



APV Cavitor Technology in Scale Free Heating in Food & Beverage

A NEXT GENERATION SCALE FREE HEATING AND MICROSCOPIC MIXING TECHNOLOGY

THE POWERFUL FORCES OF CAVITATION PRODUCE RESULTS THAT FAR EXCEED THOSE OF CONVENTIONAL TECHNOLOGY

The APV Cavitor is a new breakthrough technology for scale-free heating and microscopic mixing of Food & Beverage (F&B) products based on controlled hydrodynamic cavitation.

Scaling or fouling on the surface of F&B heating systems is a major challenge to the industry as it limits the production up-time, impacts product quality, and increases cleaning costs. The new APV controlled cavitation technology has proven to be a superior solution for e.g. pasteurization of liquid egg. Egg processors have seen a doubling or even tripling of run time in some cases. Pasteurization temperatures have been increased above conventional parameters to give a longer shelf life, yet the functional properties of the egg have not been changed.

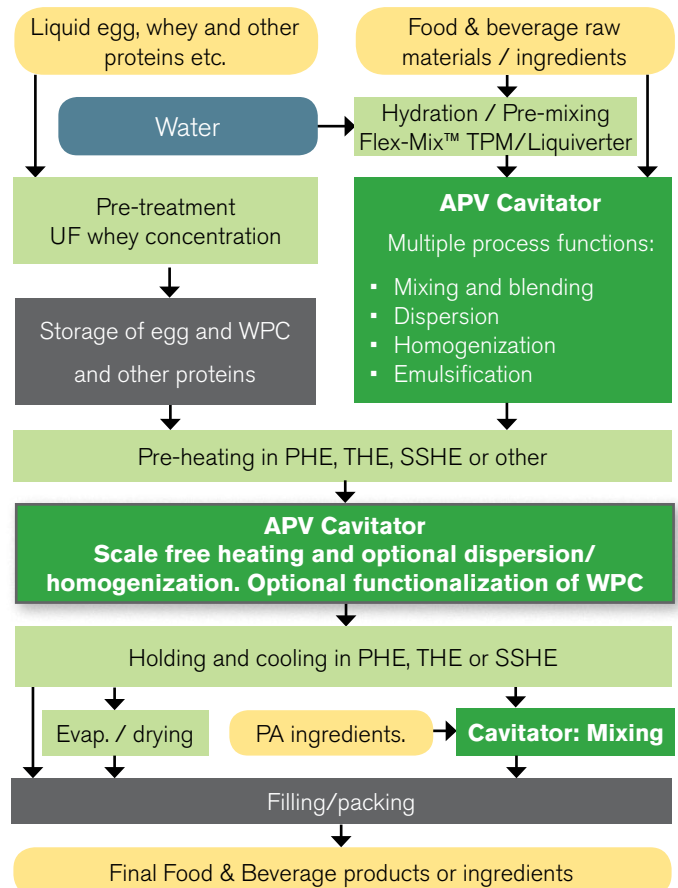
The Cavitor is incorporated into a conventional pasteurizer in a hybrid solution for use in the critical temperature zone. Thanks to a highly efficient, controlled and gentle microscopic mixing the Cavitor also eliminates the homogenizer in a one-step whole egg pasteurization and low pressure dispersion process.

The APV Cavitor has no heat transfer surface, so it can be used for Scale Free heating of a wide range of heat sensitive and highly fouling F&B products, e.g. pasteurization of high grade WPC and dairy nutritionals, acidified products and other animal and vegetable proteins. Other examples are BBQ and cheese sauces and puddings and many more difficult to heat products.

The Cavitor can be incorporated into any thermal system, like plate, tubular or scraped surface type systems and it can handle very viscous products and very high temperature as well. The Cavitor is highly flexible, and for some products a partial heat denaturation might be desired. For others the goal might be a nearly complete denaturation in combination with microparticulation to obtain additional functional properties, and this is yet another excellent application for the Cavitor.



PROCESS DIAGRAM FOR SCALE FREE HEATING IN FOOD AND BEVERAGE



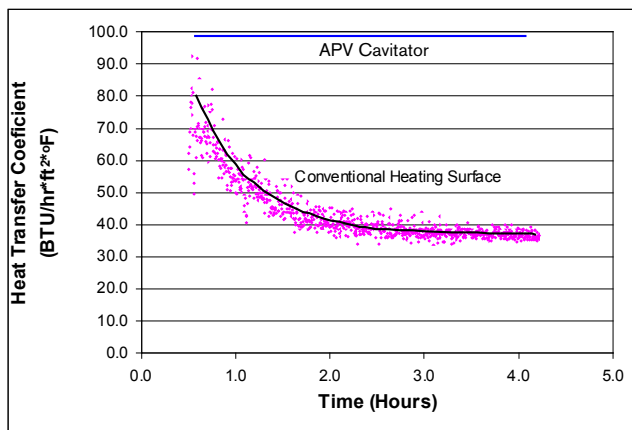
THE PRINCIPLE OF THE APV CAVITATOR

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 shock wave effect create high shear ensuring a very efficient but gentle microscopic mixing effect and friction which generates the controllable scale-free heating.



USE OF THE APV CAVITATOR FOR SCALE FREE HEATING

The process diagram shows scale free heating in the context of processing of liquid egg, whey protein concentrate (WPC) grades, and other proteins as well as F&B products of various kinds. The Cavitator is integrated into thermal systems in a hybrid solution and applied in the critical temperature zone to protect heat-sensitive proteins and to avoid fouling. The scale free pasteurization can be combined with dispersion/homogenization and also heat denaturation and microparticulation/functionalization of WPC for an additional dimension of functional properties. The Cavitator has also proven its efficiency for mixing post addition (PA) ingredients into very viscous products.



The APV Cavitator has no heat transfer surface and consequently no fouling build up

FEATURES AND BENEFITS OF THE APV CAVITATOR FOR SCALE FREE HEATING AND MORE

The controlled cavitation technology offers several unique features and benefits due to its scale free heating combined with dispersion/homogenization and or functionalization:

- The excellent scale free heating technology enables double or even triple run time compared to conventional technology. This provides a significant increase in the plant capacity as well as reduced CIP time and OpEx.
- For some products, e.g. whole egg, the temperature can be increased 4-5 °C above the critical denaturation temperature without denaturing proteins and impacting the functional properties. In addition, this leads to a potential extension of the shelf life (ESL).
- Functionalization of WPC can be done using the Cavitator in a scale free denaturation and microparticulation process that yields a narrow particle size distribution at 1 μ. This enhances water binding, and improves the emulsification properties and creamy taste in F&B products.
- The Cavitator is highly flexibly for a wide range of process functions in addition to scale free heating, including microscopic mixing, hydration, emulsification, and dispersion/homogenization. Furthermore, it excels at mixing minor PA ingredients into high viscosity products and also at incorporating a gas for aeration or carbonation.
- Highly reliable and sanitary design, meeting 3A and EHEDG standards
- Low maintenance time and cost also contribute to the overall reduced OpEx.
- The APV Cavitator can be delivered as a single unit or as a plug & play skid mounted system.



Example of scale free heating for whole egg:

Compared to conventional technology, the APV Cavitator has proven to triple the run time and to exceed the denaturation temperature by > 4 °C while maintaining the functional properties.



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