



Plant-based frozen desserts

Four processing challenges

– and how to overcome them



Four processing challenges in plant-based frozen desserts and how to overcome them

Plant-based frozen desserts* are soaring in popularity as consumers discover dairy-free and vegan alternatives to conventional ice cream. But creating a product with the right ingredients and the desired texture and mouthfeel demands a carefully calibrated process.

Here we look at four common production challenges when producing non-dairy frozen desserts – and how to solve them.



*Frozen dessert is a term for all kinds of desserts that are meant to be eaten in a frozen condition. They include ice creams, sherbets, sorbets, frozen yoghurts and non-dairy frozen desserts. Dairy ice cream is made with legally defined amounts of milk fat and non-fat milk solids that vary between countries according to national regulations. This must be checked in each case by the food producer. For the purposes of these pages, references to plant-based ice cream could be read as synonymous with plant-based frozen dessert.



1 What type of plant-based frozen dessert should you choose to make?

Knowing what plant-based frozen dessert to produce is your first important decision. But navigating the wide spectrum of plant-based ingredients and available product formats can be a hurdle if you're new to the market.

The initial step, according to Torben Vilsgaard, Manager of Tetra Pak Ice Cream Academy in Aarhus, Denmark, is to determine what level of sophistication your intended product should have.

"The question is how complex you want the product – and your process – to be. Are you looking to produce a relatively basic product, or do you want to be more adventurous and develop a more functional option and explore different types of plant protein?"

The simplest way is to make a frozen dessert based on a commercially available whipping agent and then to add a plant ingredient as a source of solids and that possibly adds some viscosity to the mix. The ingredient could be anything from a raw fruit or vegetable to processed plant proteins or plant derivatives.

This, Vilsgaard explains, is a straightforward and secure route into the market as you seek to build your brand and expertise in plant-based frozen desserts.

A more advanced route is to choose functional plant ingredients with inherent whippability and favourable properties that allow you to create and control a frozen dessert with your own signature.

These ingredients can include fat, protein or carbohydrate and come from multiple sources. They may differ widely in functional properties and be capable of being processed in different ways.

This approach is worth considering if you're looking beyond simply adding a non-dairy label to your portfolio and want to develop a genuinely distinctive or premium product.

Processing and cost are other key considerations. It can be appealing to simplify your production by buying in non-dairy drinks as your key ingredient, and this may indeed offer a fast market entry. But, as Vilsgaard notes, reliance on an externally sourced base becomes expensive over time.

"Your raw material costs will be high if you have to buy in your basic mix and over time this will reduce your margin," he says.

"Making the frozen dessert from scratch yourself gives you full production oversight and higher product quality because you're in full control of the process and the product."



2 What's the best source of plant protein for your product?

Until relatively recently, soy was the staple protein source for plant-based frozen desserts. But in recent years manufacturers have expanded their horizons to a host of alternatives, from almonds to rice and coconut to oat.

New options – such as hazelnut, cashew, pea, avocado and banana – are constantly entering the fray. Hot on their heels are future sources like potato, hemp, chia and chickpea.

Not only do all plant proteins have different tastes, they also have different properties in a recipe. To add more complexity, these properties can vary considerably between different suppliers of any given protein.

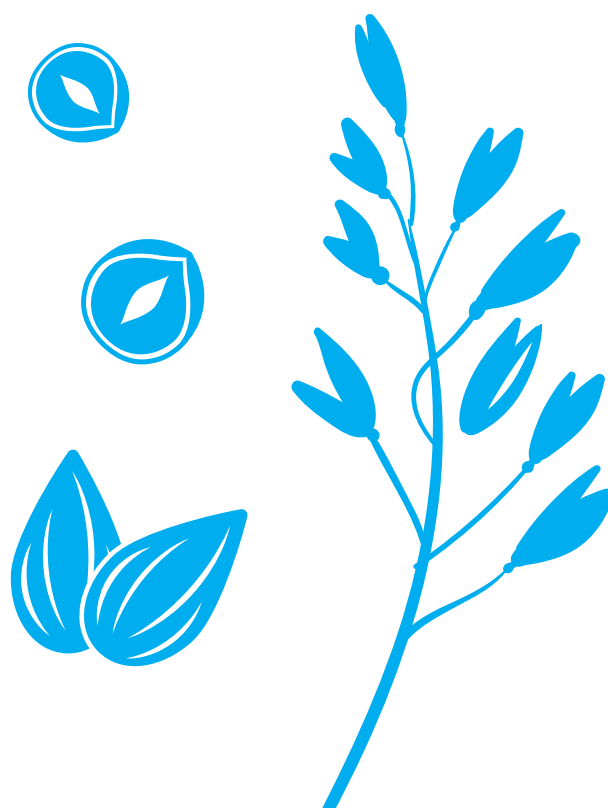
This makes it important for would-be manufacturers to experiment with a range of protein samples before making a choice.

