



Sustainable Tunnel Vision  
controls fine dust emission

# FDRS - TUNNELS

Protecting a tunnel  
environment from PM<sub>2.5</sub> and  
PM<sub>10</sub> fine dust Emissions



# The Future of Cleaner Tunnels with FDRS

*Imagine a smart, sustainable, powerful but noise-free air purifier to capture particulate matter PM2.5 (fine dust) in every tunnel. StaticAir's FDRS is the only system of its kind, especially made for tunnel application.*

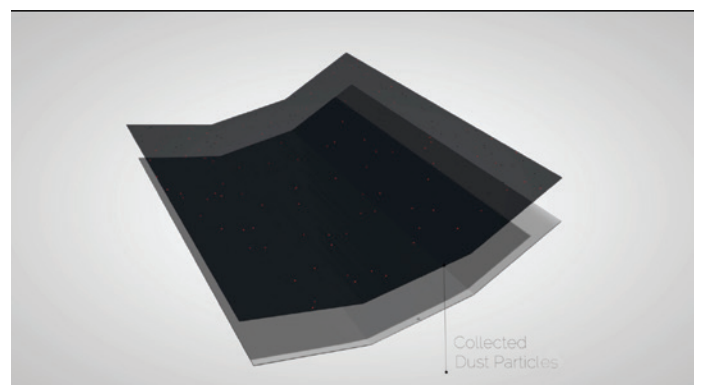
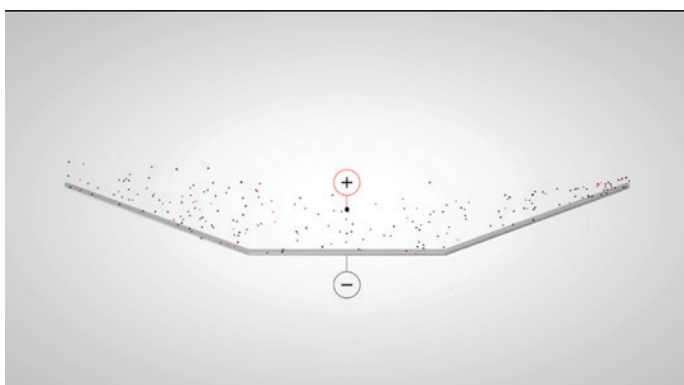
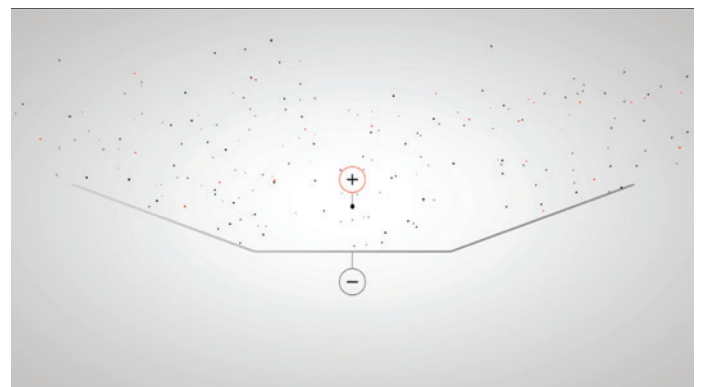
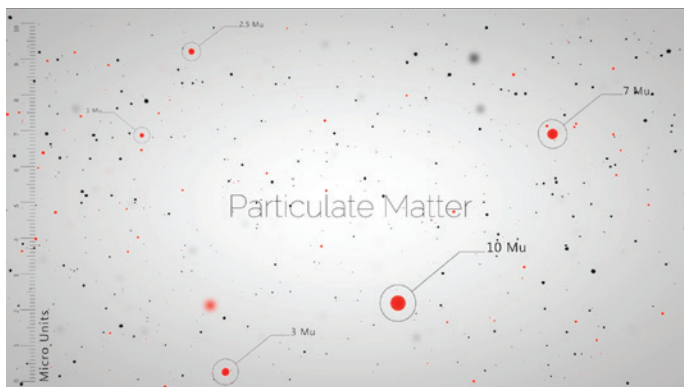
## PATENTED IONIZATION TECHNOLOGY

The FDRS is equipped with a patented and approved ionization technique by the official Dutch scientific research institute TNO and designed in cooperation with TU Delft. The system captures and reduces fine dust from traffic sources in tunnels.

