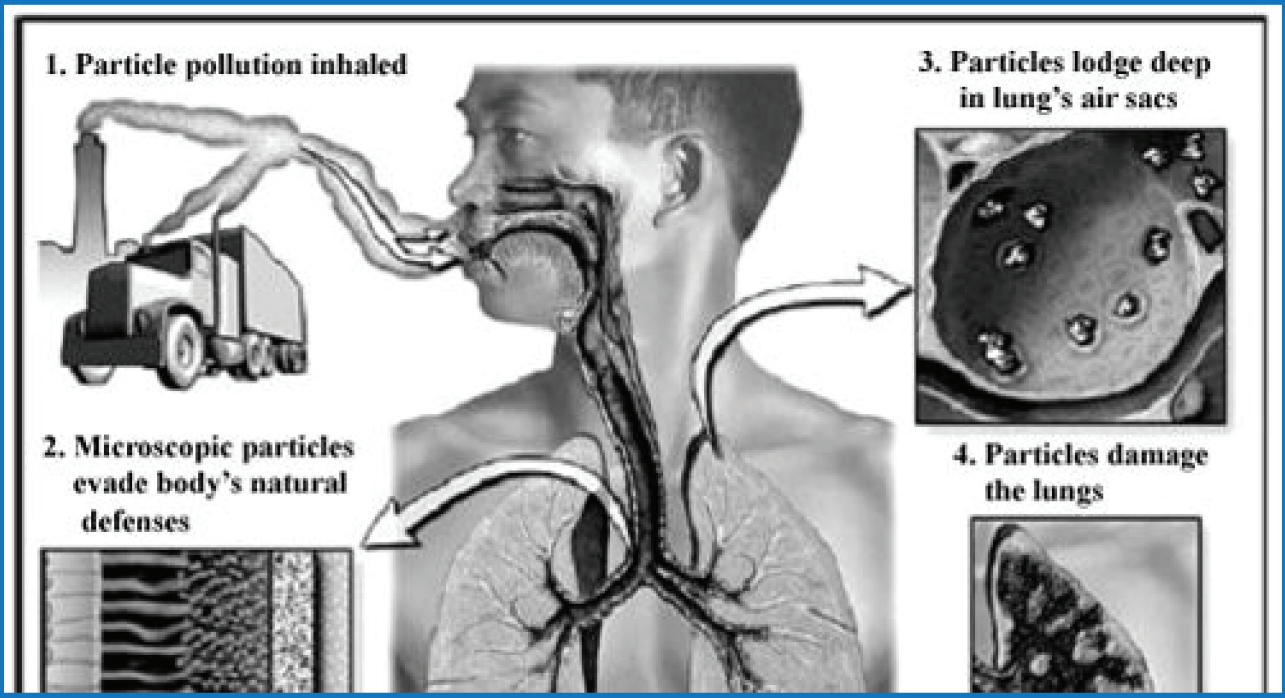
Brought to you by:

