

POSITIVE IMPACTS ON PUBLIC HEALTH DERIVED FROM DIESEL FUEL FILTRATION

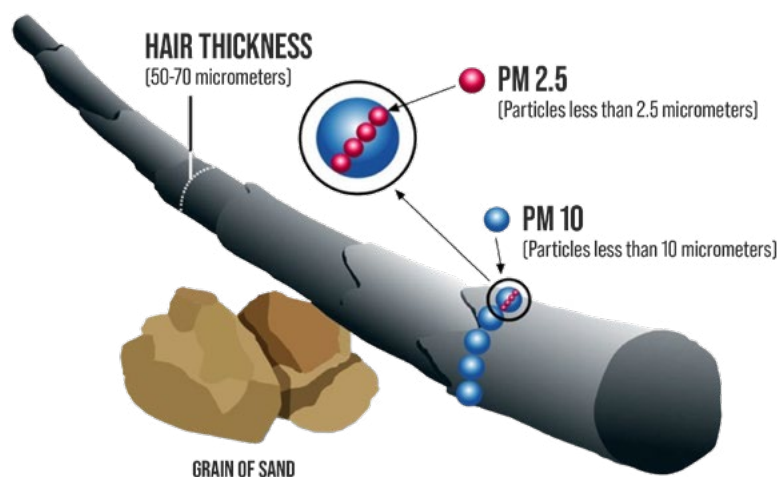
WHAT IS PARTICULATE MATTER (PM) POLLUTION?

Particulate Matter (PM) pollution refers to the mixture of particles suspended in the air, such as dust, dirt, soot, or smoke. PM particles originating from human activity are the most abundant and concerning. Their most significant source is from incomplete combustion (soot) of thermal engines used in transportation and industry, largely from diesel engines. [Explanatory video.](#)

The Environmental Protection Agency (EPA) categorizes particulate pollution into two size categories. These particles are so small that they are measured in micrometers. A micrometer or micron (μm) is one millionth of a meter: $1 / 1,000,000 \text{ m}$.

- **PM10:** inhalable particles, with diameters that are generally $10 \mu\text{m}$ and smaller.
- **PM2.5:** fine inhalable particles, with $2.5 \mu\text{m}$ and smaller diameters, mainly come from the combustion of contaminated (dirty) diesel: DPM size $< 1 \mu\text{m}$.

THE PM 2.5 AND PM 10 PARTICLES, WHICH DOMINATE THE ENVIRONMENT, ARE NEARLY MICROSCOPIC, BUT THEIR HEALTH EFFECTS ARE SIGNIFICANT.



For comparison, fine beach sand has approximately 90 microns in diameter. A human hair has a diameter between 50 and 70 microns.

HOW DO PM PARTICLES AFFECT PUBLIC HEALTH?

Several adverse health impacts have been associated with exposure to PMs. For PM2.5, short-term exposures (up to 24-hours) have been associated with premature mortality, increased hospital admissions for heart or lung causes, acute and chronic bronchitis, asthma attacks, emergency respiratory symptoms, and restricted activity days. These adverse health effects have been reported primarily in infants, children, and older adults with preexisting heart or lung diseases. PM2.5 is associated with the greatest proportion of adverse health effects related to air pollution, both in the US and world-wide based on the World Health Organization's Global Burden of Disease Project. Short-term exposures to PM10 are associated primarily with worsening of respiratory diseases, including asthma and chronic obstructive pulmonary disease (COPD).

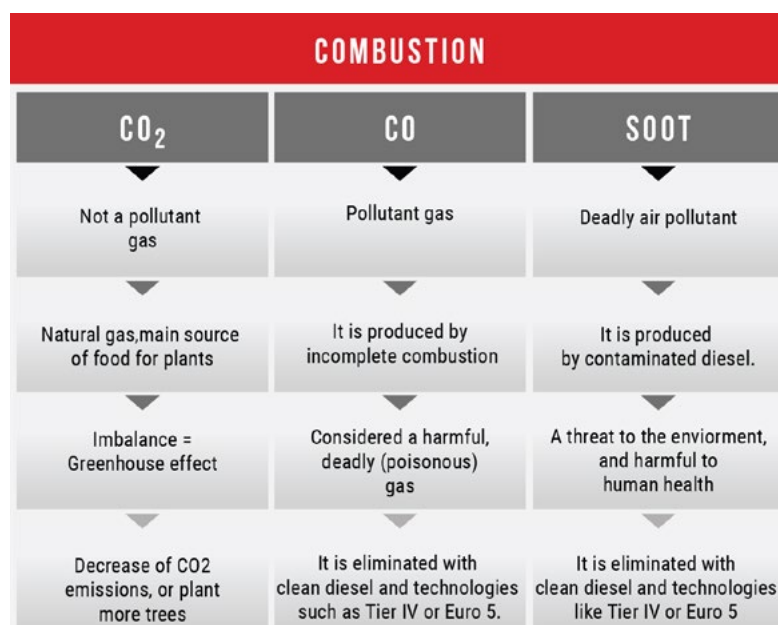
Long-term (months to years) exposure to PM2.5 has been linked to premature death, particularly in people who have chronic heart or lung diseases, and reduced lung function growth in children. The effects of long-term exposure to PM10 are less clear, although several studies link long-term PM10 exposure and respiratory mortality. The International Agency for Research on Cancer (IARC) published a review in 2015 that concluded that particulate matter in outdoor air pollution causes lung cancer and may contribute to the incidence and aggravation of respiratory diseases, including COVID-19.