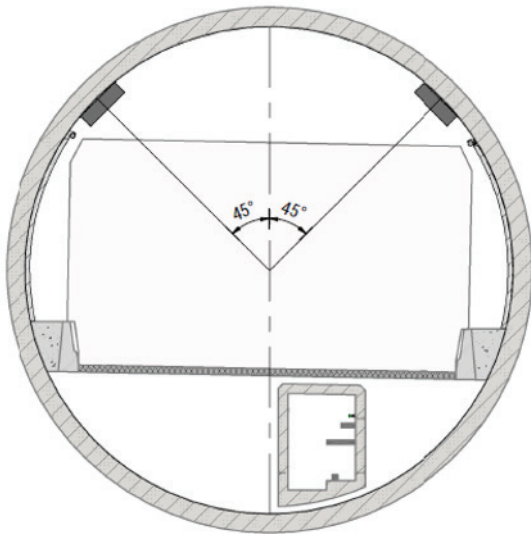
## PROVEN & TESTED SYSTEM

The development of FDRS was carefully monitored, while testing the system in an existing tunnel in The Netherlands. The results were convincing and led to other large scale projects that integrated this unique FDRS fine dust solution. Until today the FDRS lives up to its promise, typically reducing >50% of PM2.5 in tunnels.

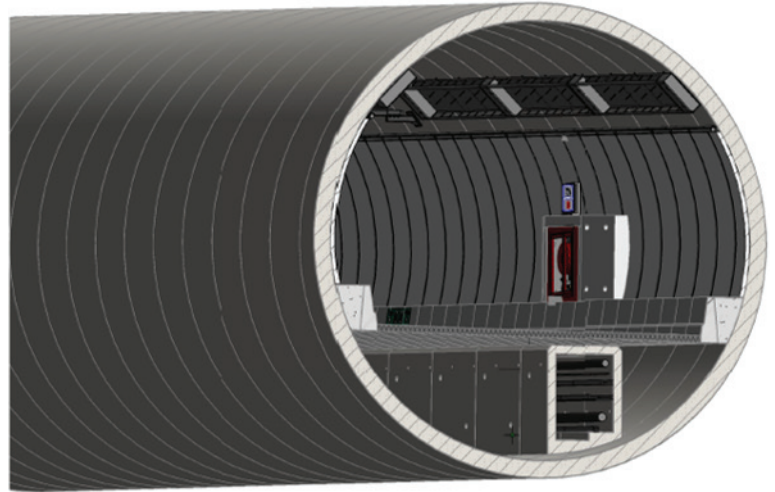
“Non-exhaust emissions expected to be responsible for the majority of PM emissions in future years”



## Installation example



Cross section Tunnel  
Scale 1:100

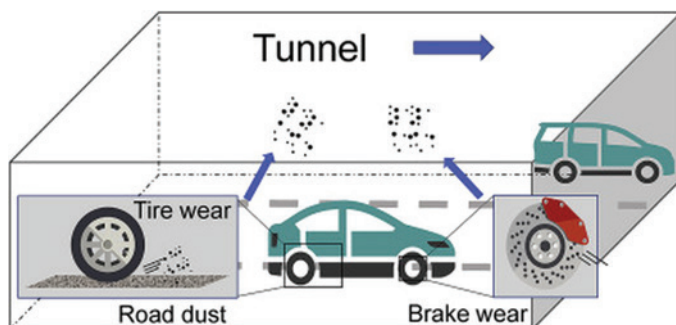


3D presentation FDRS in Tunnel

### EXHAUST vs NON-EXHAUST EMISSIONS

While emission standards are becoming more stringent worldwide, non-exhaust PM emissions like microplastics and micrometals are getting more attention. In many countries exhaust emissions have decreased with the introduction of electric vehicles (EV's). Nevertheless the focus on non-exhaust emissions like microplastic and micrometals are expected to be responsible for the vast majority of finedust pollution from road traffic in future years.

WHO warns for the impact of non exhaust emissions on public health and wellbeing as there are no safe concentration levels of PM2.5.



