“Impact of Environmental Conditions and Operational Procedures of the Robotic Weighing System on PM Filter Measurement Accuracy”

Dmytro Chyzhykov
Institute of Environmental Engineering, Polish Academy of Sciences, 34 M. Skłodowskiej-Curie St., 41-819 Zabrze, Poland

Silesian University of Technology, Faculty of Energy and Environmental Engineering, 22B Konarskiego St., 44-100 Gliwice, Poland

Kamila Widziewicz-Rzońca
Institute of Environmental Engineering, Polish Academy of Sciences, 34 M. Skłodowskiej-Curie St., 41-819 Zabrze, Poland

Piotr Oskar Czechowski
Institute of Environmental Engineering, Polish Academy of Sciences, 34 M. Skłodowskiej-Curie St., 41-819 Zabrze, Poland

Abstract:

This study rigorously investigates the influence of environmental parameters, specifically temperature and relative humidity, on both exposed and unexposed particulate matter (PM) filters within an automated weighing system. The primary objective is to elucidate the impact of filter position transition time in the robotic weighing system's rotor on the accuracy of PM filter measurements. Furthermore, the research aims to evaluate the precision of mass determinations using standard reference materials in both manual and automated weighing systems. By systematically modulating temperature and humidity conditions, this study quantifies their effects on the measurement precision of both loaded and unloaded filters inside the robotic weighting system. Additionally, it examines the temporal dynamics associated with filter rotor position changes and their consequent impact on measurement fidelity. The insights garnered from this investigation are anticipated to enhance operational procedures, thereby optimizing PM filter measurement accuracy. The findings are poised to enhance air quality monitoring practices precision and contribute to the development of more robust and precise particulate matter measurement protocols and standards.