

# Off-road Diesel Emission Controls



## Purifilter™

Passively regenerated DPF



## Combifilter™

Electrically regenerated DPF



## AZ Purifiers and Purimufflers™

Flow-through DOC

# AZ Purifiers and Purimufflers

- Level 1 Verification: >25% PM reduction
  - up to 35-50% PM reduction achieved
- Operate on all duty cycles!
- Maintenance-free, direct-fit muffler replacement
- ARB verified for Tier 1 Cummins, Case, Komatsu and International non-road engines used in cargo handling applications
- Verification extension to include Tier II Cummins, Case, Komatsu and International engines and to broaden to all rubber tire applications is in process



# Purifilter

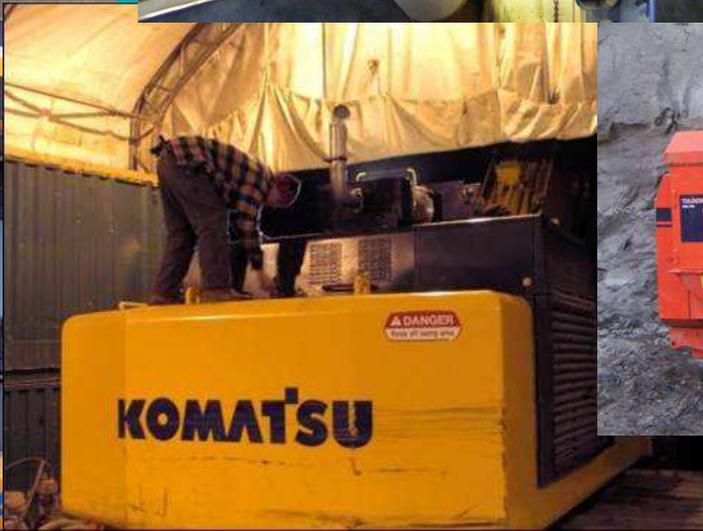
- Level 3 Performance: >85% PM reduction
  - ARB and EPA Non-road Verifications being pursued
  - ARB EO under Aftermarket Parts Program for Non-road Applications makes it legal for sale in CA
- Passive Regeneration if Duty Cycle 25% > 280°C (550°F)
- Silicon carbide filter- more resilient than Cordierite
- Rugged Severe Duty Construction
- Provided with Backpressure Monitor Kit
- Broadly Verified for Hwy Applications by ARB, EPA, Denmark, Sweden, UK & VERT
- Broadly Verified for Non-road Applications by VERT, Sweden