(Figure A: Non-exhaust PM emissions)

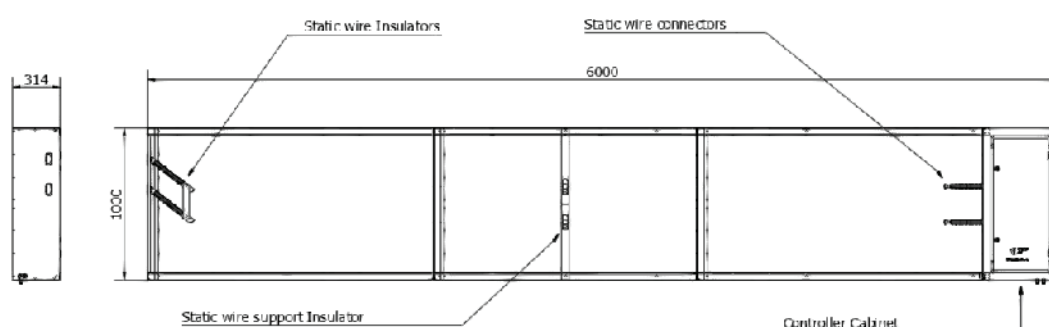
"FDRS innovation captures >50% of PM2.5 emissions"

### UNIQUE FEATURES FDRS:

- Proven and tested system
- Low life Cycle Costs (LCC)
- Extremely low power consumption (20 watt)
- No replacement of expensive filters
- Low maintenance intensity
- I/O connection to tunnel management system
- IoT connected
- Scalable innovation that works
- Made in The Netherlands



# FDRS Specs



## DESIGN PHYSICS

Configuration	Rectangular
Dimensions L x W x H	6000 x 300 x 1000 mm (standard)
Net weight	110 KG
Material	Sustainable stainless steel frame
Colour	Steel colour
Mounting options	Wall mounting

## PERFORMANCE

Volume	Depending on air flow
Air flow	Uses natural present air flow
Capacity	Patented passive ionization technology
Reduction	50%* Particulate Matter PM10, PM2.5 - PM0.1
Noise level	Silent operation - 0 dBA
Application area	All tunnels
Humidity tolerance	0-99%
Temperature tolerance	-10°C to 60°C

## ELECTRIC SPECS

Power supply	230V/110V
Power consumption	20 Watt
IP classification	IP 65
Control	LED indicator

## MAINTENANCE

Wire set replacement	1x per year*
Low maintenance cleaning	High pressure water jet

## OPTIONAL

Tunnel Management connection	I/O connection for monitoring and switch on/off
Smart City IoT technology	LoRa or LTE option for dashboard management connection
FDRS Custom design	Color, length

## PRODUCTION

Locally produced in The Netherlands

\* Depending on local situation and positioning



## SMART TECHNOLOGY

The digital infrastructure of a tunnel requires systems with remote monitoring equipment. All StaticAir systems have the option to be equipped with LoRa or LTE technology. Smart integration offers IoT (Internet of Things) for the FDRS to connect to tunnel management dashboards in order to track performance and system status 24/7. Traditional cable connection is always possible. Our systems can be completely adapted to the wishes of the customer.



“Stop mixing  
dangerous Fine Dust  
with Fresh Air!”

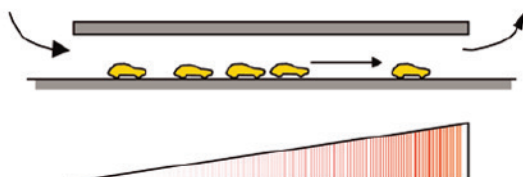


Figure A: Build-up of PM2.5 and PM10 concentrations in tunnel tubes.

## FINE DUST BEHAVIOR IN TUNNELS

The build-up of fine dust air pollution at tunnel mouths is the result of traffic passing through the tunnel as well as tunnel ventilation. FDRS ideally captures fine dust in tunnels at tunnel mouths. In this way PM2.5 pollution (as well as PM10) from tunnels can be reduced for vulnerable urban area's. StaticAir developed the FDRS (Fine Dust Reduction System) especially for this purpose.

