Basics of Ultrasonic Cleaning Technology 2004-3 2012/9/18

**True Ultrasonic Cleaning Technology: The True Nature of Cavities Let's understand the nature of spherical nebula cavities and learn how to apply them correctly.**

**Third Generation Ultrasonic Cleaning Technology [Basic Idea]**

Before seeking specific new technology for each application, I would like to discuss ultrasonic cleaning, which is the backbone of new technology.  
 **The principle is important, and the applications are unlimited, depending on the object.**  
 This is the basic technology that the author first discovered and put to practical use in the world during the CFC era, and has been refining under the banner of "eliminating CFC. （  
If the cavitation control is not accurate, the required performance will not be achieved, and in some cases, it may lead to the destruction of the ultrasonic transducer and a significant decrease in cleaning power.

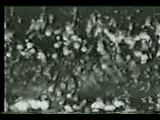
However, we believe that without this technology, innovation in cleaning technology in China (and unfortunately Japan as well) in the new era would be impossible.  
 **This is the third generation of cleaning technology: the Cavitation Enhancement System.**

1. **Cavitation Enhancement System**

Ultrasonic cleaning equipment that controls the dissolved amount of air in the liquid   
according to the purpose, based on the premise of an ultrasonic tank that precisely controls cavitation,   
is called ultrasonic cleaning equipment with a cavitation enhancement system (third-generation ultrasonic cleaning equipment).  
 The ultrasonic cleaners are called ultrasonic cleaners with a cavity enhancement system (third-generation ultrasonic cleaners). The ultrasonic cleaning technology of the future is inconceivable without controlling the air content (hereinafter, for the sake of measurement technology, the dissolved oxygen content will be substituted).  
 When the dissolved oxygen content is more than a few ppm, in other words, in the case of general water and water-based ultrasonic cleaning, gas nebula cavities are generated.   
In the case of gas nebula cavities, the speed of movement of the liquid at the time of cavity formation and annihilation is slow, and as a result, the impact force is extremely weak. In addition, the cavities themselves move only a short distance (within a few millimeters), resulting in severe cleaning irregularities.  
 Although this is better than ultrasonic cleaning equipment that generates visible bubbles, it is not suitable for the ultrasonic cleaning equipment that will compete for precision in the future. Therefore, the spherical nebula cavity should be used for future ultrasonic cleaning.  
 Ultrasonic cleaning that uses these spherical nebula cavities stably and efficiently by controlling the amount of dissolved oxygen in the liquid is called the third-generation ultrasonic cleaning and cavitation enhancement system.

1. **Globular nebula-shaped cavity**

In the ultrasonic cleaning in the range of 20 KHz to 10 MHz, we believe that low dissolved oxygen control and the use of spherical cavities are absolute prerequisites for achieving efficient precision cleaning.  
 Spherical cavities absorb and discharge a large amount of liquid per unit time, and the cavities themselves move at a high speed.  
 Therefore, the cleaning power is the highest under the same conditions, and the diffusion effect (dirt transport effect by cavities) is also the highest.  
 Air entering from the liquid surface, gases contained in the liquid itself, and air on the surface of the object to be cleaned should be removed from the ultrasonic cleaning area, and the air content of the liquid around the object to be cleaned and between the object and the vibrating plate should be kept at 2ppm or less in oxygen at all times.  
 This is exactly the same if the ultrasonic irradiation utilizes a cavity, no matter what medium or what flow path it goes through.  
 How much oxygen (air) content is appropriate depends on the frequency of the ultrasound, the type and temperature of the liquid, and above all, the accuracy of the cleaning objective.  
 In order to use this technology stably and efficiently, it is not enough to simply degas the liquid, but it is necessary to strictly adhere to the aforementioned cavitation control. In Japan, many attempts have been made since the presentation of this technology by the author, and as a result, it must be said that a similar product cannot be made yet because of the lack of technology to comply with cavity control.  
 The following is a list of the main fields of application of this spherical cavity technology.  
 I am still seeing a large amount of my data, images, and videos being used in Japan, Taiwan, and China without permission, as if they were the originals. I would like to learn about anti-copying technology.

［Movie and Photo 5] Cavitation distribution of the third generation  
  
 The image on the left was taken around 1993, which is nostalgic but very old.  
 Now, we do not make such low-density cavity distributions.  
 However, you can see that the cavities are spherical and appear to be moving vertically.  
 You can also see some rough standing waves, but this was taken 17 years ago.  
 If I have a chance, I would like to change the image to the latest one with anti-copying treatment.  
 It is very sad to see unauthorized copying in Japan. (shibano)  
球状星雲型キャビティー  
 Globular Nebula Cavity

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