SAFEair

The world's leading filtration and pressurisation system

- Greater return on investment
- Safer working environment
- Future proofing your mine site

WORKAIRTECH FREUDENBERG FILTRATION TECHNOLOGIES

FREUDENBERG INNOVATING TOGETHER

A PRE FILTER ASSEMBLY
(FILTER HEAVY CONTAMINANTS-CYCLONE)

B FIRST STAGE FILTER
(FILTER COARSE DUST PARTICLES)

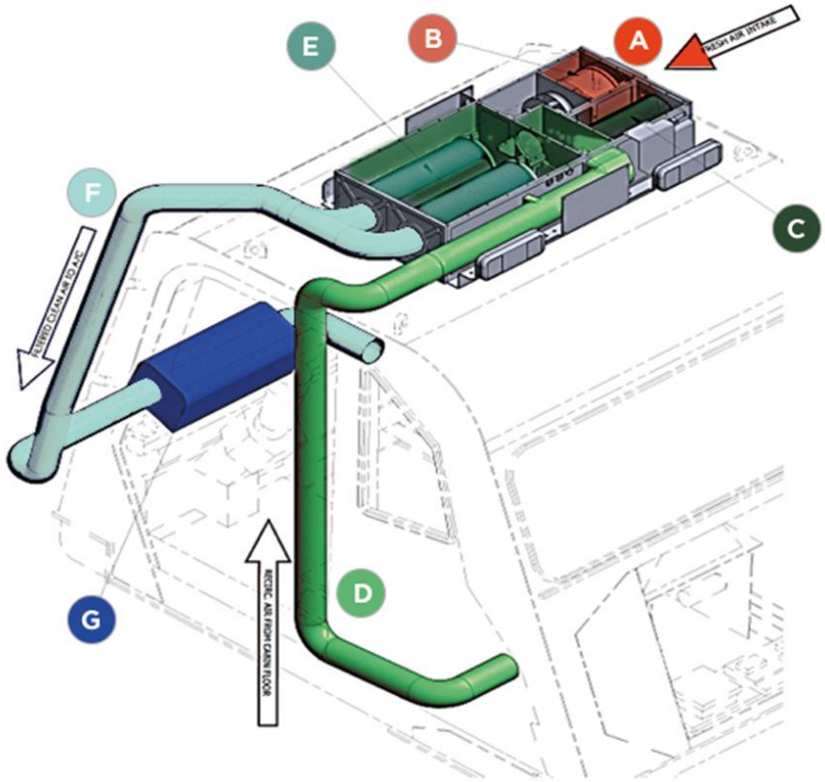
C 2ND STAGE HEPA FILTER
(FILTER SUB MICRON PARTICLES)

D SNORKEL (RECIRCULATION LINE)
The fan draws the air from the bottom rear of the cabin, pulling any contaminants dislodged from occupant clothing/shoes away from their breathing zone. This air is recirculated back to the 3rd stage HEPA filters via the snorkel where it is combined with fresh air from stage 2.

E 3RD STAGE HEPA FILTER
(FILTER SUB MICRON PARTICLES)
The fresh air in conjunction with the recirculated air is then filtered through the 3rd stage HEPA filters to eliminate sub micron particles.

F MANIFOLD CONNECTION TO A/C
(CLEAN AIR TO CABIN)
Clean HEPA filtered air enters the A/C Unit and enters the cabin via the air vents, into the breathing zone of the occupant(s).

G AIR CONDITIONER SYSTEM



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QUICK REMOVAL OF RESIDUAL IN CABIN

Occupants entering into the cabin expose the cabin to the outside dust. Once the cabin door is shut the SAFEair unit quickly removes the contaminated air via the suction pipe through to the HEPA filters to deliver clean air back into the cabin.

INCREASED AIR CONDITIONING PERFORMANCE

There is increased air conditioning system reliability due to the integration of the vehicle's air conditioning system with the SAFEair unit.

HOSPITAL GRADE AIR

The HEPA filters provide hospital grade air into the cabin for the occupant.

LEAK PROOF SYSTEM

The suction line remains under positive pressure at all times. In the unlikely event of a hole occurring in the suction line, the air will still flow out the suction pipe and not back into the cabin due to the positive pressure.

EXTENDED LIFETIME OF ELECTRONIC COMPONENTS IN CABIN

All of the cabin's electronic components such as switches and connectors last longer because they are not exposed to dust. In addition, the end of shift cleaning time is greatly reduced.

