

Automated Filter Testers

Application: Photometer Based Testing

Smith SD; "Predicting the Response of Photometer-Based Filter Testers to Submicron Challenge Aerosols;" paper presented to the *American Filtration and Separations Society*; Boston, Massachusetts, USA; April 6-9, 1999. (TSI paper A103)

The response of photometer based aerosol filter test instrumentation was compared with theoretical predictions. Good agreement was found between experimental and theoretical results for glass fiber filtration media with most penetrating particle size (MPPS) of about 140 nm when exposed to typical polydisperse sub-micron sodium chloride (NaCl) aerosol. These results have led to improved confidence in the repeatability and reproducibility of photometer based aggregate penetration measurements and provides a path for developing "accuracy" criteria for production test instrumentation.

Johnson T and SD Smith; "Correlation of Penetration Results Between Filter Testers that Use Different Particle Generators and Detection Methods;" *Proceedings of the 1998 Nonwovens Conference, TAPPI*; St. Petersburg, Florida, USA; March 9-11, 1998. (TSI paper A104)

Efficiency results obtained by a filter tester will depend on the aerosol size distribution and the properties of the particle detector. Results of different test methods can be related by analyzing the size distribution of the aerosol and relating that to how the particle detector detects particles. Some aerosol generators produce polydisperse aerosols and others produce monodisperse aerosol with varying degrees of monodispersity. Small changes in either the median size or the width of the distribution (geometric standard deviation) can have large effects on the efficiency results. Some particle detectors count particles while others measure the amount of light scattered by the particles. These different techniques also result in different efficiency results.

The size distribution of a test aerosol can be determined by using a SMPS (scanning mobility particle sizer). The efficiency curve for the filter can be determined by doing a filter efficiency test using monodisperse test aerosol. Using the properties of the particle detector it is possible to determine the efficiency that will result using various detectors. This paper shows the results of this analysis and compares the predicted results with test result data from different automated filter testers and different test aerosols

Johnson E, J Agarwal, and B Johnson; "Two New Aerosol Generators for Filter Testing;" paper presented to the *American Filtration and Separations Society*; Chicago, Illinois, USA; May 8-12, 1994. (TSI paper A87)

Two aerosol generators have been developed for use in testing filter media, filter cartridges and other types of finished filters. One of the aerosol generators produces solid sodium chloride and the other produces an oil aerosol. These generators were developed for use with commercial photometer-based automated filter testers manufactured by TSI Incorporated. For the automated tester application the generators had to be simple to operate, have inherent stability and provide reproducible test data using the most penetrating particle size. All of these desirable characteristics were achieved with these generators. To produce the right particle size, different mechanisms were needed for solid and oil aerosols. Both mechanisms rely on the removal of the largest particles from a broad distribution of aerosol particles produced by atomization. For the sodium chloride aerosol generator, the large water droplets are removed by a high speed rotating impeller. For the oil aerosol, the large oil droplets are removed by passing them through a roughing filter. The aerosol generators have been tested extensively with a photometer based filter tester using flat sheet glass-fiber filter media. The data resulting from the use of the new aerosol generators with the photometer based filter tester compares favorably with data using the sodium flame photometer test method and widely used 0.3 micron DOP (hot DOP) test method. Data using aerosol generators has been compared with the actual penetration at the most penetrating particle size (MPPS) of the media. MPPS was determined using a spectrum of monodisperse particle sizes generated by the differential electrical mobility technique.

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