

S3.1.2 FINE DUST DISPERSITY MEASUREMENT USING SHADOWGRAPH TECHNIQUE

Min Tang*¹, Seungkoo Kang², Sheng-Chieh Chen², Wing-Tak Lai³, David Pui²

¹University of Minnesota, ²Department of Mechanical Engineering, University of Minnesota,
³TSI Inc.

For measuring the size distribution of re-suspended dust particles from dust dispersers in the application of filter tests, real-time aerosol instruments are generally used. Various instruments, however, report different size distributions for the same dust sample. The main reasons are likely due to the particle transport loss during the sampling, especially for dust particles larger than 1 μm , as well as the different measurement principles and different sizing ranges of the instruments. In this study, the in-situ and noninvasive shadowgraph technique with an image analysis technique (particle/droplet image analysis, PDIA) were applied to measure the size of re-suspended dusts. The experimental system consisted of an 8 megapixels CCD camera equipped with a high magnification lens, up to 28X, to allow the measurement of small particle sizes down to 1.5 μm . Monodisperse PSL particles with diameters of 5, 17 to 26 μm were generated from a home-built generator and used to validate the sizing accuracy of the system. The validated system was then applied to measure the size distribution of the widely-used ISO A2 fine dusts re-suspended by different dust dispersers, including the ISO light-duty and ISO heavy-duty injectors. Results showed that a large discrepancy between the size distributions determined by the powder manufacturer and those from ISO injectors by PDIA. This study reported the reliable size distributions for A2 dusts re-suspended by ISO injectors under different operation conditions.
Keyword: dust dispersity, shadowgraph, size distribution