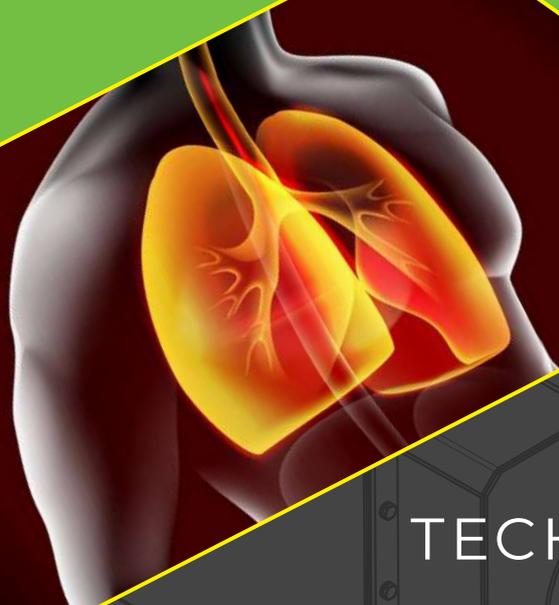


CLEANER  
AIR  
UNDERGROUND

# DPM REDUCTION

- ✓ DPFs - TACKLE DPM AT THE SOURCE FOR CLEANER AIR
- ✓ REDUCING LOAD ON THE VENTILATION SYSTEM
- ✓ SATISFY REGULATED EMISSIONS EXPOSURE TARGETS
- ✓ REDUCING PERSONNEL TO EXPOSURE RISK



TECHNICAL INSIGHTS



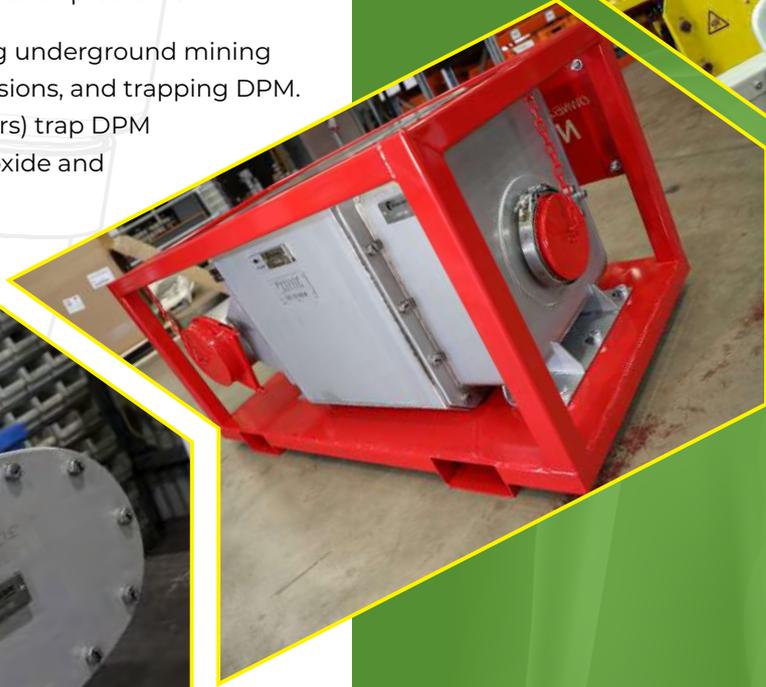
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## HOW A WALL-FLOW DPF WORKS

### A SAFER UNDERGROUND

In confined environments, diesel emissions are hazardous to workers if exposure is for a prolonged period. Diesel Particulate Matter (DPM) exposure increases the risk of serious health problems.

We are committed to making underground mining safer, reducing harmful emissions, and trapping DPM. DPFs (Diesel Particulate Filters) trap DPM while reducing carbon monoxide and hydrocarbon emissions.



## DPM – SMALL PARTICLES, BIG PROBLEM

### DPM IS A CLASS 1 CARCINOGEN

Exposure to diesel emissions can lead to long-term health problems and cancer risk. In a press release from the World Health Organization in 2012, diesel emissions were classified as a Class 1 carcinogen. Many consider DPM to be the 'next asbestos'.

### THE DANGER OF NANO PARTICULATES

Particulate matter from diesel engines is often smaller than one micron in diameter. The particles are now small enough to enter the alveoli (a membrane that usually prevents particles from entering the bloodstream). Nanoparticles (50-1nm) are fine enough to pass through the subtle respiratory membrane.

