

The CleanAIR PERMIT™ Filter System

Reduces PM, CO and HC

The CARB verified PERMIT™ Filter for diesel engines is designed to reduce diesel particulate matter (PM), carbon monoxide (CO) and hydrocarbons (HC). Applications for the passively-regenerating PERMIT™ Filter system include stationary diesel engines used for power generation and pumps.

The wall-flow filter is coated with a unique, high performance catalyst and housed within a stainless steel canister. The PERMIT™ Filter is available in standard add-on designs, muffler combination, and silencer configurations. In many large diesel engine applications, multiple PERMIT™ Filters are integrated into a silencer design, taking the place of a standard exhaust silencer. Filter/Silencer designs are available with critical and supercritical sound attenuation.

The PERMIT Filter (non-verified) is also available for some on- and off-road mobile applications, such as mining and construction equipment.

Reduces:

- PM greater than 85%
- HC up to 95%
- CO up to 95%

CARB Verified Level 3+
for Prime and Emergency Generators



CARB Level 3+ Verified

- Verified for prime and emergency stationary engines
- PM reductions greater than 85%
- HC and CO reductions up to 95%
- Meets regulation compliance levels for PM reduction on stationary engines
- Passive regeneration with wall-flow ceramic filter
- Low regeneration temperature of 300°C
- Works with diesel engines: generators and pumps
 - Available for some on- and off-road applications that meet regeneration requirements

Customized to Client's Specifications

- Technical product and engineering assistance to determine the correct size and design to fit the application
- Custom engineering to fit space availability or enclosure dimensions
- Compact packaging – filters and silencing in one unit
- Available as standard add-on filter, filter/muffler or filter/silencer design
- Designed to customer inlet/outlet specs
- Choice of Industrial, Critical or Super-Critical Grade Sound Attenuation

Guaranteed Long-Life Construction

- All components produced by CleanAIR
- All stainless steel body using corrosion-resistant 304L steel inside and outside
- Double-walled, insulated construction
- Precious metal-based non-washcoat catalyst

No Health Risk

- Uses non-toxic, non-vanadium particulate filters

How the PERMIT™ Filter Works

The wall-flow design of the CleanAIR PERMIT™ Filter captures diesel PM as soon as the engine is started and continues through operation, dramatically reducing PM and visible black smoke.

Due to the PERMIT™ Filter's unique non-washcoat catalyst incorporated within the wallflow filter, the captured PM is then oxidized into CO₂ while the engine is operating. This results in a passive, selfcleaning (or regenerating) filter without the need for manual intervention.



Emissions of carbon monoxide and hydrocarbons are also eliminated when exhaust gases interact with the filter's unique catalyst. Regeneration is dependent upon exhaust temperature, fuel sulfur level, duty cycle and engine load.



The easy-to-install, CARB verified CleanAIR PERMIT™ Filter works with all diesel stationary engines for compliance with air quality regulations and is available in many design configurations to meet customer needs and space availability.



Meet CARB Level 3+ Standards with the CleanAIR PERMIT Filter

Reduces:

- PM greater than 85%
 - HC up to 95%
 - CO up to 95%

CleanAIR
SYSTEMS
A Caterpillar Company

PERMIT™ Filter Emissions Reduction Summary

Control Technology	Fuel	PM	HC	CO
PERMIT™ Filter System for Stationary Engines	ULSD (<15 ppm S)	Greater than 85%	90-95%	90-95%
	Biodiesel (<15 ppm S)	Greater than 85%	90-95%	90-95%

Results are fuel dependent and may vary with application.
Operating the filter using high sulfur fuels may have varying results.

