

Pasteurization and Remelting

OF LOW FAT PRODUCTS

Introduction

Margarine and crystallized products like butter and spreads are characterized as water-in-oil (w/o) emulsions for which the water phase is finely dispersed in the continuous fat phase. The ingredients used for margarine production can be divided into water-soluble and fat-soluble ingredients, prepared as a water phase and a fat phase, respectively. The subsequent processing can be divided into the following production steps: emulsion preparation, pasteurization, crystallization and filling or packing. If the texture of the filled or packed product is not according to specification, the product will be diverted to the remelting system where it is melted prior to returning to the buffer tank for re-processing. This article will cover the recommended equipment used for the pasteurization and the remelting process for various products, as these processes are often disregarded/neglected by manufacturers as being vital for optimal, trouble-free processing and high quality of the final crystallized fat product.

When the water phase has been added to the fat phase in the buffer tank and the emulsion has been created, the emulsion is normally continuously pumped through either a plate heat exchanger (PHE), a low pressure scraped surface heat exchanger (SSHE) or a high pressure SSHE for pasteurization prior to entering the crystallization line.

Pasteurization

The pasteurization process has several advantages. It ensures that the number of bacteria and other micro-organisms is low during processing, thus improving the microbiological stability of the final product. Pasteurization of the water phase only is a possibility, but pasteurization of the complete emulsion is preferred since the



pasteurization process of the emulsion will minimize the residence time from pasteurized product to filling or packing of final product. The product is treated in an in-line process from pasteurization to filling or packing of the final product as pasteurization of any rework material is ensured when the complete emulsion is pasteurized.

In addition, pasteurization of the complete emulsion ensures that the emulsion is fed to the crystallization line at a constant temperature achieving constant processing parameters, product temperatures and product texture. Furthermore, occurrence of pre-crystallized emulsion fed to the crystallization equipment is prevented when the emulsion is properly pasteurized and fed to the high-pressure pump at a temperature 5-10°C higher than the melting point of the fat phase.

A typical pasteurization process will after preparation of the emulsion at 45-55°C include a heating and holding sequence of the emulsion at 75-85°C for 16 sec. and subsequently a cooling process to a temperature of 45-55°C. The end temperature depends on the melting point of the fat phase.

Low Fat Products

For full fat products a PHE is typically used for pasteurization but for lower fat products, the SSHE system is recommended. Low fat products set special demands to the pasteurization and remelting system as these products often contain various heat-sensitive ingredients like stabilizers and proteins in order to achieve low fat products with good eating properties. Milk protein, typically in the form of skimmed milk powder, whey powder or butter milk powder, is added to low fat emulsions in order to achieve a better and faster flavour release. Protein destabilizes the emulsion and produces a looser emulsion as it acts as an oil-in-water component. Thus stabilizers are required when protein is added to low fat spread emulsions.

The larger amount of water is stabilized by ingredients such as pectin, alginate, guar gum, starch or mixtures acting as thickening agents. Improved stability of the low fat emulsion is additionally achieved by a lower emulsion temperature and by adding higher amounts of emulsifier. These actions often result in emulsions with higher viscosity and the relatively high viscosity not only creates a higher pressure in the PHE but also an overall reduced heat transfer in the heat exchanger system and risk of fouling. The increase in viscosity, the reduction in heat transfer and the risk of fouling depend on the type and amount of stabilizers and proteins but also on processing issues. But the low pressure SSHE, the GS Consistator[®], is suitable to overcome these problems.

Consistator[®] - the Optimal Solution for Pasteurization and Remelting Process

As the physical properties of the low fat products such as viscosity differ from recipe to recipe, flexibility of the pasteurization and

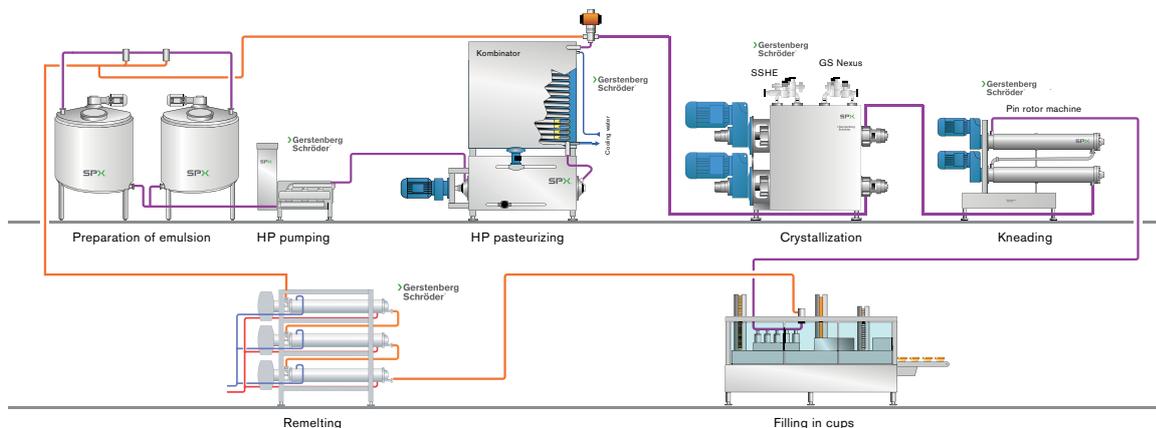


Low pressure SSHE, the GS Consistator[®]

remelting processing equipment is important. Due to the design of the GS Consistator[®], it is less sensitive to viscosity than the PHE. The GS Consistator[®] is designed for thermal treatment of products that are sensitive to mechanical shear, heating or both. The larger annular space and the continuous scraping off of the inner surface of the SSHE create a turbulent flow which minimizes burned protein and avoids separation of the relatively unstable low fat emulsions during pasteurization and remelting. The design of the GS Consistator[®] offers no dead legs, thus it ensures an optimal hygienic process environment hereby resulting in longer production periods before any cleaning is necessary. The GS Consistator[®] is designed for CIP (cleaning in place).

The GS Consistator[®] is the optimal choice for pasteurization and remelting of low fat crystallized products as it can efficiently process low fat emulsions with high viscosity in contrast to PHE. The GS Consistator[®] is placed prior to the high-pressure pump, thus still on the low-pressure side of the processing line.

If pasteurization on the high-pressure side is preferred, a high pressure SSHE pasteurization solution is available as well. The advantages described when the GS Consistator[®] is used for pasteurization do also apply for the high pressure SSHE solution.



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