CONSISTENT MINIMUM 100Pa PRESSURE

The SAFEair system delivers a constant minimum required pressure of 100Pa. The air conditioner fan speed knob controls the required pressure in the cab to 100Pa, although the industry standard is 50Pa. Should there be any leakage due to open window(s), the fan speed can be increased by the driver to achieve minimum pressure required in the cab.

REDUCED CO2 LEVEL IN CABIN

When a new SAFEair unit is fitted to a mine vehicle, the cab is deliberately not entirely sealed. Purged air is exchanged for HEPA clean, fresh air resulting in lower levels of CO2 in the cabin.

CLEAN EVAPORATIVE COIL

The evaporative coil of the vehicle's air conditioner remains clean, as it is not exposed to dust due to integration with the SAFEair unit.

INTERACTIVE TOUCH SCREEN PANEL

An interactive touch screen panel mounted inside the cab with password protected settings and alarm set to minimum 50Pa to alert the driver to take corrective action.

We deliver a SAFER mine site

Without SAFEair
after 3 months

With SAFEair
after 5 years

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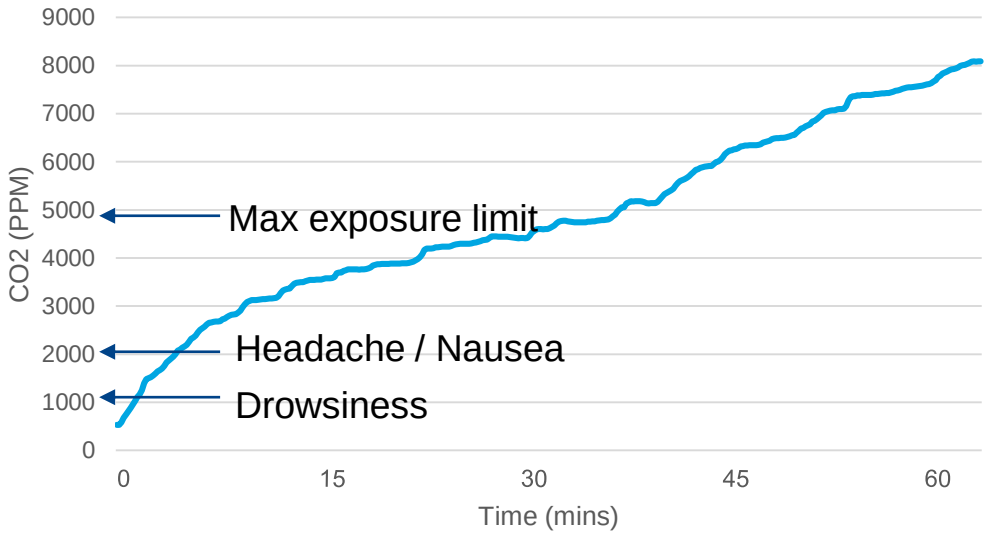
CO2 levels

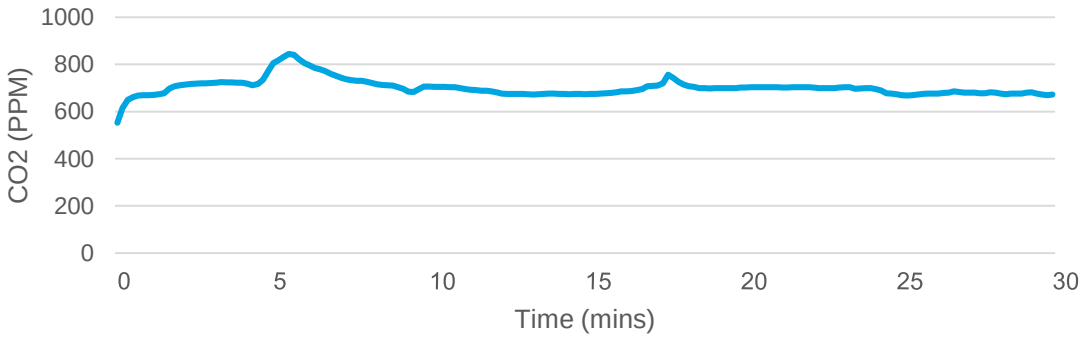
250-500ppm	**Normal background concentration in outdoor ambient air**
400-1,000ppm	Concentrations typical of occupied indoor spaces with good air exchange
1,000-2,000ppm	Complaints of drowsiness and poor air.
2,000-5,000ppm	Headaches, sleepiness and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.
5,000ppm	Workplace max exposure limit (as 8-hour TWA) in most jurisdictions.