John Ratcliffe

Diesel Emissions Part 2 of 2

Part 2

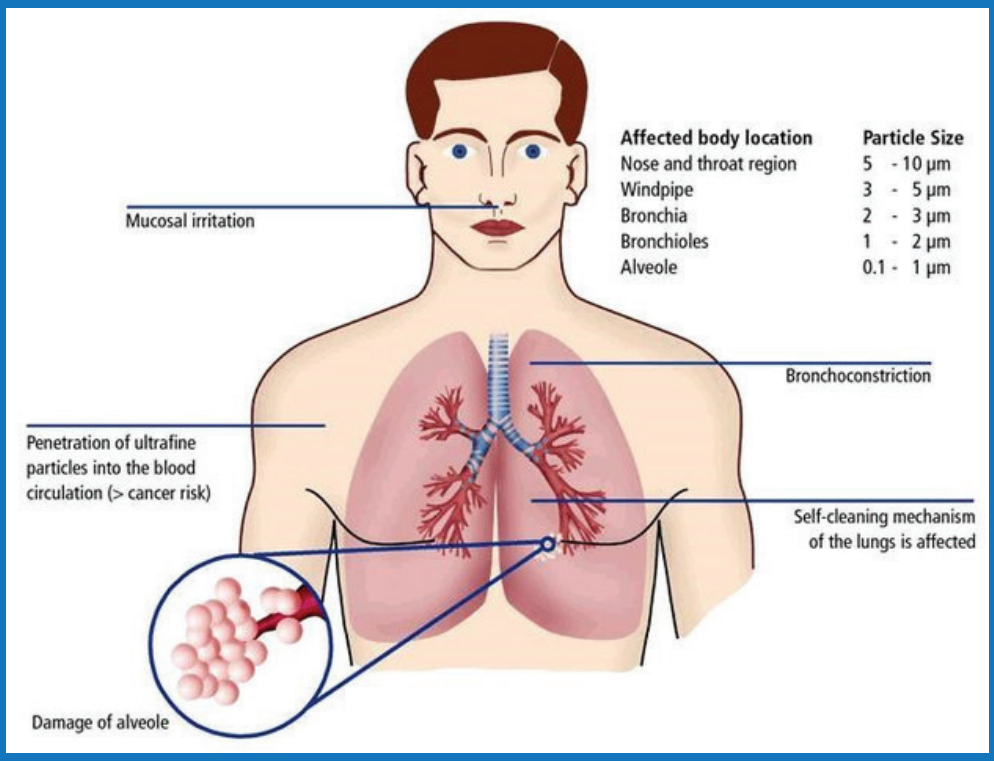


Diesel Particulate Matter (DPM), perhaps the most characteristic of diesel emissions, is responsible for the black smoke/soot traditionally associated with diesel powered vehicles. The diesel particulate matter emission is usually abbreviated as PM or DPM, the latter acronym being more common in occupational health applications. Diesel particulates form a very complex aerosol system.

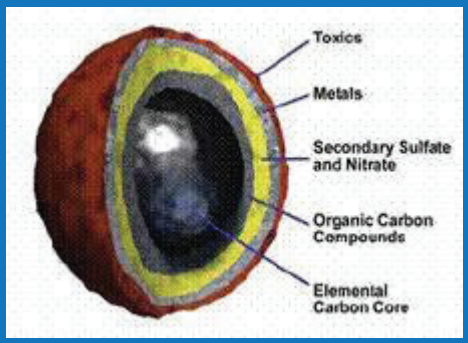
Despite the considerable amount of basic research, neither the formation of PM in the engine cylinder, nor its physical and chemical properties or human health effects are fully understood. Nevertheless, the existing medical research suggests that PM is one of the major harmful emissions produced by diesel engines. This black smoke is not only carcinogenic, affecting the operators' lungs, but deposits will stain paintwork and/or contaminate products manufactured or stored where diesel vehicles frequently work.

Diesel Particulate Matter (DPM) has been classified as a carcinogen to humans (Group 1) by the International Agency for Research on Cancer (IARC) and the World Health Organisation (WHO) in June 2012. Diesel particulates are subject to diesel emission regulations worldwide, and have become the focus in diesel emission control technology.

Continued...



Diesel Particulate Matter (DPM) also has many different types of particles that can be classified by size or composition. The size of diesel particulates that are of greatest concern are in the categories of fine, and ultra-fine particles which can get deep into the lung when inhaled.



The composition of these fine and ultra-fine particles may be composed of elemental carbon with absorbed compounds such as organic compounds, sulphate, nitrate, metals and other trace elements. The most common exposures to diesel particulate matter occur in underground in mining, or indoors within factories and storage facilities with the use of diesel-powered equipment.