# Purifiers at LAX



# Purifiers in New York City

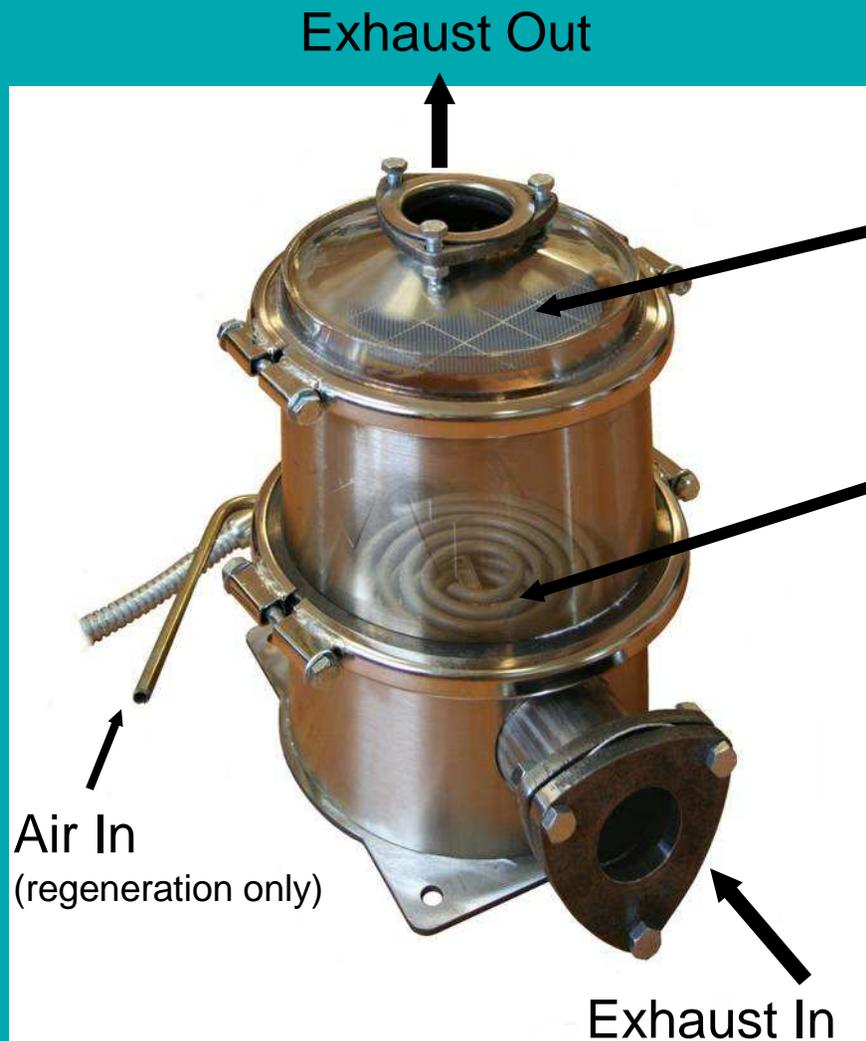


# Combifilter Experience

- Level 3 Verification: >85% PM Reduction
- Active (electric) regeneration
  - Independent of duty cycle & fuel sulfur
- Used in the Off-road in Europe since 1986
- Used on construction & utility vehicles since 1995
- Engineered for stationary applications since 1999
- Approved by VERT (Swiss certification)
- Approved Sweden Environmental Zones

