



APV Cavitor Technology for Ice Cream Mix Production

A NEXT GENERATION MIXING, DISPERSION AND HOMOGENISATION TECHNOLOGY

The powerful forces of cavitation produce results that far exceed those of conventional technology

Controlled cavitation is a new breakthrough technology for microscopic mixing, dispersion/homogenisation and scale-free heating based on hydrodynamic cavitation.

Ice cream is a complex system of air (gas) dispersed as small cells in a partially frozen continuous fat phase. The fat is the inner phase in an emulsion where the milk solids and stabilisers are in a colloidal solution and sugar and salts form the true solution.

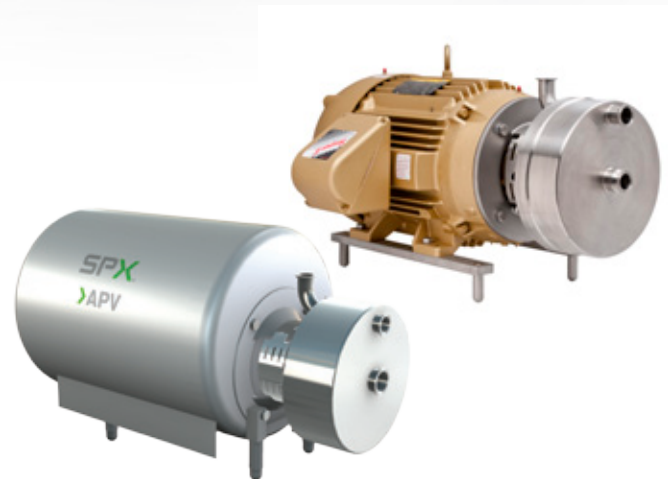
The key challenges in ice cream processing are getting the hydration right, in order to prepare the key ingredients during the emulsification state, and getting the right de-emulsification during the ageing to the freezing state.

The APV Cavitor can help optimise the hydration of protein, emulsifier and stabiliser ingredients and functionalisation of WPC.

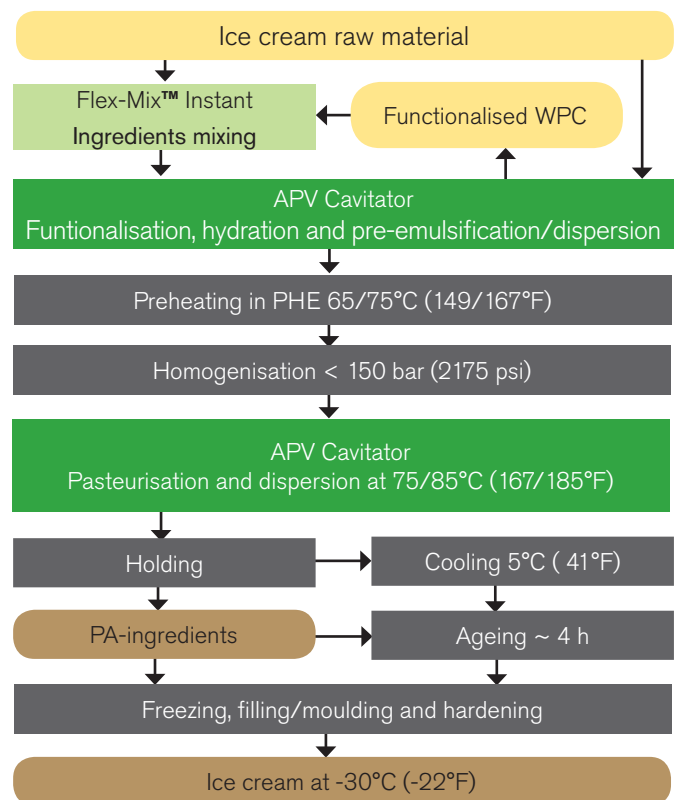
The principle of the APV Cavitor

The heart of the technology is a rotor spinning in a liquid chamber. The rotor has a number of radial holes.

The spinning action generates internal liquid frictions (disk friction) and the holes generate hydrodynamic cavitation. The cavitation creates locally intense shockwaves ensuring a very efficient microscopic hydration and mixing effect. The friction is generating controllable scale free heating and thereby avoids fouling.