The composition of these fine and ultra-fine particles may be composed of elemental carbon with absorbed compounds such as organic compounds, sulphate, nitrate, metals and other trace elements. The most common exposures to diesel particulate matter occur in underground in mining, or indoors within factories and storage facilities with the use of diesel-powered equipment.

John Ratcliffe's Position

Rather than following various international standards on countless different diesel equipment and applications, we have adopted a holistic approach.

This approach is based on the facts already published by the World Health Organisation and the hierarchy of hazard control.
This approach targets the source of the DPM contamination in the workplace and focuses on the elimination of the risk, rather than management thereof!

This approach could save billions in litigation and compensations where operators and employees could prove that management have not applied all knowledge and available technology to eliminate the risks. We already have an ***example*** of this in the asbestos claims recently awarded.

What are the exposure limits for Diesel Particulate Matter?

The Australian Institute of Occupational Hygienists (AIOH) have issued an updated guidance on diesel exhaust particulate and health risks. The document retains the original recommendation that levels of DPM should be controlled to; below 100µg/m³, as an 8 hour average value, measured as submicron elemental carbon (EC).
In South Africa, the regulatory authority (Department of Minerals and Energy) for Mine Health and Safety would normally promulgate regulations controlling the exposure of the workforce to below a specified Occupational Exposure Limit (OEL), which has a similar definition to a TLV. Under the Mine Health and Safety Act (Act 29 of 1996) a Guideline for a Mandatory Code of Practice on the use of diesel engines should also be considered from a health and explosion prevention perspective. The South African Bureau of Standards (SABS) also publishes engine performance standards that can be made legally binding to OEMs and industry when referred to in legislation. There are currently no personal occupational exposure limits or legally binding tailpipe emissions standards in South Africa for DPM. Mining companies are however obliged to conduct risk assessments in terms of Section 11 of the Mine Health and Safety Act (Act 29 of 1996) on all factors that could adversely affect the health and safety of the workforce and institute appropriate mitigation measures, where no local regulations exist, international best practice should be utilised. OEMs are also required to provide a full disclosure, in terms of Section 21 of the Mine Health and Safety Act (Act 29 of 1996) of the health and safety impact of the equipment being sold to a mining company and provide advice on appropriate measures that can be taken to eliminate or reduce the risk.

The Group Environmental Engineers "GEE" committee recognised that several International Agencies have imposed limits for DPM, but also that these limits have been developed in countries where:

- Higher quality diesel fuel with low sulphur content is used;
- Latest generation diesel engines are used;
- Maintenance staff is adequately trained and available for employment to work on these units; and
- Exhaust purification and filter systems are used extensively.

To this extent, the GEE's recommendation for action was to introduce an interim DPM exposure control value and gradually lower this exposure control value by means of a "phased-in" approach as follows:

A DPM exposure control value of 350µg/m3 (TC) up to 31 December 2013;
A DPM exposure control value of 250µg/m3 (TC) for 01 January 2014 to 31 December 2014;
A DPM exposure control value of 200µg/m3 (TC) for 01 January 2015.

As from 01 January 2016 a DPM exposure control value of 160ug/m3 (TC) was supposed to be adopted. This level was however also subjected to review should new knowledge on the risks associated with excessive exposure to DPM become available.
At the date of the GEE's position, the exposure limits in Australia, Canada, United Kingdom and United States of America were as follows and were based on the measurement of particulate constituents as indicated in the table below:

Regulatory/Agency	Exposure Guidelines/Limits	Substance Measured
Canada (Ontario)	400µg/m³	Total Carbon(TC)
US MSHA	160µg/m³	Total Carbon(TC)
Australia	160µg/m³	Total Carbon(TC)
Australia	120µg/m³	Elemental Carbon(EC)

Internationally, DPM is regulated via two mechanisms i.e. Occupational Health and Safety Standards and Tailpipe Emission Standards. Where diesel engines are used in confined spaces, their operation is regulated by occupational health standards in addition to tailpipe emissions.