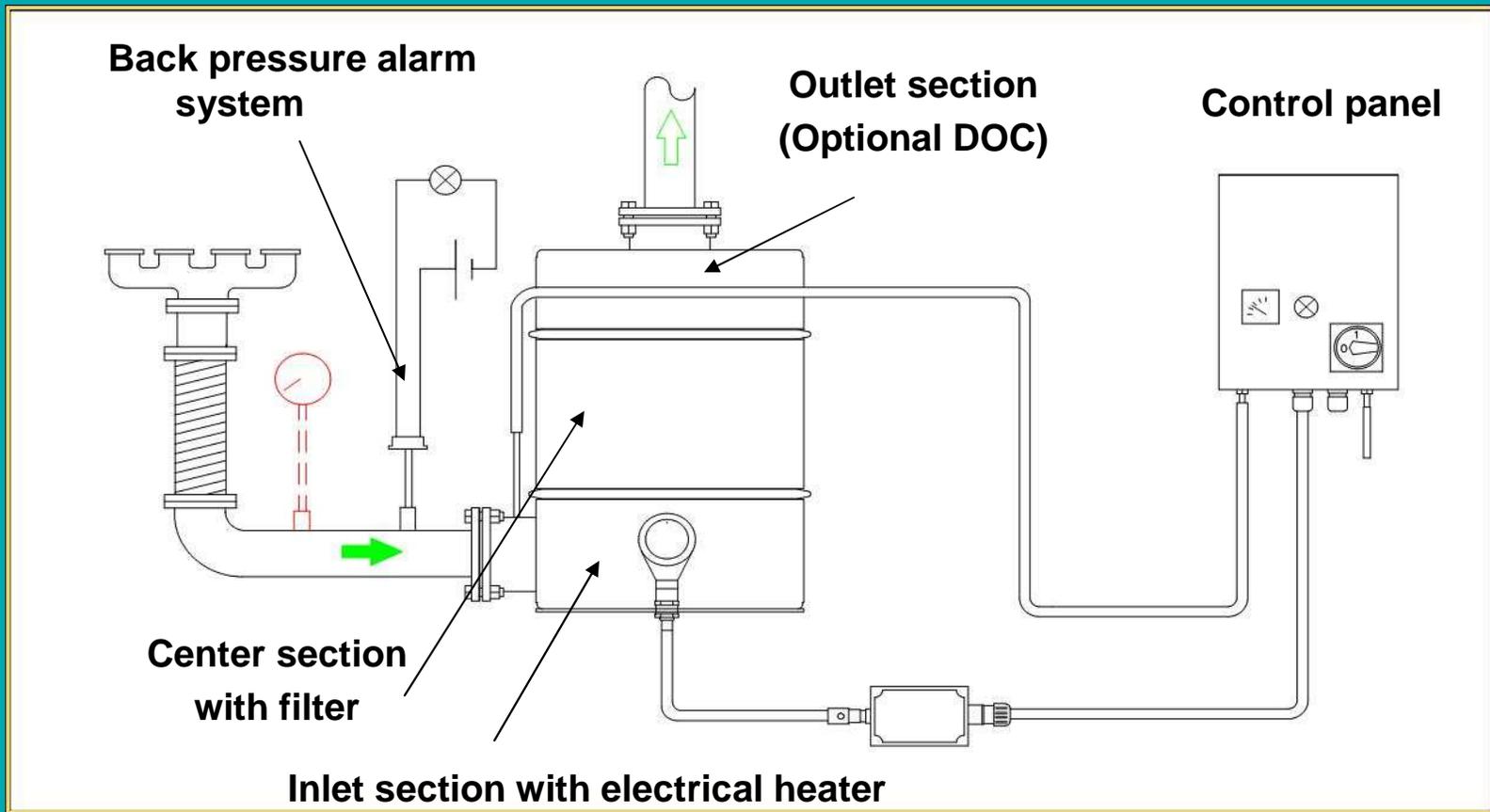


# Combifilter Internal Components



- DPF Substrate
  - SiC or Cordierite
- Heater Elements
  - Type K: 8hrs regeneration
  - Type S: 60/90min regeneration
- Optional DOC on outlet section
  - CO reduction (OSHA)
  - HC (nuisance smell) control

# On-board regeneration



# Off-Board Regeneration

- Allows all filters to be exchanged and regenerated off-board
- Reduces vehicle downtime
- can be used to service passive filters



# Electrical Regeneration in Construction



# Combifilter Test Programs



## DEEP Trials: Stobie Mine

(report available at [www.deep.org](http://www.deep.org))



### Wagner ST-8 Loader DDC Series 60 with Combifilter Model 2xS18

- regenerated daily
- operated over 2000 engine hrs
- Filter survived mine cave-in



### Kubota Service Tractor with Combifilter Model S10

- regenerated as required
- operated over 500 engine hours and three years under DEEP program

# CombiClean™

- Diesel particulate filter cleaning station designed to safely perform maintenance on all DPFs
- Easiest and most efficient way to clean and restore a filter
- Built with over 25 years of proven regeneration technology
- 3-step system of vacuum–heat–vacuum
- Vacuum system removes soot and ash from filters
- Does not allow contaminants to escape into the air
- Clean cordierite & silicon carbide filters on-site



# CARB Verification of TerminiNOx

- First ARB LSI verified product
- Closed loop fuel control & 3-way catalyst for existing LPG fueled engines
  - Can also convert gasoline to LPG, then retrofit with TerminiNOx
- Reduces HC+NOx emissions to 1.0 g/hp-hr (>90% reduction)
- For 1L to 3L in-line configuration engines
- Verification for V configuration engines in progress.
- Also works with CNG fuel



*Thank you*

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