

The Deployment of Sensor Network Intelligent Emission Locator (SENTINEL) for Fence line Emission Measurements

Wan Jiao^{1,2}, Eben Thoma¹, Elsy Escobar³, Mark Modrak³, Shahrooz Amin³, Bill Squier¹, Bill Mitchell¹

¹ US Environmental Protection Agency (EPA), Office of Research and Development (ORD), Research Triangle Park (RTP), North Carolina (NC)

² Student Services Contractor, ORD, US EPA, RTP, NC

³ ARCADIS U.S., Inc., Durham, NC

Abstract:

With recent technological advances, low-cost time-resolved sensors may become effective tools to support time-integrated passive sampling strategies by helping to decipher origin of emissions in real-time. As part of the Petroleum Refinery Risk and Technology Review, New Source Performance Standards rule, the US EPA is proposing use of two-week passive sorbent tube fence line monitoring for benzene. A prototype low-cost sensor-based, stand-alone air measurement (SAM) network, called SEnsor NeTwork INtelligent Emission Locator (SENTINEL), was developed by EPA's Office of Research and Development and deployed near a refinery in South Philadelphia. The sensor network consists of a base station and one solar-powered remote station, measuring non-speciated air pollutant concentrations using passive photoionization detectors (PIDs), with sensors for temperature, pressure, and humidity and a 3-D sonic anemometer for wind field diagnostics. Logged at one second intervals, data from the remote station is transferred over a short range network to the base station where it can be accessed remotely via cellular modem. In addition to system design and current sensor performance characteristics, time-series analysis providing insights into source identification under different meteorological conditions will be presented. The limitations of the current design and recommendations for future improvements will also be discussed.