

Diesel Exhaust Fumes

Where members are exposed to diesel fumes in the workplace safety reps should raise the issue with their employers. The aim should be to replace the use of diesel fuels, or where this is not possible, provide measures in line with the guidance below, which reduce exposure to diesel fumes.

Introduction

Diesel exhaust fumes are a common workplace hazard in many workplaces, particularly in transport and distribution, but also in many factories. When diesel fuel burns in an engine, the resulting exhaust is made up of soot and gases which may contain thousands of different chemical substances.

The soot consists of very small *particles* that can be inhaled and deposited in the lungs. Diesel exhaust contains 20-100 times more particles than petrol exhaust. These particles carry cancer-causing substances known as *polynuclear aromatic hydrocarbons (PAHs)*. Gases in diesel exhaust, such as nitrous oxide, nitrogen dioxide, formaldehyde, benzene, sulphur dioxide, hydrogen sulphide, carbon dioxide, and carbon monoxide can also create health problems.

Those most likely to be exposed to diesel exhaust include lorry, van and forklift drivers, and people who work near areas where these vehicles are used, stored or maintained.

Short-Term (Acute) Effects

Workers exposed to high concentrations of diesel exhaust have reported the following short-term health symptoms:

- irritation of the eyes, nose, and throat
- lightheadedness
- feeling "high"
- heartburn
- headache
- weakness, numbness, and tingling in extremities
- chest tightness
- wheezing
- vomiting

Long-Term (Chronic) Effects

Although there have been relatively few studies on the long-term health effects of diesel exhaust, the available studies indicate that diesel exhaust can be harmful to your health.

According to the United States National Institute for Occupational Safety and Health (NIOSH), human and animal studies show that diesel exhaust should be treated as a human *carcinogen* (cancer-causing substance). These findings are not surprising since several substances in diesel exhaust are known to cause cancer. It may take many years after the first exposure for diesel-related cancer to develop.

Exposure to diesel exhaust in combination with other cancer causing substances may increase your risk of developing lung cancer even more. Other exposures that

are known to cause lung cancer include cigarette smoke, welding fumes and asbestos. All of these exposures may interact with diesel exhaust to magnify your risk of lung cancer, and should be kept to a minimum.

Some studies have suggested that workers exposed to diesel exhaust are more likely to have *chronic respiratory symptoms* (such as persistent cough and mucous), bronchitis, and reduced lung capacity than unexposed workers. People with preexisting diseases, such as emphysema, asthma, and heart disease, may be more susceptible to the effects of diesel exhaust.

Studies in animals suggest that diesel exhaust may have other effects as well:

Mice developed *skin cancer* when extracts of diesel exhaust were applied to their skin.

Diesel exhaust caused lung injury in exposed laboratory animals.

Exposure to diesel exhaust reduced animals' resistance to bacterial infection.

Laboratory animals exposed to high concentrations of diesel gases showed a *reduced level of activity and coordination*.

In addition, many of the individual components of diesel exhaust are known to be hazardous. For example, *nitrogen oxides* can damage the lungs, and *carbon monoxide* can aggravate heart disease and affect coordination.

Not in Confined Spaces

Operating engines in confined spaces or poorly ventilated areas can lead to dangerous levels of carbon monoxide, exposing employees to carbon monoxide poisoning. It may also lead to high inhalation of particulates.

A hazard can exist in workplaces such as cold stores, enclosed store rooms or any workplace where there is poor ventilation, no fresh air intake or no mechanical ventilation. Petrol, diesel and LPG powered forklifts produce carbon monoxide, but electrically powered forklifts do not. Only diesel engines emit potentially dangerous particulates.

Example

A forklift operator was admitted to hospital with headache, dizziness and stomach pains, having suffered convulsions and collapsed unconscious at his workplace.

Four days later three employees from a refrigeration company developed symptoms of headache, nausea and increased heart rate while checking the same cool room. A forklift had earlier been operating in the cool room.

Tests showed that the forklift idling in the cool room caused a carbon monoxide level of 200 parts per million, well over the exposure standard of 50 ppm TWA (a quantity evaluated over an eight hour average), causing employees in the cool room for an hour and a half to be over-exposed to carbon monoxide. The tests also showed it was possible for carbon monoxide to accumulate in the cool room over a period of time.

