

APV Cavitator Technology in Functionalization of WPC and other Food Ingredients

A NEXT GENERATION MICROSCOPIC MIXING AND SCALE FREE HEATING TECHNOLOGY



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

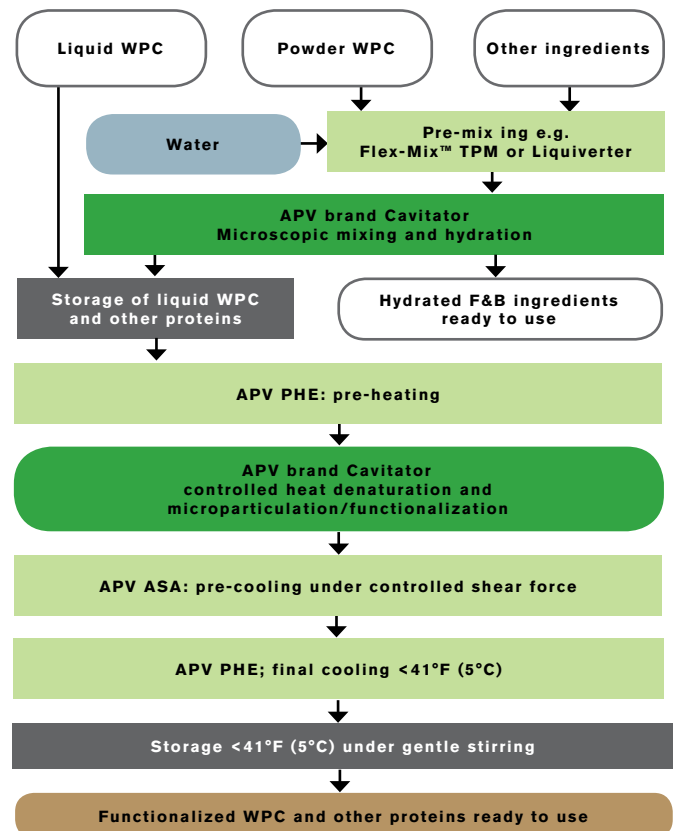
The APV brand Cavitator is a new breakthrough technology for microscopic mixing, scale-free heating and ingredients functionalization based on controlled hydrodynamic cavitation.

Microparticulation (MP) of WPC combining heat denaturation and ideal particle size distribution in a one-step process solution was launched in 2005 under the brand name of APV LeanCream™.

The LeanCream™ technology was successfully launched for cheese with whey drainage, powder ingredients and protein enriched drinks. The technology is based on a special designed and patented Scraped Surface Heat Exchanger (SSHE) known as the APV Shear Agglomerator (ASA).

SPX FLOW is now launching a next generation breakthrough MP or functionalization solution based on the new APV Cavitator technology. In addition to the highly efficient MP and functionalization of WPC35 - 80 or higher grades and other potential animal and vegetable proteins, the Cavitator can also be used for efficient hydration of proteins and other minor and major powder ingredients.

PROCESSING DIAGRAM FOR FUNCTIONALIZATION OF WPC AND OTHER PROTEINS/INGREDIENTS



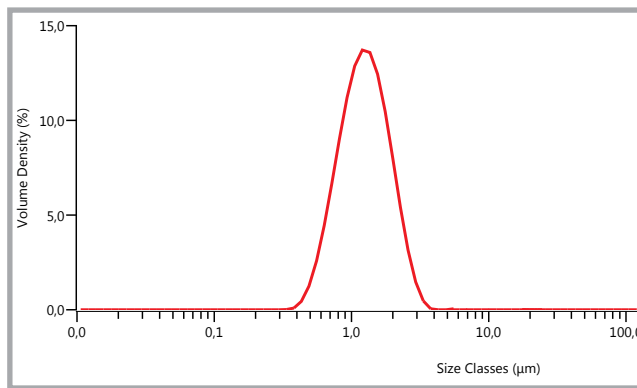
A key challenge is to obtain an optimal denaturation degree and particle size distribution of the WPC Functionalized Ingredients (WPC-FI) for use in the food & beverage industry. In addition to those key functions, the Cavitator also eliminates fouling of the thermal system ensuring a long run time between Clean-In-Place (CIP). This is also the case for high solids and high protein WPC grades from sweet or lactic whey. WPC plays an increasing role in nutritional and healthy food products including low or no fat products. The key benefits of the FI process are the unique functional properties such as enhanced creamy mouth feel, enhanced water binding capability and emulsification which adds to the WPC ingredients.



Functionalized WPC Food Ingredients (WPC-FI) can be used for a wide range of food & beverage products. Some examples are: dressings, sauces, mayonnaise and several other processed food applications. Dairy based products like ice cream, fresh cheese, yogurts and nutritional protein enriched beverages. Additionally, it can be used for meat, poultry, seafood products as well as confectionary and bakery products. The Cavitator offers a wide range of benefits that meets the customer's needs.

THE PRINCIPLE OF THE APV BRAND 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 friction (disk friction) and the holes generate hydrodynamic cavitation. The cavitation creates high shear ensuring very efficient microscopic mixing effect and friction which generates controllable scale-free heating.



