# 1.169 Are Selective Catalytic Reduction Systems on Diesel Engines an Atmospheric Source of Isocyanic Acid?.

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Abstract:

Diesel engines account for half of the nitrogen oxide ($NO_x$) emissions from combustion sources in the United States. Strict emissions standards have mandated the use of after treatment devices such as the Selective Catalytic Reduction (SCR) system. In an SCR system, urea is injected into the hot exhaust to yield ammonia, which reduces $NO_x$ over a catalyst surface to form $N_2$. However, SCR chemistry is known to produce isocyanic acid (HNCO) as an intermediate product and SCRs have been implicated as an atmospheric source of HNCO. HNCO is a highly toxic gas linked to adverse health outcomes. In this work, we measure HNCO emissions from a representative diesel engine and, by leveraging earlier data, use a three-dimensional air quality model to simulate the ambient concentrations of HNCO in a polluted urban environment. Experiments were performed on a diesel engine that was configured to meet three generations of EPA emissions standards over the past 10 years. Engine tests were conducted at three different engine loads, with two different fuels (diesel and biodiesel) and four urea injection rates. HNCO was measured using an acetate reagent based chemical ionization mass spectrometer. The engine was found to emit primary HNCO, although the emission factors were an order of magnitude higher than those found earlier; we suspect that steady state engine loads produce more HNCO. In contrast to earlier findings, we do not find any evidence that the after treatment devices produced or enhanced HNCO in the exhaust. The use of biodiesel was found to slightly reduce HNCO emissions. At present, work is underway to model the emissions, chemistry and deposition of HNCO in the UCD/CIT air quality model. The air quality model will be used to predict ground-level concentrations of and comment on the possible human exposure to HNCO in the Los Angeles airshed.