

HAZARD ALERT

Health effects of diesel exhaust

Risk of cancer and respiratory diseases

In 2012, the World Health Organization classified diesel exhaust emission as a substance that is known to cause cancer in humans.

Mining sector workers beware of higher risk if you work as an underground production and development miner, heavy equipment operator, or heavy-duty equipment mechanic.



SHORT-TERM EFFECTS

- Eye irritation
- Nose irritation
- Throat irritation
- Breathing irritation including coughing, phlegm production, wheezing, chest tightness
- Nausea
- Fatigue
- Headache
- Allergic reactions

SIGNS OF EXPOSURE

- Gravimetric air sampling indicates diesel particulates
- Gas monitors indicate elevated levels of carbon monoxide (CO) or nitrogen dioxide (NO₂)
- Irritated eyes or difficulty breathing
- White, blue, or black smoke
- Visible haze
- Noticeable odour of diesel exhausts

LONG-TERM EFFECTS

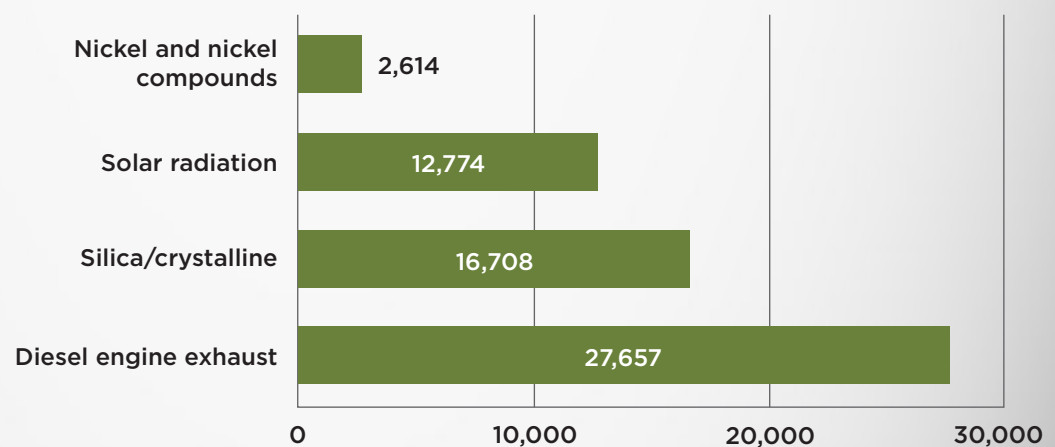
- Lung cancer
- Respiratory diseases
- Decrease in lung function
- Increased risk of developing asthma
- Increased severity of existing respiratory conditions and allergies
- Cardiovascular disease

You do not need to experience any signs of exposure or short-term health effects to develop long-term health effects like cardiovascular disease, respiratory disease and lung cancer.

MINING HEALTH AND SAFETY REGULATIONS

- Cannot exceed the Ontario occupational exposure limit for diesel engine exhaust 0.4 mg/m³
- Provide proper ratio of air flow to equipment in use
- Conduct regular diesel engine maintenance
- Conduct emission tests on engines after repairs

NUMBER OF CANADIAN WORKERS IN THE MINING SECTOR EXPOSED TO TOP FOUR CARCINOGENS



CONTROLLING DIESEL PARTICULATE MATTER IN UNDERGROUND MINES



PROACTIVE CONTROLS
Reduce or eliminate diesel particulate emissions before they enter the workplace air

Replacing or repowering old equipment
Newer engines must meet much stricter emissions regulations. Replacing an engine or a piece of equipment with a newer model will significantly decrease emissions. The level of reduction depends on the old and replacement equipment.

Rebuilding engines
Manufacturers often offer upgrade kits that can be incorporated into an engine rebuild to improve emissions.

Alternative Energy
Involves replacing diesel equipment with alternatives such as electric.

Aftertreatment systems
A variety of different aftertreatment systems are available. Emissions reductions depend on the type of filter chosen, as well as the engine and load. Particulate reductions can range from 20-95%.

Idling technology
Idling technology works by automatically turning off the engine when the vehicle idles. The emissions reductions will be greater for equipment that spends a high proportion of time idling.

Preventive maintenance
Maintenance keeps all parts of the engine, as well as any emissions control systems, functioning optimally. Poorly maintained engines can produce significantly more emissions than an engine in good condition.

Idling policies
Idling increases both emissions and engine wear. Idling policies limit the amount of time an engine can be idled.

AVERAGE REDUCTIONS
Average particulate matter exposure reductions based on published data

- >50% ↓
- 50-85% ↓
- 85-99% ↓
- 100% ↓

Varied/Unknown: ?

More effective ←

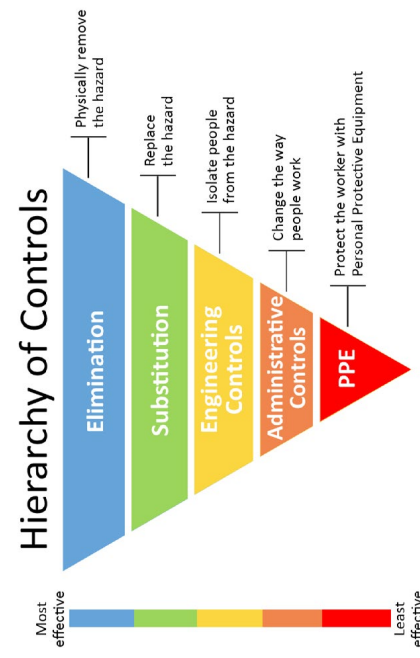
Less effective →

Proactive controls

← More effective

Less effective →

Hierarchy of Controls



REACTIVE CONTROLS
Remove diesel particulate emissions from the workplace air, or reduce the likelihood that workers will inhale particulate emissions

General ventilation
General ventilation dilutes emissions by bringing clean air into the area. The reductions vary depending on the volume of air provided. It also helps reduce ambient air concentration of non-diesel hazards, as well as helping with temperature control.

Enclosed cabs
When properly functioning, enclosed cabs protect the operator, but do not protect the surrounding workers.

Tele-operating
Tele-operation allows the operator to be in a safe location, such as a filtered control room on the surface. Reductions in exposure can be up to 100% if the operator is completely removed from the site. Other workers may still be exposed if they enter the work area, or if emissions circulate to other areas of the mine.

Operator training
Training can include driving skills, how to recognize maintenance issues, proper use of diesel control technologies, and the health effects of diesel exhaust.

Scheduling and site planning
Control the number of diesel engines operating in an area. Schedule workers during times when fewer diesel engines are working.

Monitoring emissions
An emissions monitoring program is critical for ensuring that diesel controls are functioning properly.

Respirators
PPE should be used as a last resort, and is not a replacement for other controls. The concentration of diesel exhaust in the air should still fall below the regulatory limit. When used, respirators should be fit-tested, and training should be provided to wearers.



Towards a cancer-free workplace