### SIDE EFFECTS OF DPM

DPM causes both short and long-term health problems. The diagram to the left illustrates some of the most common health effects of diesel particulate matter.

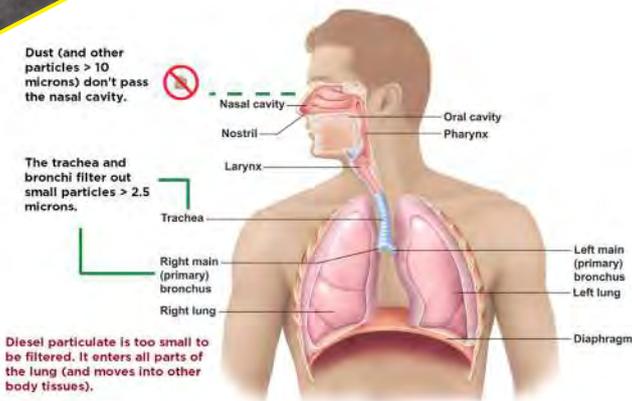


Image: Diesel particulates respiratory dangers (Workplace Safety North, 2018, Page 6)

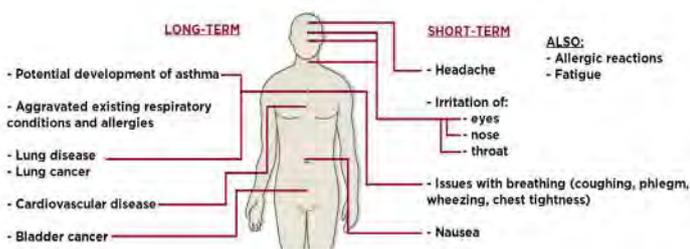
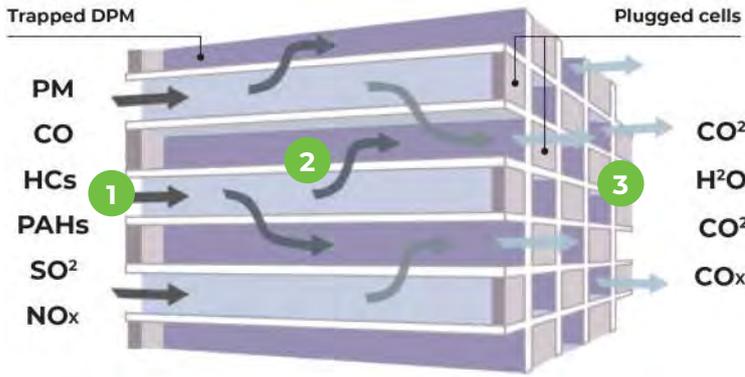


Image: Health effects caused by DPM exposure (Workplace Safety North, 2018, Page 8)

# ENTER DPFs – TACKLE DPM AT THE SOURCE

A DPF (DIESEL PARTICULATE FILTER) IS AN AFTERMARKET OR FACTORY-FITTED ACCESSORY THAT FORMS PART OF THE ENGINE ECOSYSTEM. DPFs TRAP DIESEL PARTICULATE MATTER AND REDUCE CARBON MONOXIDE AND HYDROCARBONS FROM LEAVING THE EXHAUST SYSTEM. THESE FILTERS ARE INSTALLED IN-LINE WITH THE OEM EXHAUST SYSTEM.



## HOW A WALL-FLOW DPF WORKS

- 1 Particulate matter is filtered by forcing exhaust gas through the substrate.
- 2 DPM collects on the walls of the DPF. Once conditions reach a certain point, the catalyst reacts with the gas, temperature, and soot to form a passive regeneration.
- 3 As a by-product of the regeneration process, soot is burned off creating ash. This ash cannot be passed through the DPF or burned off.

