NUMERICAL INVESTIGATIONS ON INFLUENCES OF AMBIENT AND GEOMETRIC PARAMETERS ON SALSCS PERFORMANCE

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A Solar-Assisted Large-Scale Cleaning System (SALSCS) has been proposed for the remediation of air pollution in urban areas around the world. The system is mainly composed of a solar collector, a tower, filtration elements and fans for generating more flow rate if necessary. Previous study shows that a full-scale system with a solar collector of 2.5 km in radius and a tower of 500 m in height can generated a system flow rate of 2.64 × 105 m3/s. Many factors can affect the flow rate and system performance on removing urban PM2.5 pollution. This includes the geometry and dimensions of SALSCS, pressure drop of the filtration elements, fans inside the system, ambient temperature, wind speed and solar radiation intensity. For the current study, numerical models within the ANSYS Fluent fluid solver are developed for both the SALSCS itself and an atmospheric domain encompassing the system. For each scale of system flow rate, an optimum design of the system geometry and dimensions has been proposed based on our numerical results. Extra flow rate generated by fans and the corresponding power supply is considered in this study. By utilizing the numerical model, a sensitivity study on the impact of ambient temperature and solar radiation intensity on the system air flow is conducted. The final goal of this study is to provide a guide for the SALSCS design and development for air pollution removal in the future.