

Per-Tec Ltd



THE UNIVERSITY
of MANCHESTER
ENGLAND

Power Trap™.

Ultrafine PM Control without Performance Penalties

Presented By:

Peter Kukla Managing Director, Per-Tec Ltd

Presented August 25th , DEER 2003, Rhode Island, USA

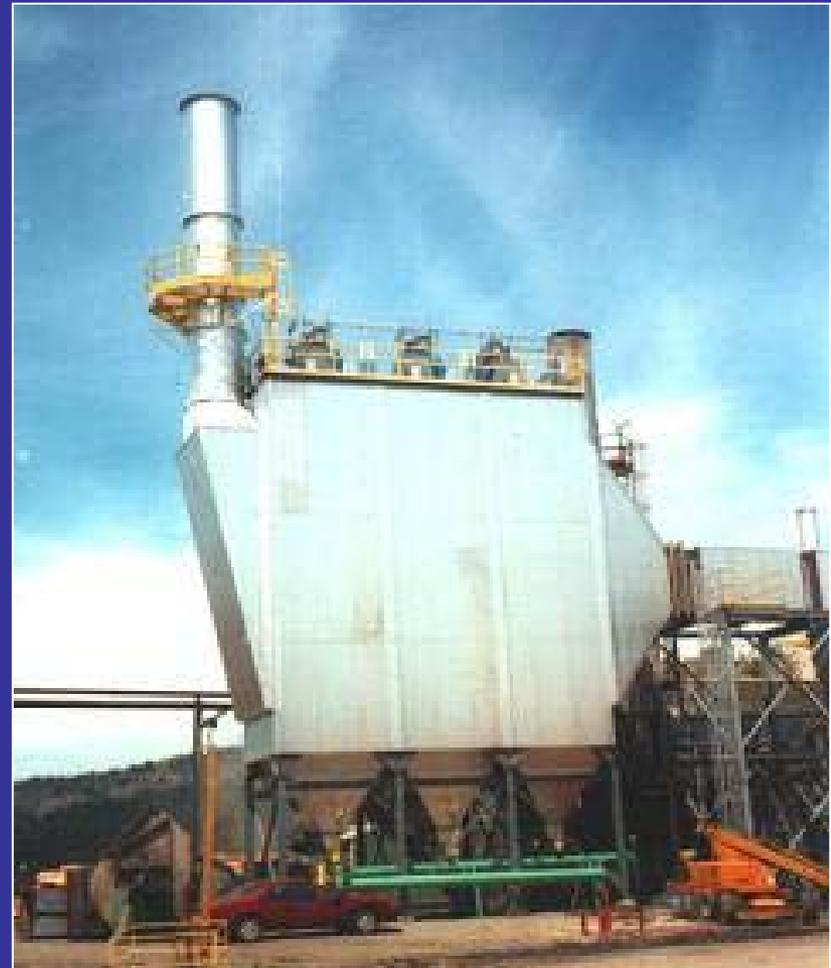
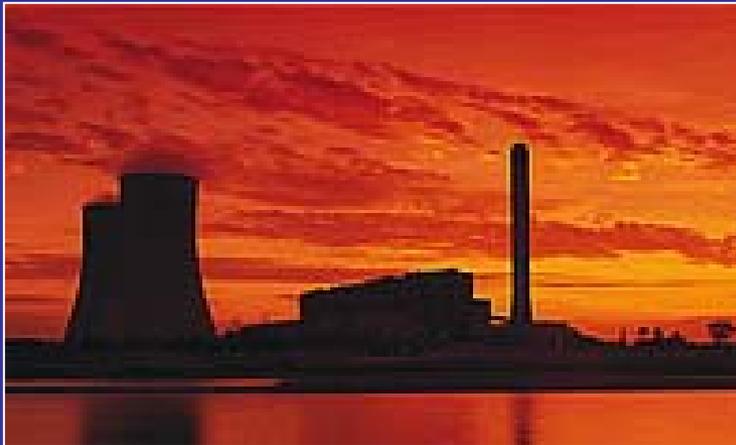
Today's Presentation

- Company Introduction
- The Product
- How It Works
- Applications
- Features
- Test Results
- System Maturity
- Case Studies

