

DIESEL EXHAUST, AIR QUALITY AND HEALTH

Publication 849

May 2002

WHAT IS DIESEL EXHAUST AND HOW ARE WE EXPOSED TO IT?

Diesel exhaust is a complex mixture of thousands of gases and fine particles that contains more than 40 air contaminants. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. It also contains other harmful pollutants, including nitrogen oxides (a component of urban smog).

Diesel exhaust is produced when an engine burns diesel fuel, suspending particles and gases in the air that are inhaled when we breathe.

WHAT ARE THE HEALTH EFFECTS OF DIESEL EXHAUST?

The microscopic particles in diesel exhaust are less than one-fifth the thickness of a human hair and are small enough to penetrate deep into the lungs, where they can contribute to a range of health problems.

Diesel exhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde and nickel) have the potential to contribute to mutations in cells that can lead to cancer. These changes can occur at very low levels and have led to the belief that there is 'no safe level' of exposure to diesel exhaust (or many other carcinogens).

Exposure to diesel exhaust can have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, light headedness and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks. There is also strong evidence that people who are exposed to high levels of diesel exhaust in a work environment (much higher than that experienced in ambient air) have an increased risk of developing lung cancer. Based on this evidence the United States Environment Protection Agency and International Agency for Research into Cancer have classified diesel exhaust as a probable human carcinogen.

Diesel engines are a major source of fine-particle pollution. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution. Numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks and premature deaths among those suffering from heart and respiratory problems. Because children's lungs and respiratory systems are still developing, they are also more susceptible than healthy adults to fine particles. Exposure to fine particles is associated

with increased frequency of childhood illnesses and can also reduce lung function in children.

Like all fuel-burning equipment, diesel engines produce nitrogen oxides, which can damage lung tissue, lower the body's resistance to respiratory infection and worsen chronic lung diseases, such as asthma. They also react with other pollutants in the atmosphere to form ozone, a major component of smog.

NEW DIESEL FUEL REGULATIONS

The Commonwealth *Fuel Quality Standards Act 2000* and the *Fuel Quality Standards Regulations 2001* introduce new national fuel quality standards, which were developed in conjunction with the States and Territories. This legislation will help Australia reach international fuel quality standards.

The standards will have a major impact on the level of exhaust pollutants in vehicle emissions, such as benzene and particles, with studies estimating reductions of up to 50 per cent for some pollutants over five years. The standards will enable the more effective operation of petrol and diesel vehicle engines.

The diesel fuel quality standards will be introduced in a two-stage process beginning in 2002-03 and finishing in 2006. This process will improve diesel fuel quality through the reduction of fuel components such as sulfur. This improved fuel quality will allow new emission control technology to be introduced on new diesel vehicles, and will also result in older diesel vehicles emitting fewer particles.

The new fuel quality standards were introduced to support new vehicle emission standards that will also be introduced in two stages and will harmonise with European standards. These new standards will see significant reductions in new vehicle emissions during the next five years including a particle reduction of about 94 per cent from diesel vehicles.

AIR QUALITY IN FRANCIS STREET

EPA Victoria conducted air quality monitoring in the Francis Street area between June and July 2001. EPA Victoria's mobile air monitoring laboratory (Molab) was set up in front of the Yarraville Community Centre at the eastern end of Francis Street, to measure air quality. The pollutants measured were:

- particles (PM₁₀);
- fine particles (PM_{2.5});
- nitrogen dioxide (NO₂);
- carbon monoxide (CO); and
- sulfur dioxide (SO₂).

The results of the air monitoring showed that, with the exception of particles, the air pollutants monitored in Francis Street were generally below air quality objectives set out in the State Environment Protection Policy (Air Quality Management) [SEPP (AQM)].

During periods of low wind, levels of airborne particles did exceed the air quality objectives on six occasions. The main sources of these pollutants are motor vehicles (especially diesel trucks and four-wheel-drive vehicles), domestic wood heaters and open fire places.

Generally, higher particle concentrations were measured on days of low wind speed and low temperatures. This is because particles spread out

more rapidly on windy days than on still days. On weekends lower particle concentrations were recorded. This is likely to be due to reduced traffic volumes compared to weekdays.

HOW DOES FRANCIS STREET COMPARE WITH OTHER AREAS?

Particle concentrations at Francis Street were compared with monitoring results from other air monitoring sites in Melbourne. It was found that Francis Street particle concentrations were 30 to 40 per cent higher than at other EPA monitoring stations located in suburban streets, away from main roads.

The Francis Street results were also compared with monitoring data collected at Hoddle Street, Collingwood. This site was chosen to represent typical particle concentrations at a busy arterial road mainly used by petrol-fuelled motor vehicles. Particle concentrations were significantly higher at Francis Street than Hoddle Street. These results suggest that the higher particle concentrations measured at Francis Street are likely to be due to the emissions from diesel vehicles.

WHAT DO THE RESULTS MEAN?

The particles measured in the Francis Street area might originate from a number of combustion sources. However the high traffic volumes on Francis Street, and the lower concentrations on weekends, lead to the conclusion that large diesel trucks are the most likely major source.

In EPA's experience with pollutant sources such as motor vehicles, pollutant levels drop to ambient or

background levels within 50 to 100 metres from the road. This means any effect from high levels of particles is expected to be limited to residences fronting Francis Street itself.

FRANCIS STREET HEALTH STUDY

EPA believes that further studies are required to assess the potential health risks for residents of Francis Street. This has led to a commitment by EPA to carry out a community health study for the Francis Street residents. This study aims to determine if the residents of Francis Street have a higher risk of adverse health effects from air pollution, than people living in a less exposed area. For more information regarding the Francis Street Health Study and how you can be involved, contact Dr Lyn Denison at EPA.

EPA is also conducting further air and noise monitoring in Francis Street and is conducting ongoing blitzes on smoky and noisy trucks.

FURTHER INFORMATION

More detailed information can be found in the full report: *Air Monitoring at Francis Street, Yarraville* (EPA Publication 821). You can obtain a copy of this report by calling EPA Information Centre or visiting our website www.epa.vic.gov.au.