DIESEL EXHAUST

FUMES

An Overview

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Introduction

At the Carbon Monoxide Headquarters site: http://www.coheadquarters.com/CO1.htm, it is stated that the CO concentration of diesel exhaust is 0.1%, higher if poorly tuned, compared with the exhaust of a petrol engine with a concentration of 1-10%.

Further, this site gives examples of the use of exhaust fumes for suicide, and demonstrates how the CO concentration in the air inside the passenger compartment of a motor vehicle (expressed in parts per million) builds up over time, but those examples all refer to gasoline engines. For example, it shows how a 1% CO concentration in the exhaust (the lowest level for gasoline engines) will produce an air concentration of 10,000 ppm after about 10 minutes, and then level off.

Tables at this site show that exposure to an air concentration of 10,000 ppm will cause the carboxyhemoglobin (COHb) in the blood to build up to the fatal level of 50% after about 15 minutes.

Although the COHQ site does show the build-up of CO from an exhaust concentration of 0.1% (the normal level produced by a diesel engine), it seems reasonable to assume that diesel exhaust will cause an air concentration of 1,000 ppm. According to the table at this site, that air concentration would result in 62% COHb saturation after infinite exposure time. This suggests that the CO concentration in the air in an enclosed space produced by normal diesel exhaust would not be sufficient to be reliably, or quickly, lethal.

Petrol creates 28 times more carbon monoxide than diesel

However, modern engines have catalytic converters in the exhaust system, which convert carbon monoxide to carbon dioxide. Consequently the fumes are significantly less lethal. In summary, catalytic converters convert the hydrocarbons into carbon dioxide and water; and also convert the nitrogen oxides back into nitrogen and oxygen.

Reported Diesel Fume Fatality

In 1980, one sailor died aboard HMAS Onslow (SS 60/SSG 60) (one of six Oberon class submarines operated by the Royal Australian Navy (RAN)) when carbon monoxide fumes from one of the diesel generators filled the submarine.

Components of Diesel Exhaust

The exhaust gas from diesel engines contains, during normal operating phases, a high proportion, about 3 to 10 vol. %, of oxygen in addition to unburnt hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx).

Also known as diesel fumes, diesel exhaust is a complex mixture of gases and diesel particulate matter (DPM). Components include:

- carbon monoxide
- carbon dioxide
- sulphur dioxide
- nitrogen oxides
- aldehydes including benzene and formaldehyde
- hydrocarbons
- polycyclic aromatic hydrocarbons (PAHs)
- soot (carbon)
- water
- aldehydes

Soot

The major component of diesel exhaust is soot (60%-80%). This is what you see coming out of the exhaust pipe.

Most of the DPM, also known as fine particulate matter, consists of particles so tiny they are easily inhaled and deposited in the lower lungs where they cause various health effects.

Effects of Diesel Exhaust

The small particles in diesel exhaust are readily inhaled and deposited deep into the lung tissue. These particles may cause damage to lung tissue. Pre-existing diseases, such as emphysema, asthma, or heart disease, can be aggravated by diesel exhaust.

Some short-term (or acute) health effects are:

- Irritation of the eyes, nose, & throat
- Vomiting
- Light-headedness
- Headache
- Heartburn
- Numbness
- Tightness in the chest
- Tingling in the extremities
- Wheezing

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