HSE Guidance Note HS(G)6 "Safety in working with lift trucks" gives further guidance,

57. In workplaces where LTs are driven by internal combustion engines it is important that the ventilation should be adequate to remove exhaust fumes and that the engines should be properly maintained. Exhaust fumes may be significantly reduced by the use of filter systems or catalytic converters. However, these systems are not a substitute for providing adequate ventilation. Exhaust filters should be checked regularly in order to maintain their effectiveness. Petrol and liquefied petroleum gas (LPG) engined LTs are particularly hazardous in confined spaces and should not be used there.

The Legal Position

Under the COSHH Regs, employers also have specific duties to :

identify any hazardous substances produced as a result of the operation of their business
carry out a risk assessment to determine whether the hazardous substances do pose a risk to their employees or to others
inform employees of any risks which do exist from these hazardous substances
do what is reasonably practicable to prevent or control the risks from these hazardous substances.

Recognised trade union safety representatives are entitled to see copies of any risk assessments prepared under these regulations.

Control of Diesel Exhaust

Substitution

Where possible, replace diesel engines with propane-burning engines or electric powered engines. Propane burns more completely and more cleanly than diesel fuel.

Ventilation

Diesel exhaust in garages, warehouses, or other enclosed areas should be controlled using ventilation.

Local exhaust ventilation is the best way to reduce potential hazards to diesel exhaust. A good ventilation system should include both intake and exhaust fans that remove harmful fumes at their source. Vehicle exhaust hoses, for example, will take away all emissions from that vehicle.

General ventilation uses roof vents, open doors and windows, roof fans, or floor fans to move air through the work area. This is not as effective as local exhaust ventilation, and may simply spread the fumes around the work area. General ventilation may be helpful, however, when used to supplement local exhaust ventilation.

Isolate the Worker

Another way of controlling diesel exhaust exposures is to isolate the worker from diesel fumes, although in many instances this is unlikely to be practical. Lorries should have air-conditioned cabs to isolate the driver from fumes (Windows should be rolled up so that fumes do not seep inside).

Safe Work Practices

Following the safe work practices below can also reduce exposure to diesel exhaust:

- Less polluting diesel fuels should be used. These contain lower levels of sulphur and aromatics. They are more expensive but burn more cleanly than ordinary diesel.
- All diesel equipment should have regular maintenance and frequent tune-ups. Badly maintained diesel engines emit far more particles than well maintained ones. The exhaust system should be checked for leaking fumes.
- Vehicles should be fitted with emission control devices (air cleaners), such as collectors, scrubbers, and ceramic particle traps. Air cleaners should be checked regularly and replaced when they get dirty.
- Prolonged idling of machinery should be avoided. A worker should not be in the vehicle when it is idling for a long period.
- Any cracks in the vehicle should be fitted with weather stripping to prevent fumes from seeping in.
- The floor of the vehicle should not have any holes.

Air Standards

There is no standard specifically for diesel exhaust. However, there are workplace exposure limits for individual components of diesel exhaust, such as carbon monoxide, sulphur dioxide, benzene, carbon dioxide, nitrogen dioxide, acrolein, and formaldehyde. Remember though, measuring just one constituent may not give a real indication of the level of risk.

Because diesel exhaust has been shown to cause cancer, the United States NIOSH recommends that diesel exhaust exposures be reduced to the lowest feasible limits.

Safety Rep Action

If there are problems in any area of the workplace with diesel fumes, the safety representatives should:

1. Raise the problem with the employer through the appropriate procedures
2. Ask the employer whether a COSHH assessment has been done
3. Ask to see a copy of the written details of the assessment
4. Use the procedures to try to get the employer to improve the situation.
5. Remember that even if diesel is replaced by other fuels, other residual hazards may still exist and need to be addressed.

Further Information

"Control of diesel engine exhaust emissions in the workplace" HSG187, HSE Books ISBN 0 7176 1662 2

"Diesel engine exhaust emissions" INDG286, Free, HSE Books