Particle size distribution of functionalized WPC



WPC60
before functionalization



WPC60-FI
after functionalization

Controlled cavitation is instrumental for new functional properties in healthy food

SPX FLOW, Inc. (NYSE:FLOW) is a leading manufacturer of innovative flow technologies, many of which help define the industry standard in the market segments they serve. From its headquarters in Charlotte, North Carolina, it operates a sales and support network, centers of manufacturing excellence, and advanced engineering facilities, throughout the world. Its cutting-edge flow components and process equipment portfolio includes a wide range of pumps, valves, heat exchangers, mixers, homogenizers, separators, filters, UHT, and drying technology that meet many application needs. Its expert engineering capability also makes it a premium supplier of customized solutions and complete, turn-key packages to meet the most exacting of installation demands.

Incorporating many leading brands, SPX FLOW has a long history of serving the food and beverage, power and energy, and industrial market sectors. Its designs and engineered solutions help customers drive efficiency and productivity, increase quality and reliability, and meet the latest regulatory demands. In-depth understanding of applications and processes, state-of-the-art Innovation Centers, and advanced pilot/testing technology further assist in optimizing processes and reducing timescales to reliably meet production targets.

To learn more about SPX FLOW capabilities, its latest technology innovations and complete service offerings, please visit www.spxflow.com.

USE OF THE APV CAVIMASTER FI FOR PROTEIN FUNCTIONALIZATION AND MORE

The new integrated technology solution branded as the “APV brand CaviMaster FI” consists of a combined PHE for pre-heating and final cooling of the Cavitator for controlled, scale free heat denaturation and a controlled MP process as well as an ASA for pre-cooling under controlled shear force.

The multifunctional CaviMaster FI can be used for both liquid and rehydrated powder based WPC and also for hydration of the powder WPC and for other proteins and gums etc. Moreover, it can be used for scale free heating, dispersion/low pressure homogenization, emulsification and aeration.



FEATURES AND BENEFITS

The controlled cavitation technology offers several unique features and benefits in microparticulation and functionalization of WPC and hydration and other functions.

- The excellent microscopic mixing effect eliminates powder agglomerates or “fish eyes” and ensures a fast and short hydration time of major and minor ingredients like proteins and gums etc. The results are often significant savings on raw material, improvement of functional properties and reduced process cycles, and consequently reduced cost.
- Functionalization of WPC through a controlled denaturation and MP process for very accurate particle size distribution at 1-1.5 μ, which enhances water binding, emulsification properties, and a creamy taste in low or no fat products.
- The functionalized WPC and other ingredients add significant value to a wide range of end products across the entire food and beverage industry.
- The scale free heating feature enables a more gentle heating and longer run time, resulting in reduced number of CIP cycles with significant savings and enhanced product quality.
- The Cavitator is highly flexible for a wide range of process functions in addition to mixing MP and functionalization. These include emulsification, low pressure homogenization, dispersion of minor ingredients in high viscous products and gas dispersion for foaming or carbonation.
- Controlled cavitation is instrumental for new product development in transforming natural dairy and other food proteins and components into new dimensions of functional properties and interactions for healthy food & beverage products.
- Highly reliable and sanitary design meeting 3-A and EHEDG standards.
- Low maintenance time and cost also contribute to the overall reduced OpEx.

Product characteristics and functional properties of WPC-FI:

- From sweet WPC: Creamy mouth feel and viscosity and color like coffee cream
- From Lactic WPC: Flavor and viscosity like buttermilk
- Enhance creaminess in low and no fat products
- Water-binding; improved texture and viscosity
- Excellent emulsification properties
- Enhanced foaming and whipping stability
- Soft consistency and enhanced gelation capabilities
- Pure dairy based ingredients with high nutritional value

Examples of WPC-FI applications in dairy, food and beverage products:

- Dressings, sauces and mayonnaise etc.
- Ice cream and frozen desserts
- Fresh cheese types
- Processed cheese
- Fermented milk products
- Dairy desserts
- Protein enriched nutritional drinks
- Nutritional and powder ingredients
- Chocolate, confectionery and bakery
- Meat, poultry & seafoods and ready meals





SPX Innovation Center and Cavitator Pilot Plant Services



Based in Charlotte, North Carolina, SPX FLOW, Inc. (NYSE: FLOW) is a multi-industry manufacturing leader. For more information, please visit www.spxflow.com

SPX FLOW

611 Sugar Creek Road

Delavan, WI 53115

P: (262) 728-1900 or (800) 252-5200

E: answers.us@spxflow.com

SPX FLOW, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation.

Design features, materials of construction and dimensional data, as described in this bulletin, are provided for your information only and should not be relied upon unless confirmed in writing. Please contact your local sales representative for product availability in your region. For more information visit www.spxflow.com.

The green "y" and "x" are trademarks of SPX FLOW, Inc.

ISSUED 03/2017 16024-01-05-2013

COPYRIGHT © 2017 SPX FLOW, Inc.