### REDUCED TOTAL COST OF OWNERSHIP

### >99% DPM EMISSION REDUCTIONS

### BACKPRESSURE MONITORING



Extended service life can reduce TCO by 30-40%



Heavy-duty stainless steel construction, Australian-made



Optimise DPF lifecycle and performance by tracking backpressure to inform proactive cleaning



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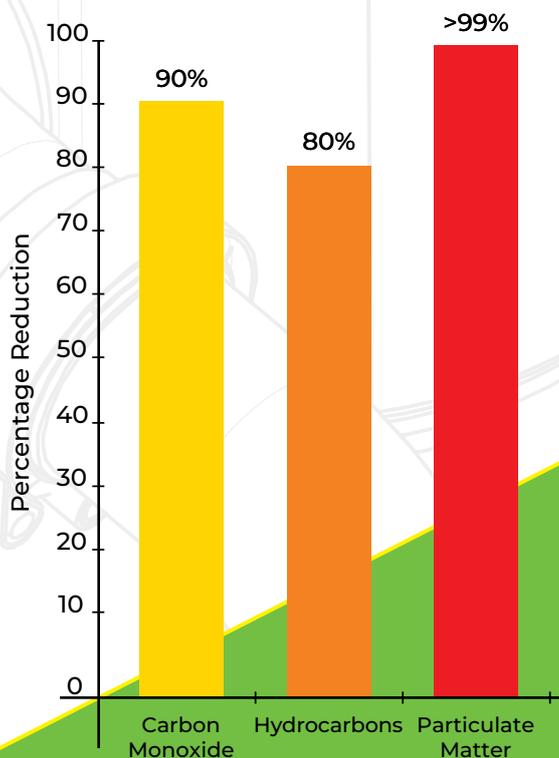
## HOW A WALL-FLOW DPF WORKS

### 1. EXHAUST GAS FILTERING

In a diesel engine, DPFs trap diesel particulates, carbon monoxide, and hydrocarbons. Aletek DPFs break down particulate matter using a complex chemical reaction. This process takes place passively under normal operating conditions. No active regeneration is required.

### 2. REGENERATION PROCESS

Continuous regeneration is achieved when the exhaust gas temperature is above the balance point for greater than 30% of the operating time.



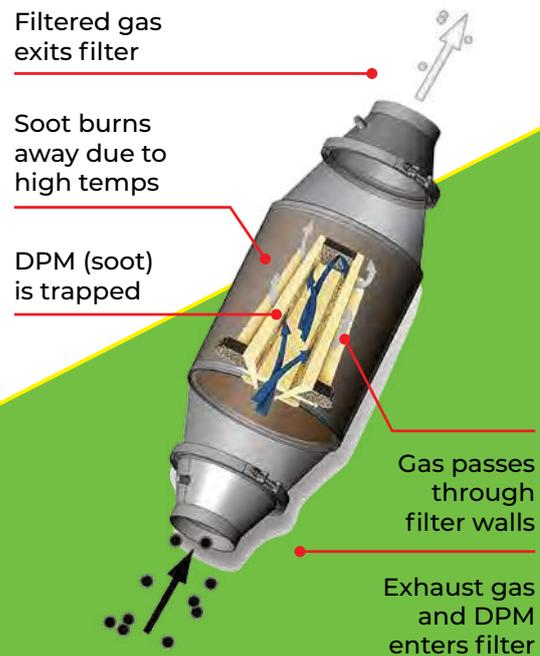
Catalytically-coated monoliths contain long, narrow channels that are open at one end and blocked at the other. As exhaust air passes through the filter walls, particulate matter (soot) is trapped in the filter. High exhaust gas temperatures burn away soot particles and convert them to innocuous gas. In addition, the DPF converts carbon monoxide (CO) and diesel hydrocarbons (HC).

### OPTIMAL OPERATING CONDITIONS:

- >60% load for >30% of operating time; or
- >350°C for 30% of the operating time

### 3. REMOVING HARMFUL DPM

Aletek's premium wall-flow DPFs use a catalytically coated cordierite substrate. Soot particles are captured in these DPFs with >99% efficiency. The DPF regenerates passively through a complex chemical reaction when key elements align, such as gas levels and soot loading. As a result of this reaction, DPM is converted to ashes which are contained in the filter. Carbon is converted into gases and expelled through the exhaust during this conversion process.



### THESE ENVIRONMENTAL FACTORS INFLUENCE OPERATING CONDITIONS BOTH POSITIVELY AND NEGATIVELY:

- Engine design
- O<sub>2</sub> operational levels (oxygen)
- Fuel type
- Operational duty-cycles



References:  
Workplace Safety North, 2018.  
Hazards Associated with  
Diesel Exhaust Emissions.  
[www.workplacesafetynorth.ca](http://www.workplacesafetynorth.ca)

