is created and high standards of vendors is required. The company performs weekly and monthly self-audits. The managers work with suppliers to ensure full traceability of products, ingredients and packaging, which is in full compliance with the food defense program.

Few companies may have one CIP program for its raw processing operations and another CIP for pasteurization. The mix room and the production room each receive a thorough

32.5 Preventing Chances of Accidents in Ice Cream Plant

Whenever the floor is wet (after cleaning) signboard indicating ‘Wet floor’ should be displayed.

Inside the hardening room, a provision of alarm should be there in case the door handle gets locked; outside the hardening room a flash bulb and buzzer should operate in such circumstances.

Due care should be taken to monitor leakage of refrigerant in the refrigeration plant.

No blades or sharp devices should be entertained in the ice cream section.

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