Per-Tec Ltd

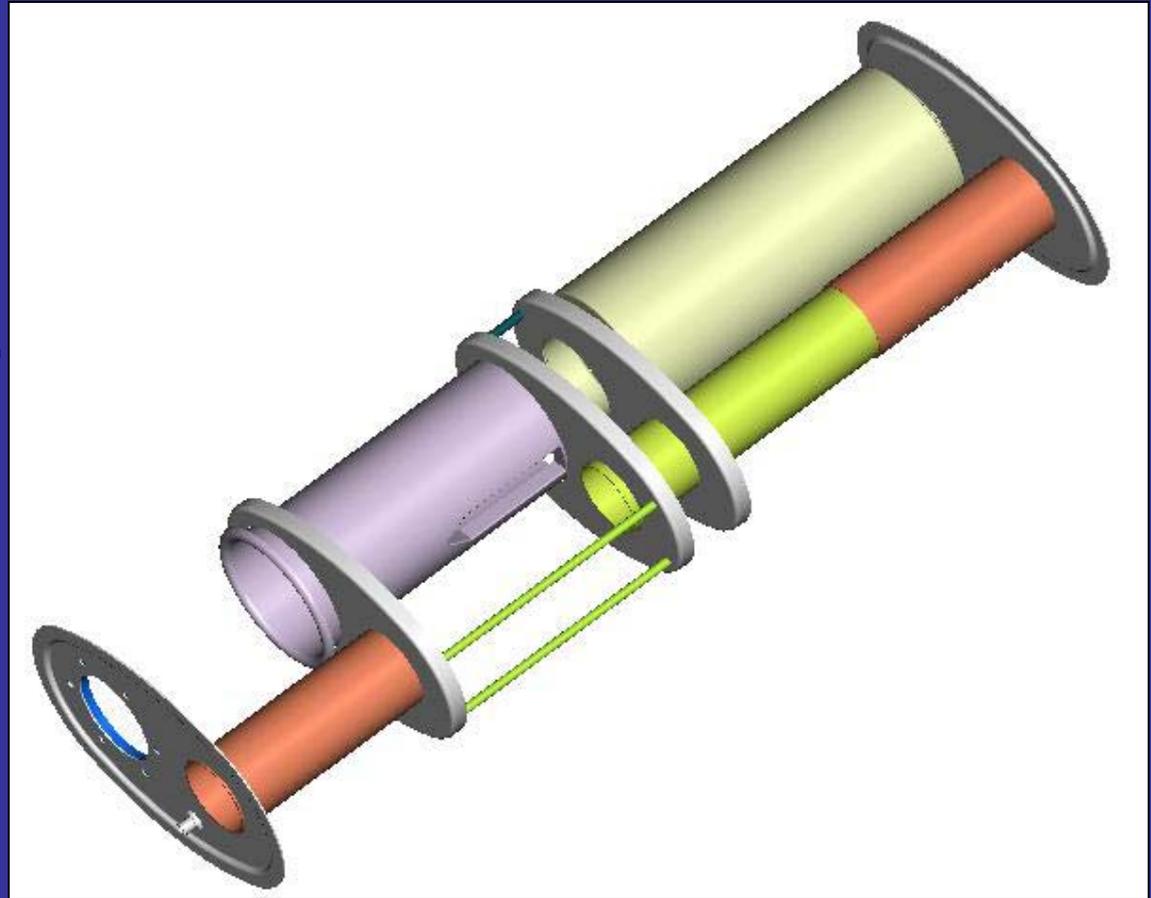
- 15 Years of Research
- Awards
 - DTI SMART Innovation Award
 - Mersey Basin Environmental Innovation Award
 - Green Fleet Diesel Innovation Award