“It’s fairly simple to test the sensory profile, solubility and dispersibility of a plant powder in water before going into testing. You’ll discover the important properties of the plant powder and get valuable knowledge for your tests,” says Torben Vilsgaard.

Extended trials are advisable when developing a plant-based frozen dessert. These trials will reveal

any need to alter the mix preparation process to ensure effective and complete mixing of raw materials. As your search narrows, it can be beneficial to work with an expert partner in larger scale testing.

Tetra Pak’s Ice Cream Academy, for example, can test in semi-commercial conditions to establish how a product works prior to commercialisation. Ice cream specialists can determine important parameters such as how it behaves during freezing and how to optimise for good extrusion.



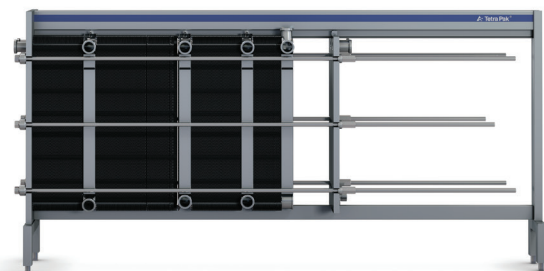


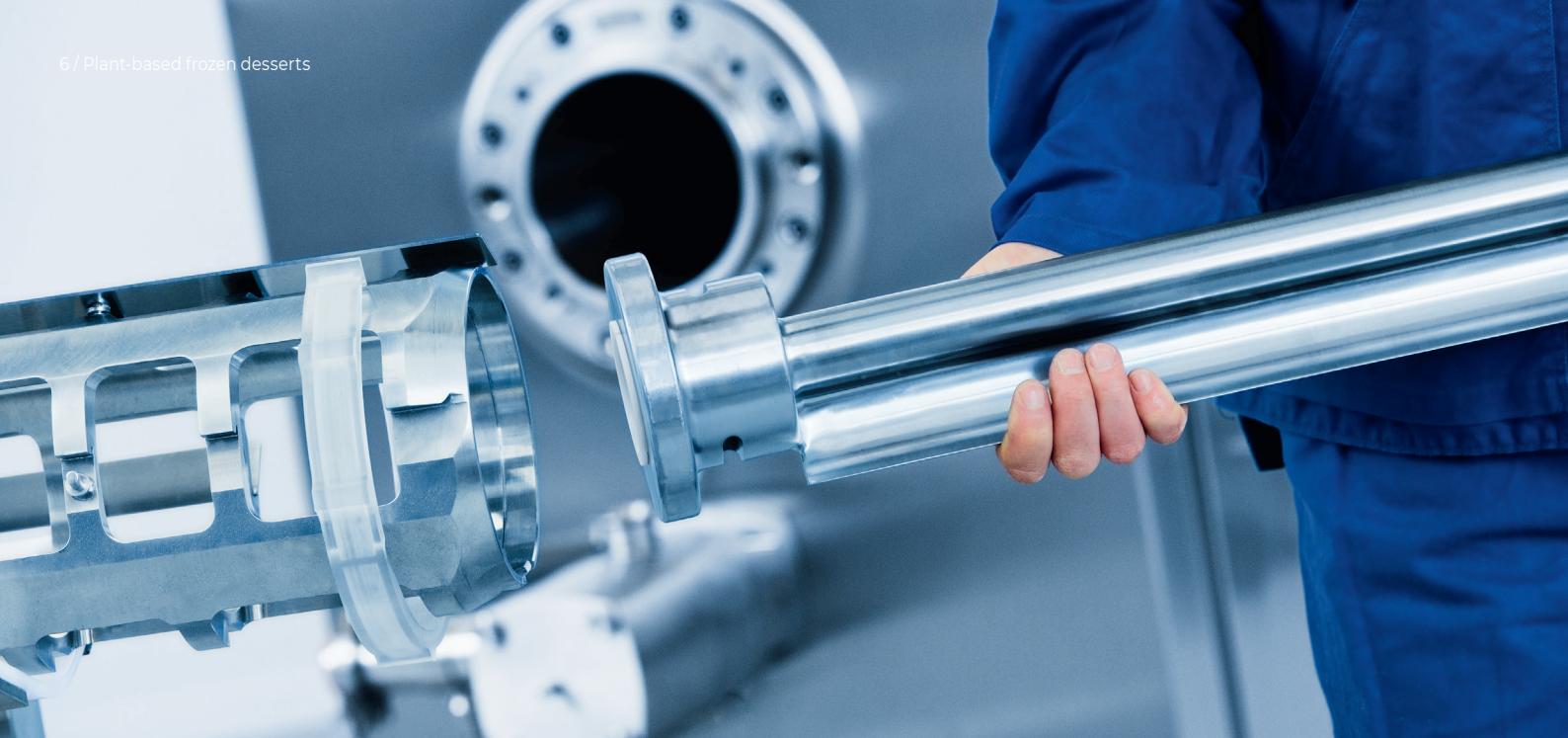
3 How can you avoid quality issues due to viscosity fluctuations?

