

Freudenberg S.A.F.E.air Cabin Protection Systems

Security
Against
Fine
Elements

Provide your workforce with a cleaner, cooler working environment

 **FREUDENBERG**
INNOVATING TOGETHER

FREUDENBERG
FILTRATION TECHNOLOGIES

 **WORKAIRTECH**

Delivering Clean Air

Safeguard your workers' future health with S.A.F.E.air

NATA THIRD PARTY CERTIFIED



Greater return on investment



Safer working environment



Future proofing your mine site



MINING

- » Operator enclosures
- » Air quality control systems
- » Air quality performance testing (Reducing health risk to mobile mining fleet operators)
- » Majority of existing mining mobile fleet will not conform
- » Freudenberg S.A.F.E.air cabin protection systems provide the optimum solution

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 **WORKAIRTECH**

ISO 23875 Air quality performance testing key criteria

ISO 23875 Air quality control system key criteria

Criteria	Requirement	Issues with existing Air handling systems	Freudenberg SAFEair solution
In-Cab Carbon Dioxide (CO2) levels	<ul style="list-style-type: none"> CO2 <400 ppm above ambient Continuous CO2 monitoring Alarm at 1000 / 2500 PPM 	<ul style="list-style-type: none"> No fresh air exchange, having a pressurizer separate to the A/C circuit A/C circuit 100% recirculation Pressurizer is pushing against a "dead-end" Nowhere for used gasses to be exhausted Major CO2 concern Fatigue related accidents CO2 reaches unsafe level in a few minutes 	<ul style="list-style-type: none"> Continuous fresh air Exhaust systems for fresh air exchange CO2 is maintained at ambient levels and continuously monitored (in-vehicle and remote via telemetry)
Respirable particulate matter removal	<ul style="list-style-type: none"> In-service performance test Fill cabins with smoke (2K-5K $\mu\text{g}/\text{m}^3$) Reduce this to less than 25 $\mu\text{g}/\text{m}^3$ within 2 minutes 	<ul style="list-style-type: none"> Filtration only on pressurizer No filtration on recirculated air Dust enters when doors are opened (or on operator boots/ clothing) Recirculates infinitely or until taken out by human lungs. Filtration (if included at all) is typically not to a HEPA level and inappropriate for mining dusts. Smaller dusts like Silica, Asbestos and Diesel Particulate may pass straight through existing filters 	<ul style="list-style-type: none"> High flow fan technology Full cabin air exchange through HEPA rated filters within 20 seconds Eliminates respirable particulate matter and much finer dusts like diesel nanoparticles
Positive pressure	<ul style="list-style-type: none"> Cabin pressure >20 Pa higher than atmospheric 	<ul style="list-style-type: none"> Existing systems with no pressurizer run close to atmospheric pressure Existing systems with pressurisers increase pressure but not allow for fresh air exchange 	<ul style="list-style-type: none"> Integrated electronic flow control Allows positive pressure up to 200 Pa with fresh air exchange)

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Air flow directions	<ul style="list-style-type: none"> Airflows to be directed away from the operator From breathing zone down to recirculation air intake 	<ul style="list-style-type: none"> Many blow dust accumulated at floor level from boots in to occupant breathing zone Many introduce air in to cab directly adjacent to recirculation intake (ineffective way to ventilate entire cabin) 	<ul style="list-style-type: none"> Laminar downflow through vehicle In to breathing zone and out furthest / lowest point of cabin
Dual filtration circuits	<ul style="list-style-type: none"> Fresh air and recirculation air filters 	<ul style="list-style-type: none"> No recirculation filtration 	<ul style="list-style-type: none"> HEPA level filtration on both circuits
Maintenance /filter precleaners	<ul style="list-style-type: none"> Filter maintenance intervals shall be considered Precleaners are recommended 	<ul style="list-style-type: none"> Extensive and regular maintenance; Clogged filters from lack of precleaners to take out larger dusts Fouled A/C components from lack of recirculation filtration 	<ul style="list-style-type: none"> Cyclonic precleaners and coarse dust filters to prolong HEPA filter life Fit standard maintenance schedules (1K-2K hours) Total A/C system protection through HEPA recirculation filtration Eliminates fan & condenser maintenance due to dust ingress
System Leakage	<ul style="list-style-type: none"> Careful attention shall be given to low pressure areas of A/C circuit 	<ul style="list-style-type: none"> Leakage in low pressure areas of A/C circuit allows unfiltered air in to cabin 	<ul style="list-style-type: none"> Full system (cabin and A/C circuit is pressurized No vacuum areas where dust may be sucked in)