Electrostatic Precipitation is Well Understood

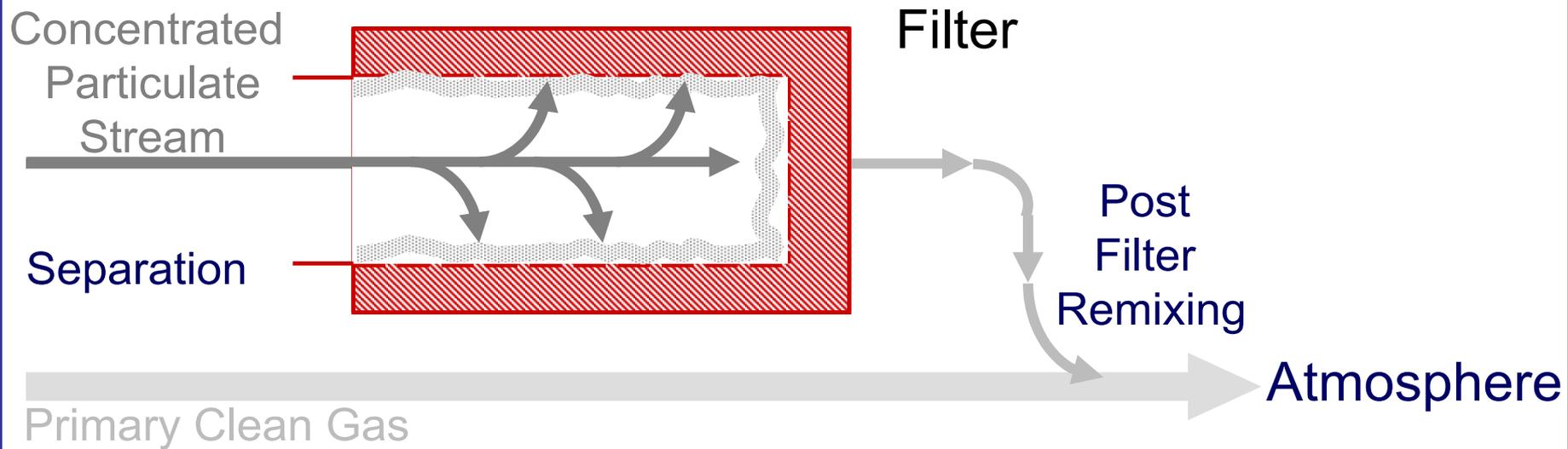
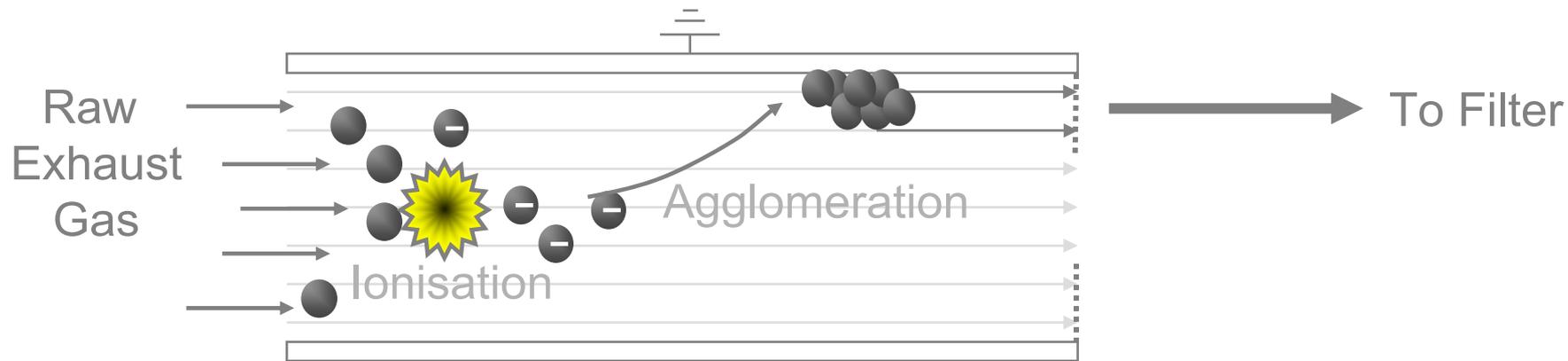


PowerTrap™

- **Electrostatic Precipitation Process**
- **Non-Temperature Dependent System.**
- **Cannot Physically Block.**
- **Controlled Regeneration**
- **Low Power Source**



The PowerTrap™ Process



Existing Trials



PowerTrap™ Features Page 1

- Controlled Regeneration Process from Vehicle's Own Power
- Controller Monitors % Time vs. % Load to Determine Regeneration Point
 - CPU is Fully Programmable

PowerTrap™ Features Page 2

- Back Pressure is Pre-Determined
- Fuel Sulphur Tolerant
 - System Tested with both on and off- road diesel to 2000 ppm.

