

INDUSTRIAL COMBUSTOR VALIDATION TEST MEASURING AIR EMISSIONS OF DIOXINS AND FURANS ON A TEQ BASIS USING EPA METHOD 23 AND HRGC/HRMS VERSUS THE AMBSTACK SAMPLER AND CALUX BIOASSAY.

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The analysis of polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) in gaseous samples by EPA method 23 and analysis by high resolution gas chromatography/ high resolution mass spectrometry (HRGC/HRMS) is expensive and complex. We have designed a low cost unitized sampling system, the (AmbStack Sampler) and combined it with a reporter gene bioassay system, the Chemical Activated Luciferase Expression method (CALUX), to provide direct TEQ estimates of PCDD/PCDF contamination in air. The current study was designed to compare PCDD/PCDF determinations on a toxic equivalency (TEQ) basis by EPA method 23 and HRGC/HRMS and the AmbStack/CALUX system. In the current experiments simultaneous sampling by both methods were performed on a North American Package Boiler (NAPB) combusting a dopant (a mixture of 1,2 dichlorobenzene and copper naphthenate) at a flow rate adjusted to yield a HCl concentration at the stack of approximately 500 ppm at 7% O₂. The flue gas stream for this experiment was stable at a temperature of 140 °C with a moisture level of about 11 %. Samples were collected for three hours at a flow rate of 3.58 M³ and analyzed by both HRGC/HRMS and CALUX analysis. HRGC/HRMS results were 2.75 ng TEQ/dscm (7% O₂) versus 3.4 ng TEQ/dscm (7% O₂) by AmbStack/CALUX. EPA method 23 and HRGC/HRMS and AmbStack/CALUX provided similar estimates of TEQ contamination of combustion effluents. The AmbStack/CALUX system is useful as a low cost diagnostic tool to quickly measure PCDD/PCDF emissions from thermal combustion systems allowing optimization of conditions to minimize emissions of these toxic environmental contaminants.