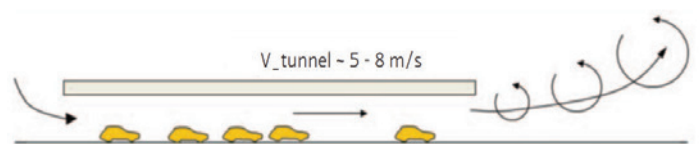
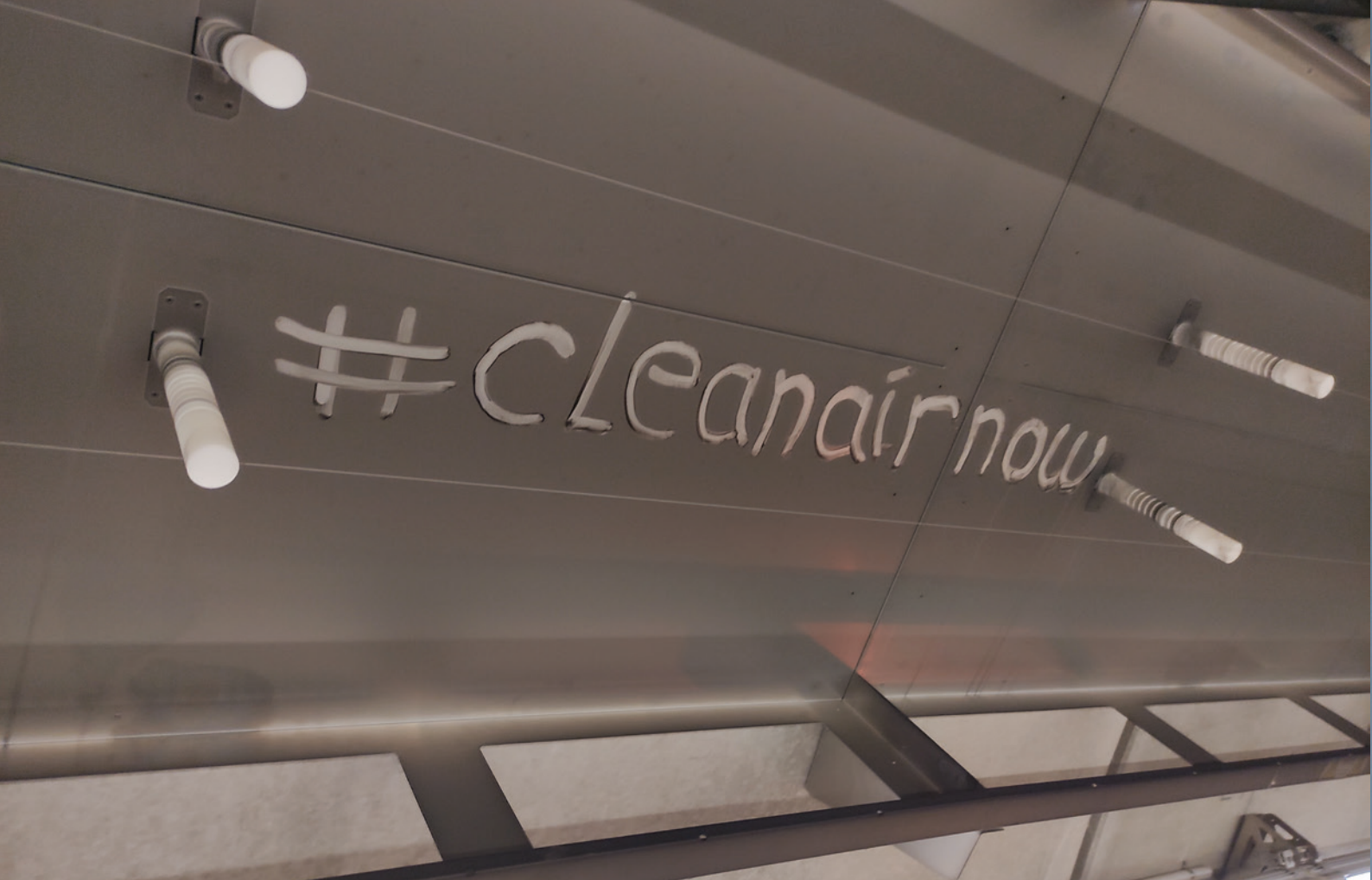


Figure B: Jet flow (impuls) + traffic turbulence + wind impact and air speed in tunnels.





**Contact:**

De Aaldor 28  
4191 PC Geldermalsen  
The Netherlands

T: +31 (0)345 – 745 920  
I: [www.staticAir.com](http://www.staticAir.com)  
E: [info@staticair.com](mailto:info@staticair.com)

Reference agent:

