

Using Extractive FTIR to Measure N₂O from Medium Heavy Duty Vehicles Powered with Diesel and Biodiesel Fuels

Edgar L. Thompson Jr¹, Richard Balduaf,¹ Richard Snow¹, Thomas Long¹, James Faircloth¹, Christopher G. Hayes²

¹*Office of Research and Development, National Risk Management Research Laboratory, U.S. EPA, 109 TW Alexander Drive, E343-02, RTP, NC 27711, USA*

²*ARCADIS Inc., 4915 Prospectus Drive, Suite F, Durham, NC 27713, USA*

Abstract

A Fourier Transform Infrared (FTIR) spectrometer was used to measure N₂O and other pollutant gases during an evaluation of two medium heavy-duty diesel trucks equipped with a Diesel Particulate Filter (DPF). The emissions of these trucks were characterized under a variety of operating conditions as well as environmental conditions. One vehicle used a NO_x Absorber Catalyst (NAC) and the other used a Selective Catalytic Reduction (SCR) system for control of nitrogen oxides (NO_x). Both vehicles were tested with two different fuels [ultra-low sulfur diesel (ULSD) and biodiesel (B20)] and ambient temperatures (70°F and 20°F), while the truck with the NO_x absorber was also operated at two loads (a heavy and light weight). Three driving cycles provided emissions estimates under changing operating conditions: 1) a cold start with low transients (CSLT), 2) the federal heavy-duty urban dynamometer driving schedule (UDDS), and 3) a warm start with low transients (WSLT). Emission rates were compared between the two vehicles operating under different modes (cold start, ambient cycle and drive cycle). Emissions from the two NO_x control technologies were also compared.