Carbon Dioxide- LV Cabin with standard A/C system



- All doors open to start, then all shut with 2x occupants
- OEM A/C system set to recirc
- 500 PPM → 8000 PPM and rising in 60 minutes!
- What is site policy?
- Do OEM pressurisers allow for fresh air exchange?
- Dongas?

Carbon Dioxide- LV Cabin with Freudenberg S.A.F.E.air system



- All doors open to start, then all shut with 2x occupants
- CO2 level is maintained at ambient level for duration of test and ongoing

Diesel Nanoparticles

30 Million particles

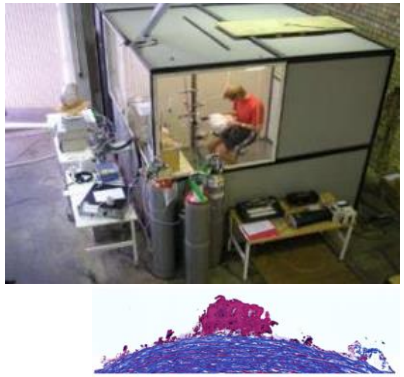
Without effective **Diesel Emissions Control** in an underground mine….

…workers can inhale 30 Million Diesel Particles **with each breath**.

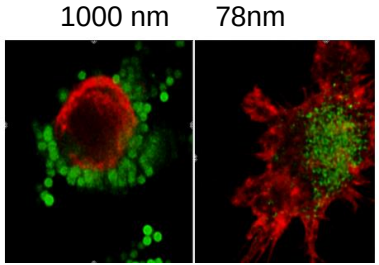
What are the health risks of Diesel Nanoparticles?

- Nemmar et al Study, 2002
  - Nanoparticulate quickly translocates into circulation
  - Traced around entire body.
  - Takes many hours for the body to expel them.

- DPM Carcinogen classification mainly to do with Lung Cancer.
- DPM health effects span far wider than lung cancer and include
  - **Bladder Cancer** (Latifofic et al, 2015)
  - **Blood Vessel Function** (Mills et al, 2005)

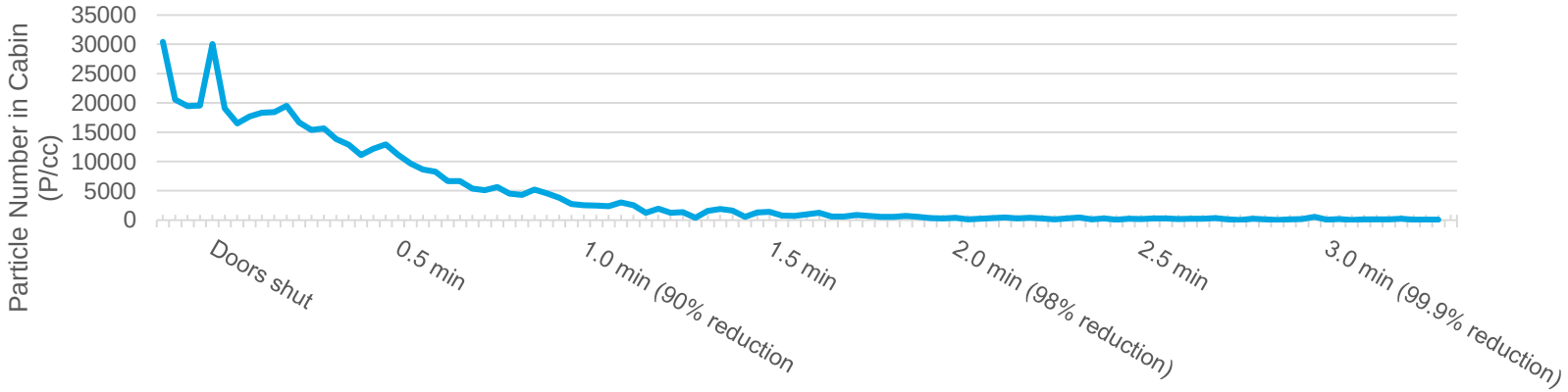


  - **DNA Damage**
    - Duan et al, 2016
    - Rothen-Rutishauser, U. Berne
    - Sunrise Dam



- Styrene particles (Green)
- Human cell (Red)

Nanoparticle reduction- Toyota Landcruiser Cabin with S.A.F.E.air, Perth airport



- All doors open to start, then all shut
- Average particle size= 10 nanometers (Aviation fuel combustion-4x smaller than DPM)
- 25,000 Particles per cubic centimetre ⟶ <100 Particles per cubic centimeter **(>99.9%)** in 1.5 mins
- Same test done in diesel workshop (average size= 40 nm)
  - 300K P/cc ⟶ <100 P/cc **(>99.9%)** in 2 minutes

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