

VERSION 2.1
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CAVITATION HOMOGENIZER

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CAVITATION HOMOGENIZER TECHNOLOGY

TRADITIONAL PROCESS

Usually, in the food industry, high pressure homogenizers are installed to create stable emulsions, where the processed fluid is fed to valves or orifice modules under high pressure conditions. The high velocity and the rapid loss in pressure due to the expansion of the fluid in a very short time, increases the energy density that promote the creation of the desired stable emulsion.

INNOVATIVE PROCESS WITH THE USE OF CAVITATION TECHNOLOGY

The CAVITATION technology exploits turbulence, cavitation and shear stresses on the disperse phase of the processed fluid (through single or multiple passages in to the cavitation chamber), to create stable emulsions. The generation and implosion of micro-bubbles, (that occur during cavitation phenomena induced by the CAVITATION treatment) give to the processed fluid an energetic input able to disintegrate the drops of the dispersed phase, improving the stability and the uniformity of the resultant emulsion. The CAVITATION is a hydrodynamic cavitation system where the dynamic of the vapor bubbles of the processed fluid is controlled. During high speed rotation, rotor channels are periodically aligned with stator channels. The processed liquid is accelerated in the radial direction and, flowing through the free channels, is subjected to cavitation or, in other words, it is subjected to the generation, growth and implosion of micro-bubbles in the processed fluid in a very short time. When the micro-bubbles collapse, high local pressure and temperature create the favorable conditions to generate micro-jets directed discontinuous phase, breaking any agglomerate and promoting the dispersions.

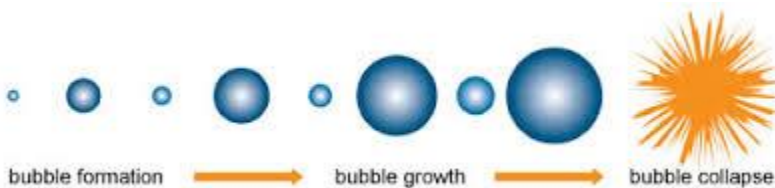
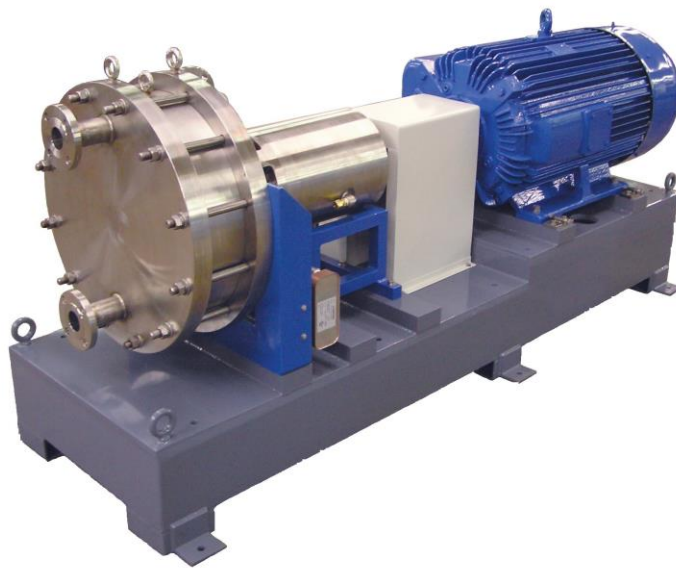


Illustration of an imploding cavity in a liquid under cavitation

COMPANY GOALS

Top company goals

- 1 Introducing cavitation technology as a main solution in several industries
- 2 Food industry (homogenizing & mixing for dairy , chocolate ,...)
- 3 Oil & gas refining and cracking industry
- 4 High quality mixing and emulsifying
- 5 Introducing and develop Medicine application



BUSINESS PURPOSE

TECHNOLOGY

As a liquid passes through the CAVITATION it is subjected to "controlled cavitation". The heart of the device is a specially designed rotor that spins. The spinning action generates hydrodynamic cavitation in the rotor cavities away from the metal surfaces. The cavitation is controlled and therefore there is no damage. As microscopic cavitation bubbles are produced and collapse, shockwaves are given off into the liquid which can heat and/or mix.