Viscosity is a key parameter in dairy ice cream making. So too for plant-based frozen desserts. Optimal viscosity is essential for a smooth process as well as for product texture and mouthfeel.

Working with plant proteins can present challenges with mix viscosity, with both low and excessively high viscosities being observed. Viscosity is often associated with the capability of ingredients to bind water, which is required during the continuous freezing process to avoid a thin ice layer building up on the cylinder wall due to overly fast freezing of the water. This is known as “skating” because it causes the scraper blades to skate on the ice layer inside the cylinder.

Overly high viscosity is often seen after heat treatment or, in some cases, after mix acidification. It is caused by the precipitation of proteins and can make the mix difficult to pump and manage. High mix viscosity can be a critical issue for the plate heat exchanger in your process and may require a recalculation or upgrade, says Torben Vilsgaard.





4 How do you optimise the freezing of your frozen dessert?

Ice cream and frozen desserts are prepared using a continuous freezer. The freezer adds air to the mix in accordance with the selected overrun and freezes a large part of the water into ice crystals. Since the freezing process is designed for handling conventional dairy raw materials, extra attention is needed when handling plant-based products.

High mix viscosities, excessively fast freezing of water in the cylinder, a non-balanced mix freezing point and insufficient whipping properties are just a few of the pitfalls you risk encountering during the freezing process, explains Torben Vilsgaard.

Running a high-viscous mix can easily cause over-churning of fat content, whereby added fat agglomerates in clumps that deposit in the cylinder and the filling line. Over-churning also reduces end-product quality.

It is therefore important to have the right setup for the continuous freezer, focusing on reducing mechanical shear, adds Torben Vilsgaard. Options such as a variable dasher speed and selecting the right beater is crucial for success when working with plant-based frozen dessert. Moreover, optimising process parameters will reduce potential defects.

Formulating your plant-based frozen dessert mix correctly is vital for avoiding problems during mix preparation and freezing. A well-balanced mix freezing point and sufficient total solids is crucial for successful freezing, as is choosing plant proteins with the proper whipping properties and water binding capacity.

Here it may be valuable to team up with ice cream experts from your equipment supplier. Tetra Pak experts, for example, can assist in making the right choices and in choosing the right processing equipment – and configuring it correctly – to ensure a smooth start for your plant-based endeavour.

