

## We-O-C1-04

### Assessment of Petrol Station Attendant Exposures to Gasoline Vapors in Saudi Arabia

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**Abstract:** Petrol station attendant exposure to gasoline vapors during refueling vehicles has raised health concerns, especially, in tropical countries like Saudi Arabia due to the impact of high ambient temperatures on gasoline vaporization and the associated risk of inhaling more vapors than in counterpart temperate countries. These concerns have been highlighted in public newspapers, studies in other countries, and by the workers themselves. Furthermore, exposure occurring during extended working hours with no vapor recovery system and the handling of gasoline containing higher percentage volumes of toxic substances (e.g. BTEX) have not been adequately addressed in the literature. Therefore, this study was carried out to investigate the validity of this concern by assessing and quantifying full shift exposures to gasoline vapors arising from the vehicle refueling process. The study assessed the exposures of 62 attendants via passive, active, and direct reading methods at fourteen petrol stations in the Eastern Province of Saudi Arabia during the winter and summertime to test the seasonal variation of the exposure pattern. The effects of the quantity of gasoline sold, the locations of the stations, weather variations (e.g. wind speed, temperature, humidity) were examined. A specially designed mini-weather station was utilized to closely monitor weather conditions during sampling. A Forward-looking infrared (FLIR) thermal image camera was used to visualize the size and movement of the vapor plumes during personal monitoring. Furthermore, laboratory experimentation was carried out to characterize the gasoline vapor component behavior under different temperatures to inform development of a new proposed OEL value. The mean of the passive results for the BTEX in air (0.58 mg/m<sup>3</sup>, 0.94 mg/m<sup>3</sup>, 0.49 mg/m<sup>3</sup>, 1.27 mg/m<sup>3</sup>, 0.71 mg/m<sup>3</sup>, respectively) were found to be relatively high compared to those reported by the IARC, 2012 and Concawe, 2002 for Europe and North America.

Keywords: A-exposure factors, A-industrial hygiene, A-sampling methods, D-occupational, B-mixtures

## We-O-C1-05

### Evaluation of 1-Nitropyrene as a marker of exposure to diesel exhaust in an underground mine

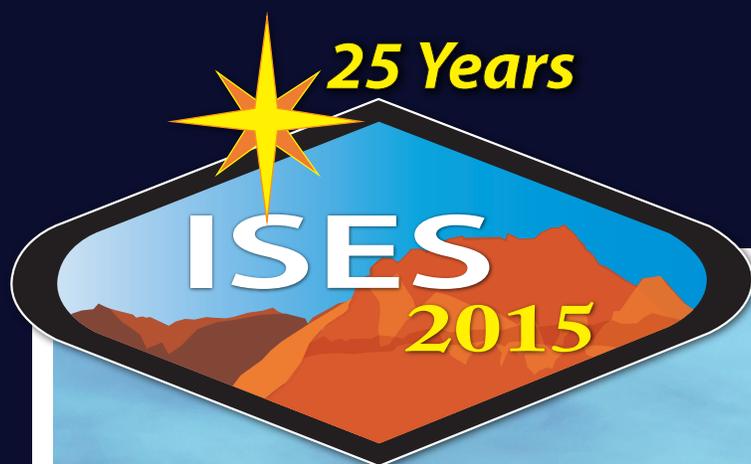
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**Abstract:** Evaluation of 1-Nitropyrene as a marker of exposure to diesel exhaust in an underground mine. Elevated exposure to diesel exhaust (DE) is widespread and has been linked to adverse health outcomes including respiratory irritation, cardiovascular disease, immune dysfunction and lung cancer. Underground miners experience amongst the highest exposures to DE of any occupation. Thus, miners are at high risk for suffering adverse health effects associated with DE exposure. MSHA currently mandates measurement of elemental carbon (EC) and total carbon (TC) to assess workers exposures to DE in underground metal/non-metal mines. However, limitations in the specificity and reliability of these metrics of DE exposure hamper quantitative evaluation of links between DE exposure and adverse health outcomes. The DE-specific chemical 1-nitropyrene (1-NP) has been suggested as a potential alternative marker of exposure to DE. In the current study we compared personal exposures to EC, TC and 1-NP amongst a cohort of 20 workers at a large underground metal mine that uses diesel engines fueled with B70 blend biodiesel. Full shift personal air samples were collected on eight occasions from each worker using a PTFE filter downstream of a GS-3 cyclone, and an MSHA compliant SKC DPM impactor downstream of a GS-1 cyclone pre-filter. Personal exposures to EC ranged between 1.69-101 µg/m<sup>3</sup>, whereas for 1-NP the exposures ranged between 0.90-497 pg/m<sup>3</sup>. Regression analysis of the relationship between 1-NP vs. EC and TC yields an 8.7% increase in geometric mean (GM) 1-NP for each 10% increase in GM EC (p<0.001) and a 13.3% increase per in GM 1-NP per 10% increase in GM TC (p<0.001). These data indicate that in this workplace where DE is anticipated to be the only source of EC, a strong association exists between 1-NP and EC.

Keywords: C-air, D-occupational, B-particulate matter, A-sampling methods, A-analytical methods

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