- The heart of the technology is a specialized rotor
- The rotor has dead-ended cavities
- Spinning creates low pressure at the cavity bottoms
- The low pressure zones collapse releasing shockwaves
- Cavitation is created in the cavities, not on metal surfaces.
- The Cavitation is controlled, therefore there is no damage.

PRIMARY CUSTOMERS

- 1 Food & Dairy industries such as milk ,cheese , butter and ...
- 2 Chocolate process line
- 3 Medicine and Drug treatment industries
- 4 Food grade oil process
- 5 Oil and gas refinery and cracking process line



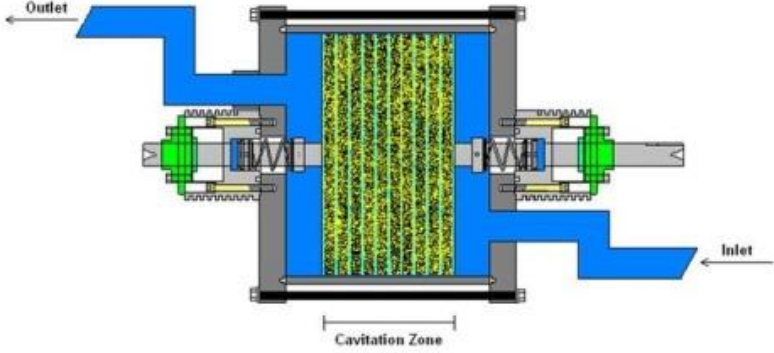
commercially capable of handling large industrial flows. Many other process intensification and cavitation technologies have low maximum flows. This often results in the inability to scale-up from lab results or running many smaller devices in parallel to accommodate commercial flows. The Shock Wave Power Technology is capable of handling flows of 1,500 gallons per minute in a single device with no decrease in intensity from lab results.



PURCHASE INFORMATION

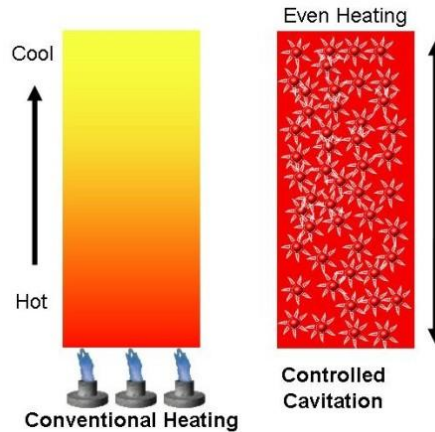
What Questions must be identify by user	
1	What is your industry?
2	What kind do you need (homogenizer, mixing , cracking ,extraction or heating)?
3	Process capacity ?
4	process temperature?

PRIMARY APPLICATION

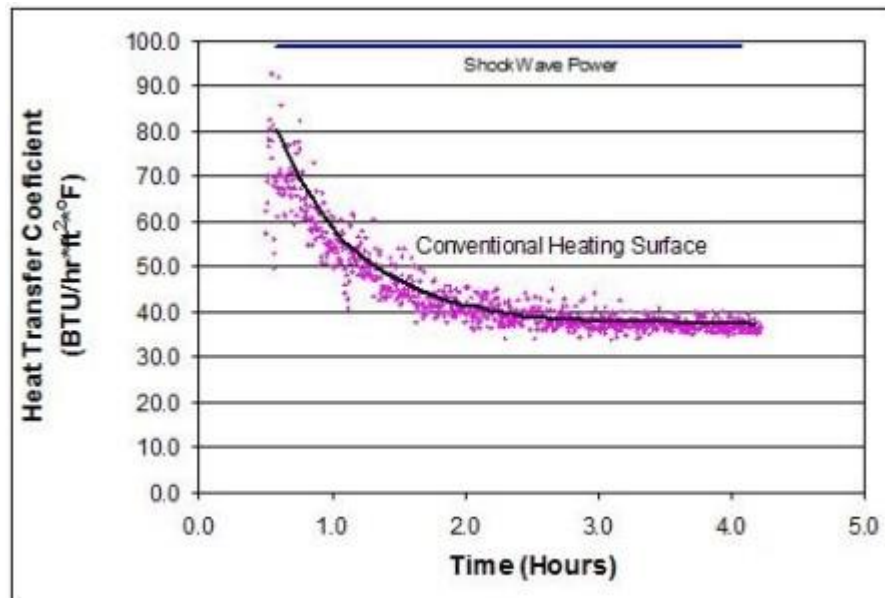
Primary application	
1	<p>The cavitation technology represents a new and innovative way to apply energy to liquids. The technology has two distinct capabilities:</p> <ul style="list-style-type: none">• <u>Scale-Free Heating</u>• <u>Extraction</u>• <u>Mixing (Increased Mass Transfer)</u><ul style="list-style-type: none">○ Gas-Liquid○ Liquid-Liquid○ Liquid-Solid 
	<p>While varying by application, one or more of these significant benefits will be realized through the use of a cavitation over conventional technologies:</p> <ul style="list-style-type: none">• Process intensification and acceleration• Improved process efficiencies (in time, operating costs, and/or capital costs)• Improved product quality, yield and/or raw material savings• Elimination or reduction of process downtime from maintenance requirements• More effective and efficient mixing and increase transfer rate• Low power mixing for most all applications

