

Filtration Solutions to Mitigate PM_{2.5} Pollutants in Urban Air

David Y.H. Pui

Distinguished McKnight University Professor, LM Fingerson/TSI Inc Chair in Mechanical Engineering, Director of the Particle Technology Laboratory, University of Minnesota, Minneapolis, MN 55455

Abstract

PM_{2.5} (Particulate Matter less than 2.5 µm) was established by the U.S. Environmental Protection Agency in 1997 as the standard method for sampling fine particles. The Particle Technology Laboratory (PTL) has developed many instruments and samplers to perform atmospheric measurements, which helped to establish the PM_{2.5} standard. Due to the rapid economic expansion, China has experienced high level of of PM_{2.5} concentration, particularly in northeast coastal region. Global Burden of Disease (GBD) estimated the outdoor air pollution has resulted in 1.2 million premature deaths each year in China. China National Action Plan requires that US\$278 billion be invested over a 5-year period in the prevention and control of air pollution. Filtration is the principal means to control PM_{2.5} pollutants. The Center for Filtration Research (CFR) at the University of Minnesota, consisting of 18 leading international filtration companies, was established to find filtration solutions to mitigate PM_{2.5} and other environmental pollutants. CFR investigators perform fundamental and applied research on air, gas and liquid filtration. A Gasoline Particulate Filter (GPF) has been developed to meet LEV3 and Euro 6 standard. A disruptive innovation, namely, the Solar-Assisted Large-Scale Cleaning System (SALSCS), is proposed to mitigate PM_{2.5} pollutants in urban air. An integrative approach, from collaboration among academia, government, and industries, can effectively manage and mitigate the PM_{2.5} pollutants, particularly in China.