

Evaluation of Automated Analyzers of Polycyclic Aromatic Hydrocarbons and Black Carbon in a Coke Oven Plant by Comparison with Analytical Methods

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Abstract : In the winter of 2014 a series of measurements were performed to evaluate the behavior of real-time PAHs and black carbon analyzers in a coke oven plant located in Taranto, a city of Southern Italy. Data were collected both inside than outside the plant, at air quality monitoring sites. Contemporary measures of PM_{2.5} and PM₁ were performed. Particle-bound PAHs were measured by two methods: (1) aerosol photoionization using an Ecochem PAS 2000 analyzer, (2) PM_{2.5} and PM₁ quartz filter collection and analysis by gas chromatography/mass spectrometry (GC/MS). Black carbon was determined both in real-time by Magee Aethalometer AE22 analyzer than by semi-continuous Sunset Lab EC/OC instrument. Detected PM_{2.5} and PM₁ levels were higher inside than outside the plant while PAHs real-time values were higher outside than inside. As regards PAHs, inside the plant Ecochem PAS 2000 revealed concentrations not significantly different from those determined on the filter during low polluted days, but at increasing concentrations the automated instrument underestimated PAHs levels. At the external site, Ecochem PAS 2000 real-time concentrations were steadily higher than those on the filter. In the same way, real-time black carbon values were constantly lower than EC concentrations obtained by Sunset EC/OC in the inner site, while outside the plant real-time values were comparable to Sunset EC values. Results showed that in a coke plant real-time analyzers of PAHs and black carbon in the factory configuration provide qualitative information, with no accuracy and leading to the underestimation of the concentration. A site specific calibration is needed for these instruments before their installation in high polluted sites.

Keywords : black carbon, coke oven plant, PAH, PAS, aethalometer

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