P-40: Ultrasonic Device for Continuous Flow Production (SONITUBE® 20-35 kHz)

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SYNETUDE design and produces a continuous flow ultrasonic reactor used for many physical and chemical processing applications. It is indented to scale-up a laboratory to a pilot or industrial scale with the same spectacular effects generated under ultrasound irradiation.

Another unique feature is the intense effects observed in the tube stronger than in the concurrent technologies are obtained with similar power. It permits to reduce considerably the power consumption and therefore to protect environment.

The SONITUBE® is available in standard frequency of 20, 35 kHz and power ratings from 200 to 1500 watts.

The present poster presents the different possible applications and benefits of using a new design integrating a 20 kHz high solid alloy sonotrode (Faïd et al., 1998).

SONITUBE® description

The SONITUBE® is a continuous flow reactor which propagates ultrasonic energy thanks to the cavitation effect. Almost all of the ultrasonic mechanical energy is delivered to the product. The product may be a liquid, a mixture of liquids or a solid/liquid mixture.

The electronic generator generates a periodic electrical signal at an ultrasonic frequency. An ultrasonic transducer excites the tube (sonotrode) wall at the resonant frequency, causing cavitation of extreme power (Figure 1).

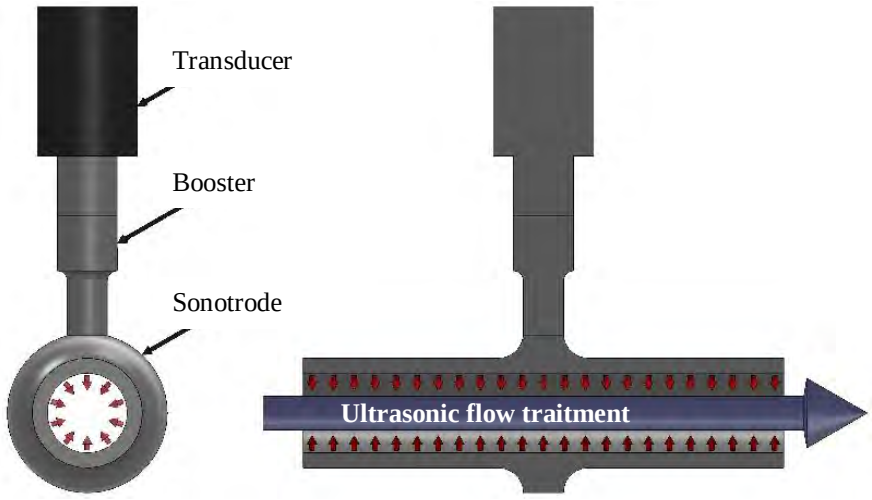

Figure 1: Diagram of SONITUBE®

The product, inside an appropriate tank reactor, may be treated in batch, semi batch, or continuous modes. It is possible to use a jacketed reactor to keep the product at a precise temperature, if necessary. The SONITUBE® has a treatment capacity range from a few liters up to several cubic meters per hour.

The SONITUBE® is available in standard in two frequencies with all options required. We design and supply fully integrated systems with sound reduction enclosures, graphic recorder, product temperature monitoring, flow rate, jacketed stirred-vessel, heat exchanger, according to the GMP (Good Manufacturing Practice) statements (Figure 2).

The standard 35kHz SONITUBE® has an active volume of 70 ml with a variable electrical powers from 200 to 400 W for a flow rate from 100 l/h up to 300 l/h depending on the application.

The standard 20kHz SONITUBE® has an active volume of 700 ml with a variable electrical powers from 600 to 1500 W for a flow rate from 300 l/h up to 600 l/h depending on the application.

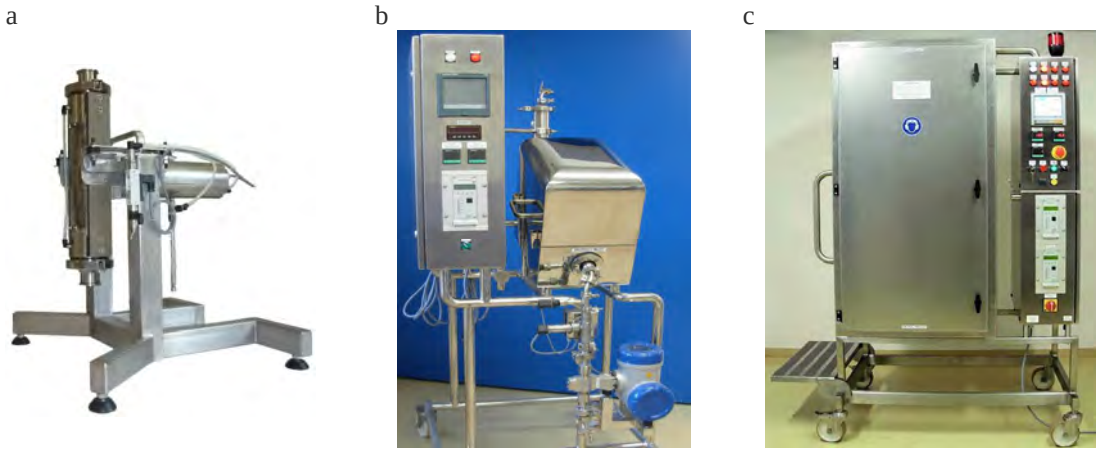

Figure 2: Example of SONITUBE® realisation : 20kHz basic (a), 35kHz instrumented for pharmaceutical industry (Sene et al., 2012) (b) and 20kHz instrumented for industry (c)

Applications

SYNETUDE, provides innovative products and high-performance solutions to diversified markets. The high ultrasonic efficiency allows to access a wide range of application areas such as in the health, the beauty, the food, the energies, the chemistry and the environment, intended for the research, for the laboratories and for the production.

Our business comprises 4 divisions :

- The monodisperse microspheres and microcapsules production units.
- The ultrasonic atomization units that they permits to produce a powder with a unique spherical shape and very narrow particle size distribution and to reduce completely the fine-particles emission (Apel et al., 2012).
- The ultrasonic processor: dedicated to research, to the laboratories or small-scale production, we develop standard and customized solutions.
- The flow through ultrasonic reactor : The SONITUBE®.

These complementary activities permit an understanding of new markets and also offering a real added value as required for applications such as cell lysis, cell poration, DNA/chromatin shearing, bacteria, spores and tissues, disintegrating or deagglomerating particle, particle size reduction, homogenization, mixing, dispersion, fluidization, enhancement of heat transfer, degassing, emulsification, crystallization, nanoparticle synthesis, biomethanation, transesterification …

References

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