APPLICATION SHEET

APV Cavitator Technology in Personal Care Processing

A NEXT GENERATION MICROSCOPIC MIXING AND SCALE FREE HEATING TECHNOLOGY

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

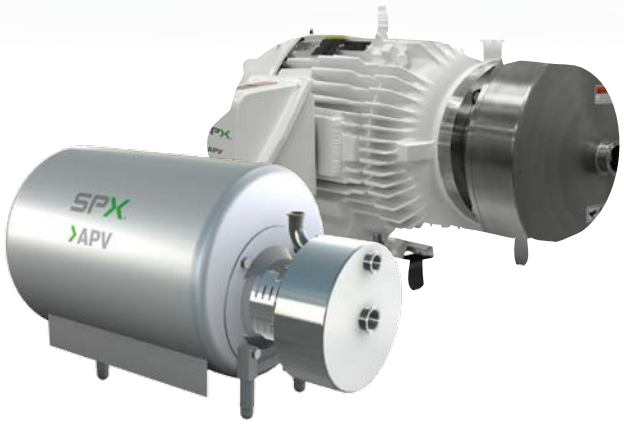
The APV Cavitator is a new breakthrough technology for very efficient microscopic mixing and scale-free heating based on controlled hydrodynamic cavitation.

Personal care processing can typically be divided into three process steps. The first step covers raw materials/ingredient preparation including hydration, functionalization, and pre-emulsification. The second step or the main processing step includes mixing and blending or incorporation of the base raw materials and ingredients, followed by dispersion/homogenization, emulsification and possibly also thermal treatment. The final step includes mixing, blending, and dispersion of post additions (PA) of minor ingredients and/or gases, for aerated products.

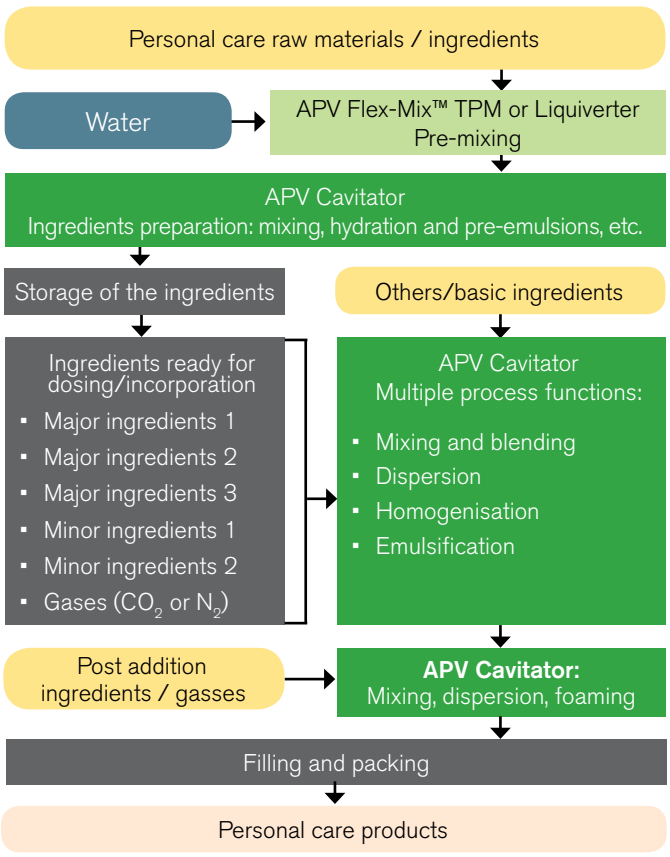
The key challenges in any personal care process are to maximize the product quality, the yields of the raw materials and the plant up-time, or minimize the process cycles, CIP time, and total cost of production. In this respect the APV Cavitator offers a wide range of benefits to the personal care industry that meet the needs of our customers.

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



Processing diagram for personal care processing



Use of the APV Cavitator in personal care processing

The process diagram shows the typical process steps from ingredients preparation to the main processing steps and functions, and then the final production step for PA ingredients addition e.g. dispersion of pigments in viscous cream and gas dispersion to make cosmetic mousse products.

Irrespective of the personal care products you want to produce, several of the mentioned process functions will be included either as separate process steps or combined. Thanks to the multifunctional capability of the APV Cavitator it can be used for all of the process function shown in the process diagram.

Commercial installations in personal care have confirmed the benefits of using the Cavitator technology to improve both product quality and financial results. Other application tests in the SPX Innovation Center and at customer locations have identified several potential and attractive applications for the APV Cavitator across the personal care industry.

APV Cavitator cosmetic cream test at the SPX innovation Centre

Cosmetic creme before the test.
Firm and greasy consistency.

After Cavitation test; without gas.
Smooth and less greasy consistency.

After Cavitation test; with gas.
Soft and less greasy consistency.

Features and benefits of the APV Cavitator in personal care production

The controlled hydrodynamic cavitation technology is commercially implemented for personal care products like toothpaste, skin creams and body wash processing and the APV Cavitator offers unique features and benefits for a wide range of personal care applications:

- The excellent microscopic mixing of gums and proteins ensures a fast and short hydration time resulting in product savings, shorter process cycles and extended up-time and lower OpEx.