PowerTrap™ Features Page 3

Euro 4 Requirement

**Dashboard
Operational
Indicator**



- Dashboard Indicator to Confirm System is Operational

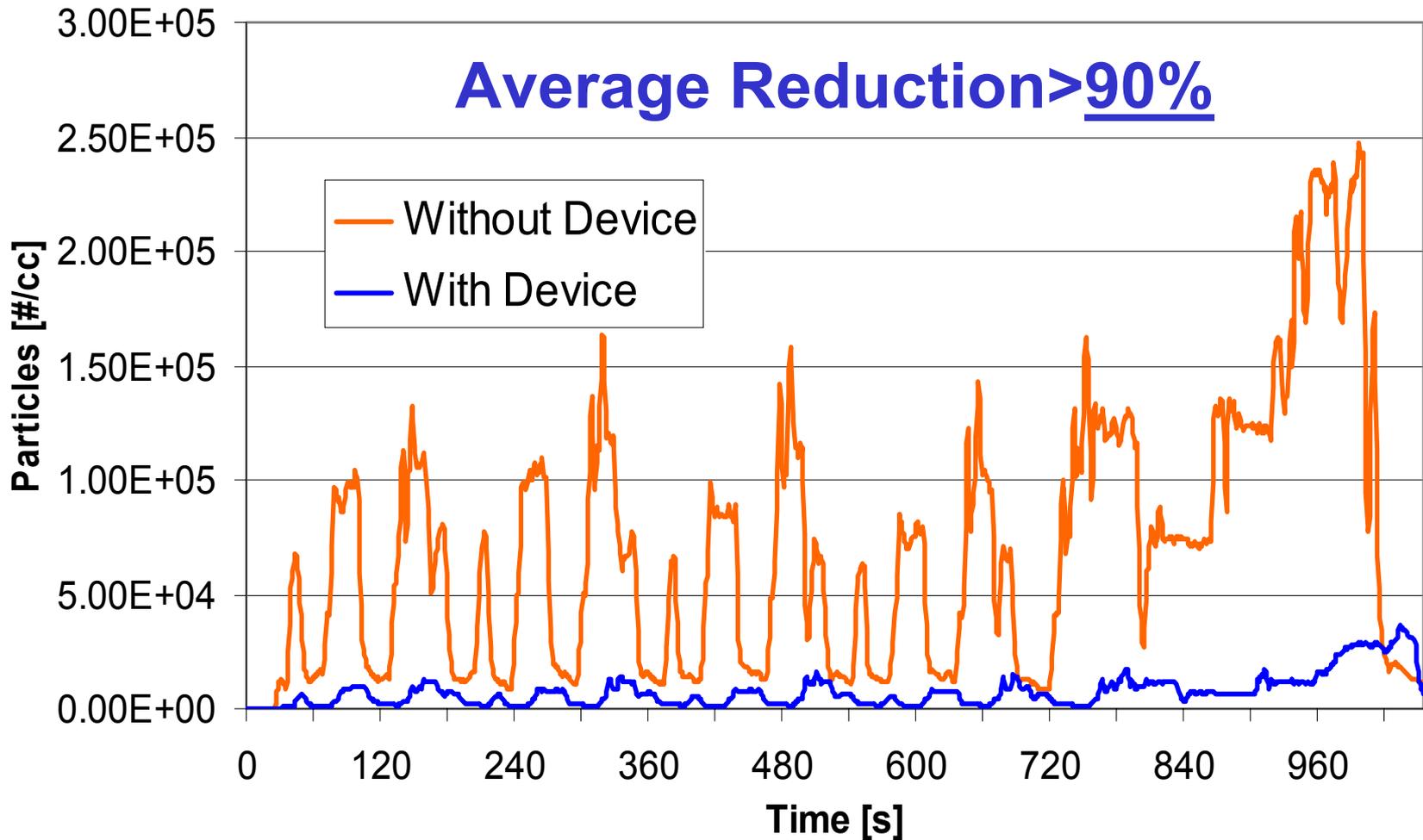
PowerTrap™ Features Page 4

- Power Consumption
 - 12 V System
 - **Electrostatic Process (Continuous DC)**
Average 15 Watts
 - **Periodic Regeneration (once every 12-15 hrs)**
 - Average 40 Amps for a 60-80 second period
 - 24 V System
 - **Electrostatic Process (Continuous DC)**
Average 15 Watts
 - **Periodic Regeneration (once every 4-7 hrs)**
 - Average 35 Amps for a 50-60 second period

