PUSONICS
Advanced High Power Ultrasonic Technologies

REMOVAL OF FINE AEROSOL PARTICLES

A NEW TECHNOLOGY TO TREAT VERY FINE PARTICLES

Removal of fine particles (smaller than 2.5 microns) from industrial flue gases is, at present, one of the most important challenges in air pollution abatement. These particles, which are hazardous because of their ability to penetrate deeply into the lungs, are difficult to remove by conventional separation technology. Ultrasonic energy offers a means to win this challenge. The application of an intense ultrasonic field to an aerosol induces agglomeration phenomena which change the size distribution in favor of larger particles, which are then easier to capture with conventional separators.

DESCRIPTION OF THE PROCESS

The ultrasonic agglomeration is a process based on the interaction of high intensity ultrasonic waves and suspended aerosol particles. Under specific conditions, the ultrasonic vibration induces a variety of physical mechanisms that bring the particles together and produce collisions that may lead to the formation of larger particle agglomerates. This growth of the aerosol particle size distribution favors the collection of the tiny particles for conventional or inertial methods. A variety of mechanisms are involved in the process. The stronger effect is the relative motion of particles of different sizes or densities along the ultrasound field. The particle entrainment by the sound field makes the bigger and heavier particles move slower and the smaller and lighter particles move faster. This difference in movement causes particle collisions and agglomeration.

FINE PARTICLES TREATED

Examples of aerosols tested:
- carbon black smoke, smoke from burning rubber, black soot, glycol fog, mixture of black soot and glycol fog, coal combustion fumes, diesel exhausts, SiO2 and TiO2

Size range of the particles tested: 0.2 to 2.5 micron

Particle growth after processing: Up to 60 times size increase with 5 sec treatment time at 21 kHz and about 163 dB, depending on the parameters of the aerosol.

Dynamic growth of carbon black particles formed in the ultrasonic process
NEW POWER ULTRASONIC TECHNOLOGY

The PUSONICS power ultrasonic plate-transducers for airborne applications have shown efficiency in the agglomeration of micronic and sub-micronic particle matter.

Ultrasonic agglomeration chambers with different number of plate-transducers have been efficiently applied to precondition micron and submicron aerosols to be removed by conventional filters.

As an example, exhaust fumes produced by a coal combustor at a flow rate of 1600 m3/h have been successfully treated by four transducers mounted inside an agglomeration chamber installed prior to an electrostatic filter. Exposure time inside the chamber of 2 seconds improved the retention efficiency of the electrostatic filter about 40% for both micro and sub-micron sized particles.

REFERENCES


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