Processing diagram for ice cream



The production process for ice cream

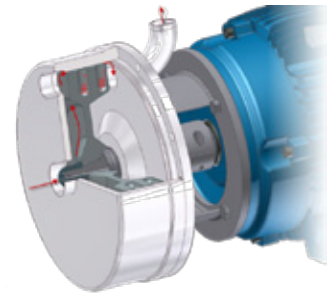
The first step is powder mixing in the liquid media, using a vacuum mixing technology. Melted fat is pre-emulsified into the mixer in batch or semi continuous set up. Air and foam are eliminated due to the vacuum mixing and after pre-mixing the mix is transferred through the APV Cavimator for final emulsification and hydration of key components. The Cavimator is also used for microparticulation or functionalisation of WPC and hydration of gums.

The ice cream mix is now preheated and pasteurised in a plate heat exchanger (PHE), homogenised and cooled, finally transferred to an ageing tank where the mix is stored for at least 4 hours. After the ageing step the mixture is whipped and frozen in a continuous freezer and filled before it is transferred to a cold storage condition where the final hardening of the ice cream takes place.

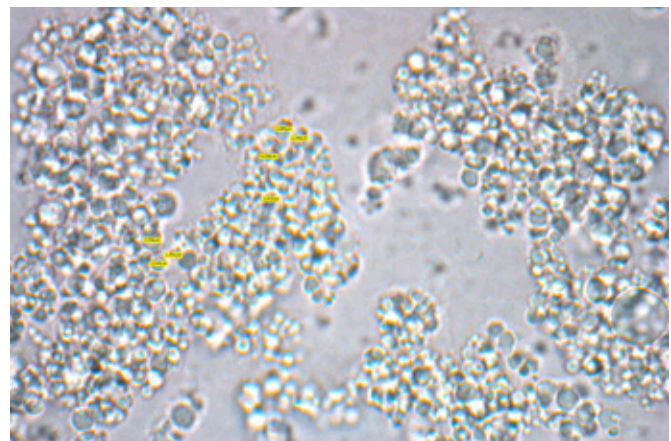
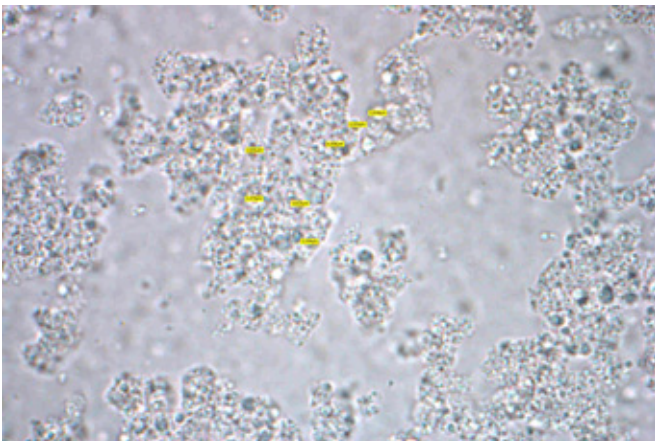
The Cavimator could also ideally be coupled to the PHE in a hybrid solution for combined scale free pasteurisation and dispersion of the ice cream mix

Features and benefits of using the APV Cavimator for ice cream mix

- The Cavimator is excellent for microparticulation of WPC in order to add new dimensions of functional properties to the WPC. In addition, it is very efficient for hydration of gums.
- The Cavimator combines hydration and pre-homogenisation in one step to obtain an excellent pre-emulsion.
- The Cavimator process will result in a complete hydration of the key components. Many formulations contain unnecessary high levels of raw materials to compensate for insufficient mixing and hydration
- The Cavimator process results in small particles of pre-agglomerated ice cream mix. This leads to a potentially lower homogenising pressure.
- Thanks to the scale-free heating the run time can be extended with longer run times between CIP resulting in reduced operating costs on top of the other key benefits mentioned.



EXAMPLES OF ICE CREAM PRE-MIX PRODUCTION USING CONVENTIONAL HOMOGENISATION AT 135 BAR (LEFT PICTURE) VERSUS CONTROLLED CAVITATION AT 60 HZ (RIGHT PICTURE)



The microscopic pictures show comparable results for pre-agglomeration while difference in the particle size: 1 μ for the homogenised pre-mix (left) and 2-3 μ for the cavitation pre-mix (right).

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