PowerTrap™ Features Page 4

- **Potential to Replace Original Silencer**
 - **Excellent Noise Reduction Performance**
- **Platform Flexibility**
 - **The Power Trap System has been Designed to Accommodate Available Filtration Technology and Coatings**

EU Light Duty Transient Drive Cycle Cold Start 60nm CPC (2.5ltr Euro 1)

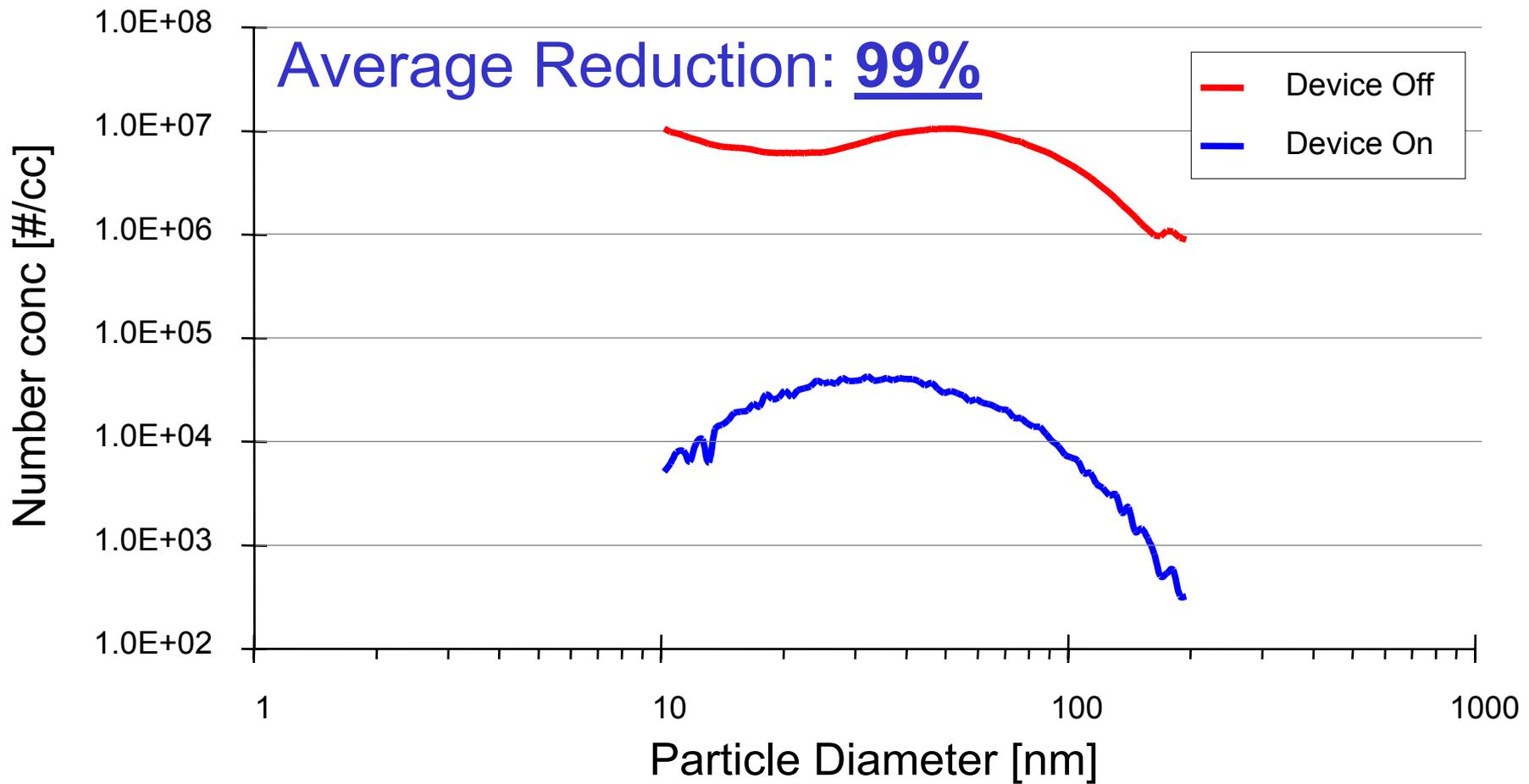


Independently Tested by:



Shell Global Solutions

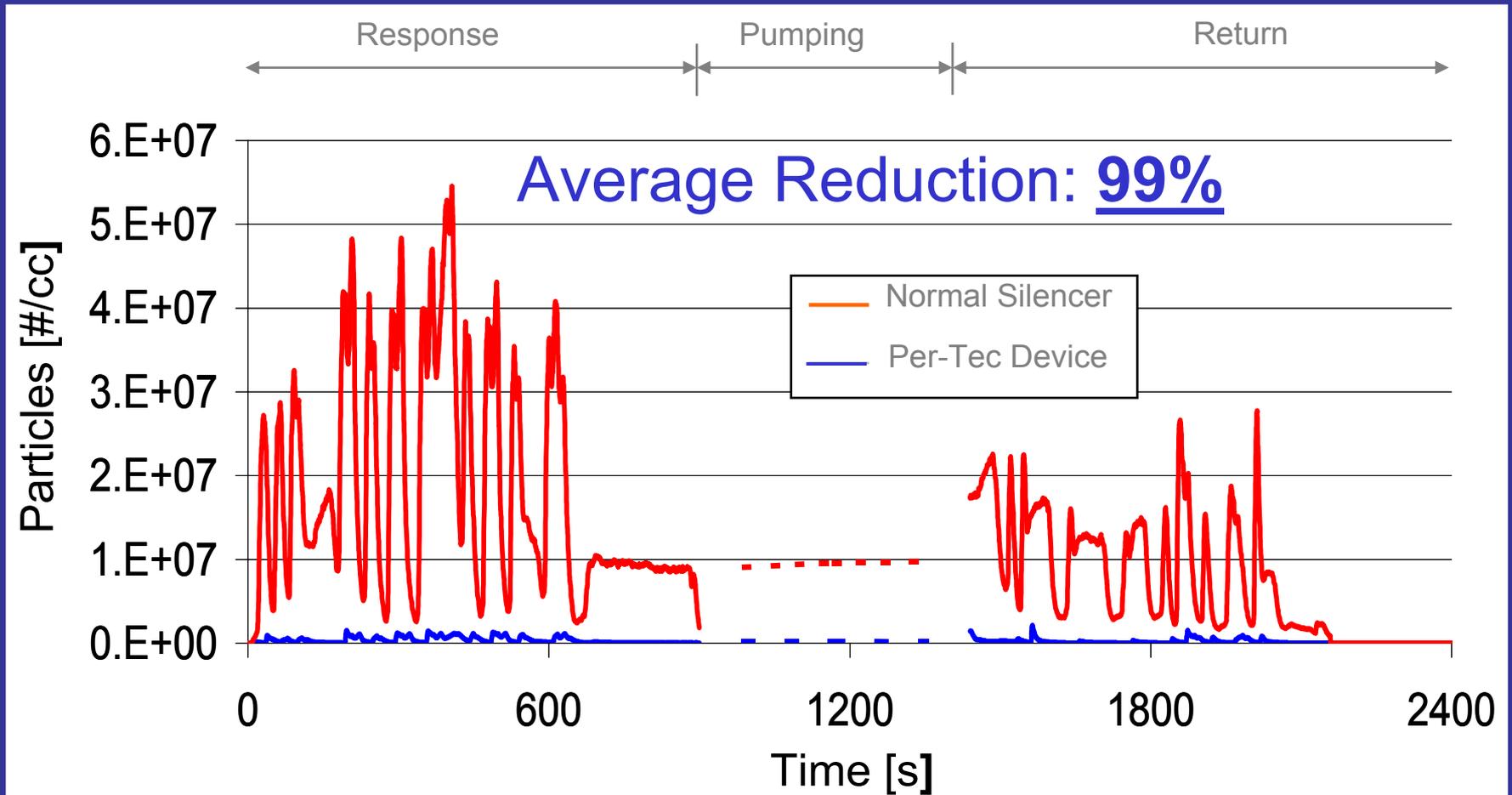
8.2I Dennis Sabre Fire Appliance Steady State SMPS Scan (10-200nm)