According to WHO, ambient air pollution, both in cities and rural areas, was responsible for 4.2 million premature deaths worldwide per year; due to exposure to PM2.5 particles which cause cancer, respiratory and cardiovascular diseases.

Source: <https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health>

Video 1: <https://youtu.be/mAjDvBwKFWE>

Video 2: <https://youtu.be/0811kyRS2GI>



ENVIRONMENTAL DAMAGE PRODUCED BY DIESEL PARTICULATE MATTER (DPM)

The particulate pollution from diesel is defined by the international cleanliness standard ISO 4406, and it is the primary parameter used to determine the maximum level of PM emissions that an engine will release into the environment.

For every ten thousand gallons of diesel with particulate contamination at code 22/21/18, 473 grams of particulate matter are emitted in exhaust gases. This means that for every million gallons of diesel per year, a total of 47,300 grams of particulate pollution are expelled into the environment, with serious impacts on air quality, water, soil, and, worse yet, on citizens' lungs.

DPM particles can be transported by wind over long distances and can then settle on the ground or in water. Depending on the chemical composition, the effects of this deposition can result in:

- Estuaries, rivers and reservoirs becoming acidic
- Change in the nutrient balance of coastal waters and river basins
- Eduction of soil nutrients
- Damage to sensitive forests and agricultural crops
- Detrimental effects on ecosystem diversity
- Contribution to the effects of acid rain

DPM'S ROLE IN CLIMATE CHANGE

Video: <https://youtu.be/kIOABRCb79w>

A large proportion of DPM is composed of black carbon (BC). Recent studies cited in the Intergovernmental Panel on Climate Change report estimate that emissions of BC are the second largest contributor to global warming, after carbon dioxide emissions. Warming occurs when BC particles absorb sunlight, convert it into infrared (heat) radiation, and emit that radiation to the surrounding air. A recent study showed that the darkening of snow and ice by BC deposition is a major factor in the rapid disappearance of mountain snowpacks. Melting of the snowpacks is one of the contributing factors to the serious decline in water supply.

CONTAMINATION PRODUCED BY LUBRICATING OILS

By maintaining clean combustion through the consumption of a diesel at optimum cleanliness parameters (ISO 4406: 11/8/7) and a clean engine (ISO 4406: 15/13/10), less contamination (soot) is generated; therefore, the lubricant remains cleaner and oil changes are more efficient, extending its useful life by double and, as a consequence, the amount of waste lubricating oil is reduced by half, a substance with a very high environmental impact on soil, surface water and groundwater.

FMS SOLUTION

DOUBLY GREEN

FMS provides expert solutions that achieve ultra-clean diesel fuels, meeting optimal ISO 4406 parameters, thereby reducing emissions gas generation.



¿HOW EMISSIONS AFFECT PUBLIC HEALTH?

CO₂

Carbon Dioxide:

Natural breathable gas. Its imbalance causes the greenhouse effect (global warming).

CO

Carbon Monoxide:

A toxic, poisonous gas that causes death, heart diseases, and respiratory illnesses.

PM

Soot Microparticles:

Affects breathing, increases allergies, promotes cancer.

HC

Unburned Hydrocarbons:

Affects breathing and promotes cancer.

NO_x

Nitrogen Oxides:

Irritates mucous membranes, affects breathing, promotes cancer.

Every transportation and industrial operation using diesel engines should be certified with ISO 4406 particle contamination controls. This ensures a reduction in emission volumes, an improvement in emission quality to the environment, and a halving of the amount of contaminating waste oils.

Optimal diesel cleanliness (code 11/8/7 or better) results in significant technical and economic benefits for the engine owner. It reduces friction and internal temperature, thereby increasing power output and consuming less fuel (enormous savings). It also reduces wear on moving parts and injection systems (significant savings on repairs and parts), and extends the lifespan of lubricating oil and original fuel and oil filters (substantial savings), among other advantages.

The technical and economic benefits of Premium FMS diesel (ultra-clean and ultra-dry) also translate into significant social, health, and environmental benefits.

