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.

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

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

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

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

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

- Nickel and nickel compounds: 2,614
- Solar radiation: 12,774
- Silica/crystalline: 16,708
- Diesel engine exhaust: 27,657

In 2012, the World Health Organization classified diesel exhaust emission as a substance that is known to cause cancer in humans. 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.
CONTROLLING DIESEL PARTICULATE MATTER IN UNDERGROUND MINES

ELIMINATION
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.

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

ENGINEERING CONTROLS
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 20-92%.

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.

ADMINISTRATIVE CONTROLS
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.

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

PPE
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.

AVERAGE REDUCTIONS
Average particulate matter exposure reductions based on published data:
- <50%
- 50-85%
- 85-99%
- 100%

Varied/Unknown:

Hierarchy of Controls

- Elimination
  - Physically remove the hazard
  - Replace the hazard
- Substitution
  - Replace the hazard
  - Isolate people from the hazard
- Engineering Controls
  - Change the way people work
  - Protect the worker with Personal Protective Equipment
- Administrative Controls
  - Scheduling and site planning
  - Monitoring emissions
  - Tele-operating
  - Endosed cabs
  - General ventilation
  - Operator training

Proactive Controls
Reduce or eliminate diesel particulate emissions before they enter the workplace air.

Reactive Controls
Remove diesel particulate emissions from the workplace air, or reduce the likelihood that workers will inhale particulate emissions.

www.occupationalcancer.ca/2017/controlling-dpm-in-mining