Independently Tested by:



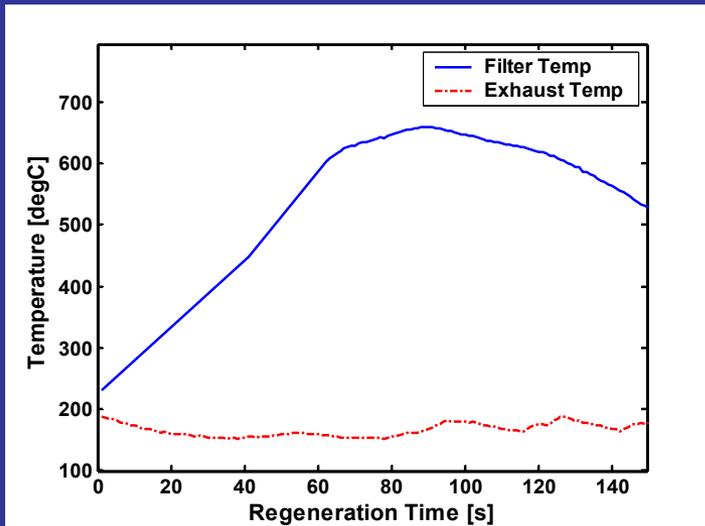
Emergency Fire Appliance Drive Cycle 60nm Particle Reductions



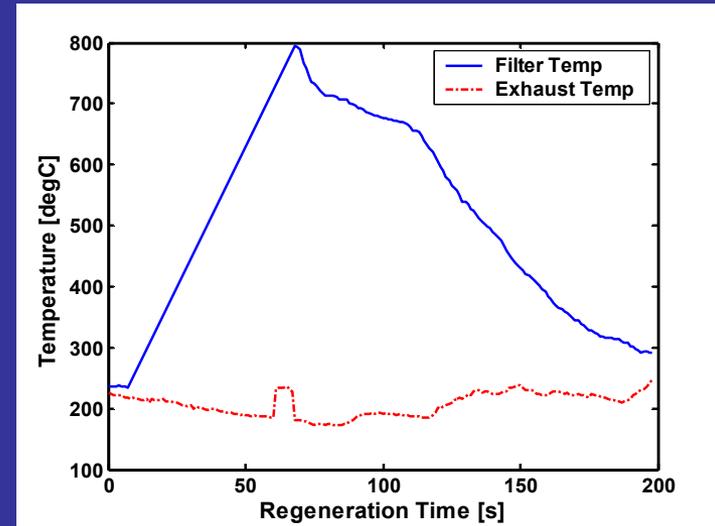
Independently Tested by:



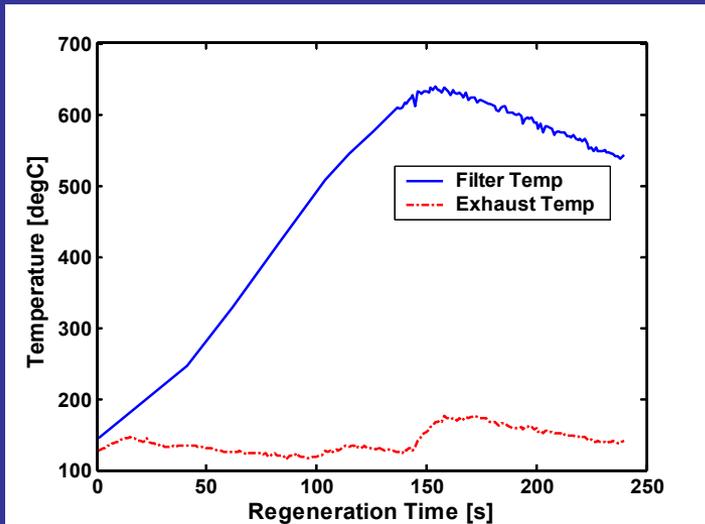
Controlled Regeneration Curves



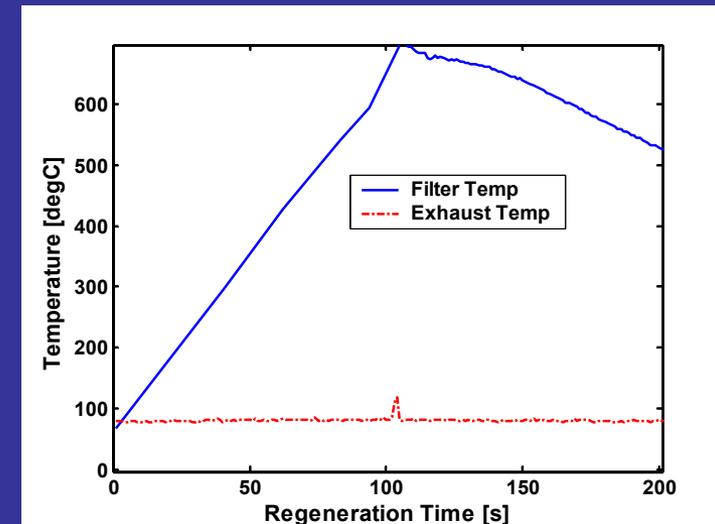
Dennis 8.5l Fire Appliance



Dennis Dart Passenger Bus (Cummins 6BT Engine)



Metrocab 2.5l Taxi



Dennis Dart Passenger Bus (Cummins 6BT Engine)

Regeneration Count

PSU (kV)

Pre Temp (degC)

F1 Temp (degC)

F2 Temp (degC)

Total current (mA)

PSU1 current (mA)

PSU2 current (mA)

GPS Valid

GPS Date

GPS Time

GPS Lat

GPS Long

MPH



F1 last off temp Regeneration Profile

F1 max off temp F1 R Time

F2 last off temp **Per-Tec RDA**
SIEMENS

F2 max off temp F2 R Time

Data Recieved

Data Valid

flash errs

Wd errs

status

port errs

Filter 1 %

h:m:s

Filter 2 %

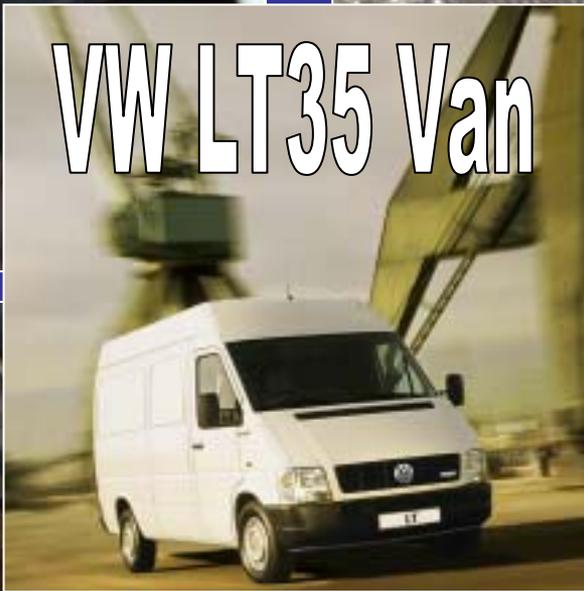
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System Maturity

- European Type Approval Attained
- Now in production, being delivered to customers
- UK Government approval
- 75% subsidy; currently up to 3.5 tonne
- Heavy duty in final stage of approval
- 3 OEMs and 1 Global Engine Supplier are Currently Working with Per-Tec

Cost

- Currently competitive with other existing systems offered for the UK retro-fit market
- OE Pricing is Achievable



Taxi



**Original
OEM System**



Fire Appliance



Per-Tec Ltd



**May We Thank John
Fairbanks and the
Department of Energy for
this Kind Invitation**

Any Questions?