A laser scattering system for real-time in situ monitoring aerosol contaminant particle in gas fluids

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ABSTRACT

This paper presents a new instrumentation and structure of a laser particle system for dynamic and in situ aerosol particle contaminant monitoring of high pressure gas pipeline. In the paper, an optical structure based on Mie scattering theory has been developed to measure particle distribution sized from 0.3 micron to 100 micron. The system uses a 660 nanometer wavelength laser diode and focus lens group with spatial filter to produce a tightly focused clean Gaussian radiation to illuminate the particle going through the center of a high pressure flow cell. A sensitive photomultiplier (PMT) is applied to collect the scattering light. The simulation is carried out by Mie theory. The paper gives the experiment setup and the measurement results of water particles with 0.3 micron average diameter. In the paper, an algorithm is built for particle signal process and a method of system calibration is developed by using two current commercial field instruments, LASAIR and direct contaminant measurement (DCM) and the results of measurement are validated by the instruments. This paper presents a viable technology to evaluate the performance of filtration facilities on line and develops a novel field instrument remotely controlling the particle contaminant in gas pipeline that needs instrument working under harsh conditions.