

# Indoor Air Quality in Construction Equipment Cabs

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Equipment operators have reported that odor from the emissions were evident in the equipment cab. Construction equipment is well known as one of the greatest offenders for emissions. Non-road diesel engines are now governed by the EPA Tier 4 emission requirements. Although the Oklahoma Department of Environmental Quality (ODEQ) collects air quality data for metropolitan locations and reports on air quality issues, little is known about the air quality in construction equipment cabs.

This research sought to answer the question of whether equipment emissions were affecting the Indoor Air Quality for construction equipment cabs. Previous studies have collected information about diesel emissions, but no research has previously been conducted to compare the emissions to the in-cab air quality. Additionally, results were compared to existing standards to find out whether pollutants approaching (or exceeding) limits. The data collection utilized the Advanced Sense Indoor Air Quality (IAQ) Pro monitor and GrayWolf probes for Volatile Organic Compounds (TVOC), Carbon Dioxide (CO<sub>2</sub>), Carbon Monoxide (CO), Nitrogen Dioxide (NO<sub>2</sub>), temperature, relative humidity and barometric pressure. 6 non-road diesel equipment identified and each piece of equipment was idled for twenty minutes. During the twenty-minute test period, readings were taken in the equipment cab. For each piece of equipment, the data collected in cab was separated into two (2) ten (10) minute segments, the first ten minutes with the air conditioner set to recirculating indoor air, the second ten minutes allowing outdoor air. For the last minute of the test, the cab door was opened to allow outside air into the cab. The data collected was downloaded using the proprietary Wolf Sense® PC software and exported into Excel spreadsheets to compile and analyze. The data was logged at 30-second intervals.

The sample times were collected over a partial period, not meeting a full eight hours. First the initial instantaneous readings over time evaluated by plotting graphs for each pollutant. Since most standards are Time Weighted Average (TWA) and data over 8 hours workday was needed, the pollutants were analyzed using the TWA equation and linear regression to extrapolate if the pollutants would exceed limits based on their current rates. It was clear based on results, that ODOT Loader has high average for most of the pollutants. Additionally, TVOC or hydrocarbons are approaching if not exceeding limits. Other pollutants are well below the TWA thresholds. However, based on the data collected, an additional study is being performed to better understand the results. There are numerous papers and reports about health issues between equipment operators, but since there is no specific standard or regulation for Indoor Air Quality in construction equipment cab, and nobody has ever focused particularly on this issue, authors believe results from this study and next studies based on this one could bring attention to this topic and make some suggestions to decrease potential risk of operators exposing to mentioned pollutants.

**Keywords:** Construction Equipment, Indoor Air Quality, Equipment Maintenance; Environment; Industrial Hygiene