Scale-Free Heating

The ShockWave Power Reactor harnesses cavitation to heat liquids in seconds, whether in batch or continuous systems. This heating can be done with pinpoint accuracy and consistently by varying rpms through a temperature controller and variable frequency drive. There is no temperature gradient or hot or cold spots. There is also no heat transfer surface so there is no scaling or fouling. The system is flameless and can be totally automated.



The CAVITATION can heat liquids with no degradation in the heat transfer coefficient. This was demonstrated in work conducted with a major university on a scaling liquid in a heating test cell.



Additionally, there is an ultrasonic cleaning effect that occurs on the metal surfaces inside the CAVITATION™ Reactor as the shockwaves are generated within narrow clearances. This cleaning effect, in conjunction with a negative delta T between metal and liquid, ensures scale-free heating.

Primary application

Extraction

The CAVITATION can use the pressure fluctuations of cavitation to assist in extraction. This push and pull motion can work alone or synergistically with chemical additives.

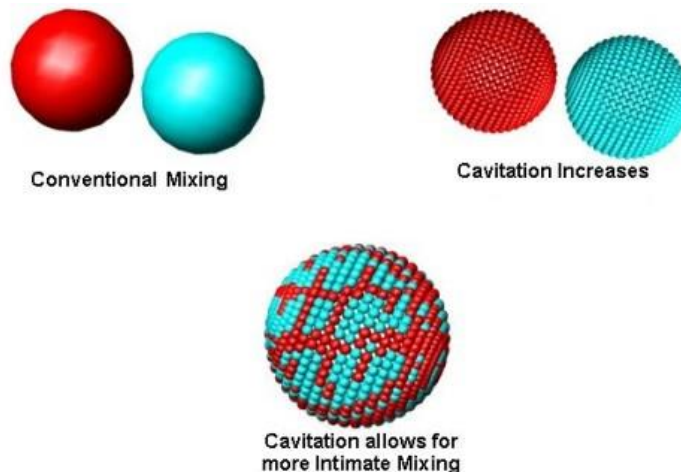
Video showing pressure fluctuations assisting extraction of oil in hops. Process is very similar for nearly any application with only the substrate and solvent changing.

Extraction applications include:

- Hop flavor extraction
- Ethanol yield enhancement
- Algae oil extraction
- Cellulosic ethanol
- Biogas
- Sands and minerals
- Liquor aging

Mixing

Inside the CAVITATION there is a spinning rotor producing millions of microscopic cavitation bubbles. When these bubbles collapse and produce shockwaves, powerful forces are generated that cut up the process material into microscopic sizes. This increases the surface contact area between the liquids, gases and/or solids being mixed and maximizes the efficiency of the process for processes such as hydration, emulsification and gas/liquid mixing. This can be seen below:



The CAVITATION mixes in a totally different way and creates results that cannot be achieved with other equipment. This is all accomplished in a small footprint with no scaling inside the device.

Primary application

The CAVITATION Compared to Conventional Mixers

A visual comparison showing the ability of the CAVITATION to mix color into a thick and viscous liquid compared to a static mixer and a high shear mixer.



Static Mixer



Homogenizer



cavitation

The CAVITATION represents a paradigm shift in mixing.