- Use of the Cavitator for pre-emulsions, in combination with high pressure homogenization, has significant potential for improved quality at lower pressure and fewer passes.
- The superior dispersion capability results in a homogenous mixing of minor ingredients into viscous products, improving the product appearance and quality.
- The Cavitator has no heat transfer surface and therefore no hot or cold spots. This makes the Cavitator a potential heating media for high fouling and heat-sensitive products. The result is longer run time and shorter CIP cycles.
- The Cavitator can be used to distribute any gas media like N_2 or CO_2 , and the highly efficient dispersion ensures very small bubble size and uniform gas distribution in the foamed cosmetic mousse.
- Further features and benefits of the APV Cavitator
  - Highly reliable and sanitary design meeting 3A and EHEDG standards
  - Low maintenance time and cost also contribute to the overall reduced OpEx.

APV Cavitator test and pilot plant service

Research and development are important elements in SPX's activities in general. Personal care, food and beverage manufacturers are increasingly seeking cost efficient process solutions for the production of high quality innovative products.

APV Cavitator pilot plants are available for tests in our Innovation Centre in Silkeborg, Denmark and for customer rental from Silkeborg, Denmark, and Delavan, USA whereas the SPX Centre of Excellence is based in Evreux, France.

Our technology specialists in France, Denmark and USA are available to help our customers with a wide range of services including:

- Product and application screening
- Pilot plant testing with scalable results
- Pilot plant equipment rentals and start up
- Validation of products, technologies and applications
- Innovation of new products, technologies and applications
- Laboratory analyses incl. particle size distribution
- Advise of integration of the Cavitator in commercial plants to maximise the benefits of the APV Cavitator.

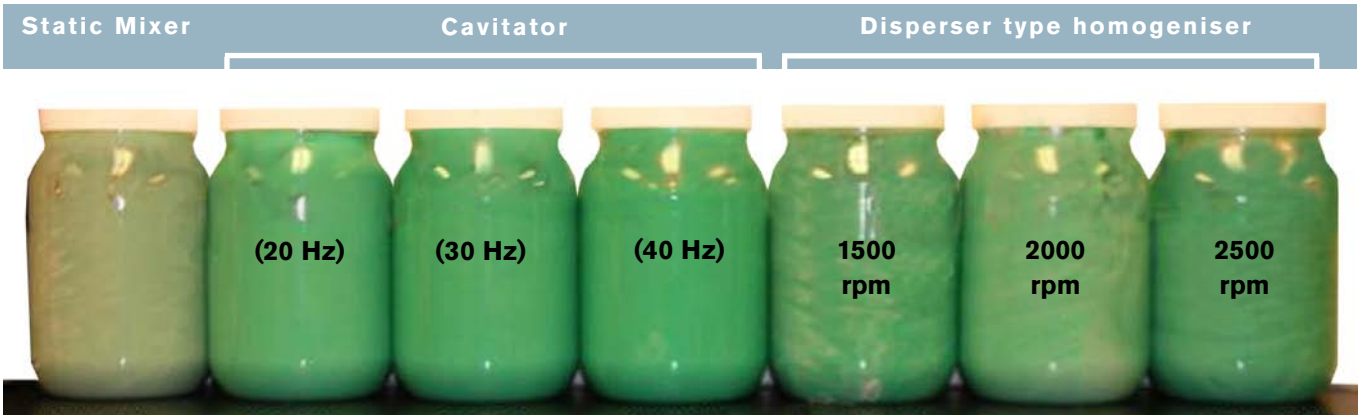
Case story

Situation and challenge

A liquid soap manufacturing plant had an issue with "gel balls" caused by incomplete hydration of gum powders in the production of body washes and other personal care products. This lead to wasted gum, maintenance and downtime issues. The batch tank would have to be manually cleaned to remove the often softball and bowling ball-sized gel agglomerates

Solution

The gum was loaded using a Venturi-based powder mixer and the APV Cavitator was placed just after this to allow for complete gel hydration. Cavitation can be used to hydrate gums, gels and polymers in seconds. The process intensity helps to more completely hydrate the powders than with conventional mixers in a fraction of the time. The shockwaves can also break up dry powder agglomerates often referred to as "fish eyes." This can result in raw powder savings, higher viscosity or higher quality due to more efficient use of the gum and a more uniform product. The liquid soap manufacturer received a reduction in mix time (batch cycle time) and improved cleaning. More homogeneous mixing at the Cavitator reduced the needed tank agitation. The payback of the APV Cavitator was less than one year considering the cost of batch time, gum powder saving and decreased clean-uptime.



APV Cavitator in comparison with static mixer and homogenizer. Mixing pigment and other post additional ingredients with high viscous base cream liquids.

SPX Innovation Centre and Cavitator pilot plant services and personal care Centre of Excellence

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For more information about our worldwide locations, approvals, certifications, and local representatives, please visit www.spx.com.

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