Experimental Evaluation of Electrospray Technique for Particle Removal

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ABSTRACT

Particle removal techniques are of great importance in many sectors, such as industrial post-treatment and indoor air cleaning. Currently, electrostatic precipitators (ESPs) in which particles are electrically charged by corona discharge and are removed by existed or additional electrical fields are widely used because of the high particle removal efficiency and low pressure drop. One well-known concern for the use of ESPs, especially for indoor air cleaning, is the ozone generation in the corona discharging process. Meanwhile, the standards of ozone emission and ozone concentration have been tight. For examples, the Occupational Safety and Health Administration (OSHA) requires workers not to be exposed to an average concentration of ozone more than 0.10 ppm for 8 hours. The Food and Drug Administration (FDA) sets the limit of ozone output from indoor medical devices at the level less than 0.05 ppm. It limits the application of ESP as an indoor air cleaning technique ESPs are in general fail to satisfy these standard without additional ozone removal process while maintaining high particle collection efficiency.

In this study, the electrospray technique is used in an ESP to remove particles instead of corona discharge used in traditional ESPs. Highly charged, fine droplets produced by electrospray are employed to electrically charge particles sampled into the precipitator. With its low voltage and current operation compared with those in ESPs (when the electrical field strength is less than the electrical breakdown of particle carry air) no ozone will be produced in electrospray. The preliminary result shows the performance of this new ESP system is comparable to the traditional ESP. Further, the energy consumption rate of new ESP system is lower compared to that used by traditional ESPs. In this talk we will report the detail of experimental results from this study.