Guidelines for PERMIT™ Filter Passive Regeneration

The following guidelines ensure engine operation adheres to verification parameters specified by ARB for passive regeneration of the PERMIT™ Filter:

- At least 30% of the operating time the exhaust temperature is above 300°C and the engine load is above 40%
- Fuel sulfur content <15 ppm, ULSD
- Engine PM output of < 0.2 g/bhp-hr

How Sulfur in Fuel Affects the PERMIT™ Filter Performance

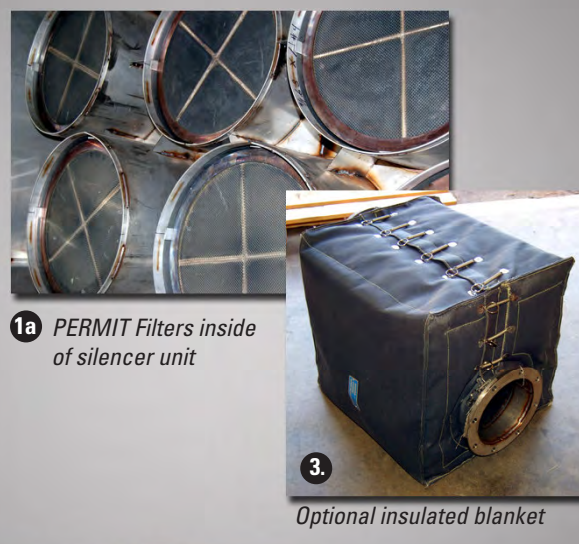
The PERMIT™ Filter can operate using high sulfur fuel. However, lower regeneration temperatures and maximum performance are achieved when low sulfur fuels (<15 ppm S) are used. ARB verifications specify the use of ultra-low sulfur fuel with all verified filters.

CleanAIR HiBACK USB™ Data Logging and Alarm System

The HiBACK USB™ is a microprocessor-based data logger and alarm system used in conjunction with the CleanAIR PERMIT™ Filter System as both an alarm and a data logger to record time, backpressure and temperature data. It is the key component to ensuring the PERMIT™ Filter unit is working as intended and that the filter is not plugging up with particulate matter. The HiBACK USB™ unit can warn the operator of possible problems with excessive backpressure, can track the duty cycle of the engine and allow analysis for operation time, exhaust temperature and backpressure profiles. Data collected by the HiBACK USB™ can be downloaded to an Excel spreadsheet on a computer for detailed analysis using optional software. (Optional software sold separately. The HiBACK USB™ is required for warranty and verification of the PERMIT™ Filter.)

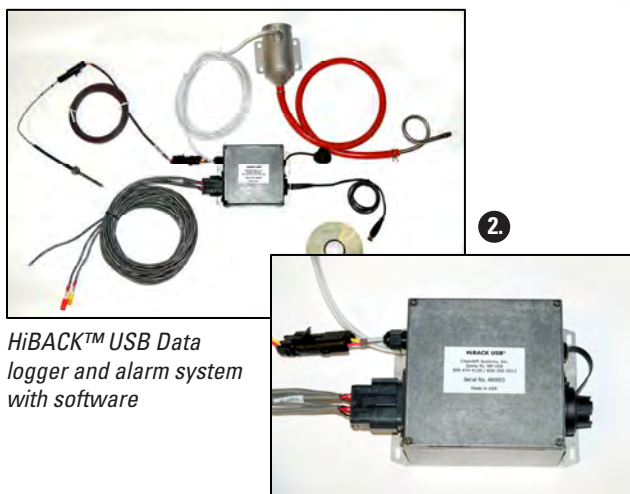
System Components:

1. PERMIT™ Filter Silencer: double-walled, fully insulated stainless steel silencer body
 - 1a - includes diesel particulate filters packaged inside of unit
2. HiBACK™ USB Data logger and alarm system with software
3. *Optional:* Custom-designed insulated blanket to reduce heat loss and optimize regeneration performance; available for exhaust piping, filter body and engine housing



1a PERMIT Filters inside of silencer unit

3. Optional insulated blanket



HiBACK™ USB Data logger and alarm system with software



PERMIT™ Filter Package Designs for Stationary Engines

The CleanAIR Systems' PERMIT™ Filter is packaged in a 304L stainless steel shell and finished by bead blasting to give a highly corrosion-resistant product that will last for years. The packaged filter can be incorporated into many different configurations depending upon the application requirements. The most basic configuration is a packaged filter with cones on both inlet and outlet ends. Typical sound attenuation for this design is 12 dBA.

Replacement muffler designs are used for applications where space is too tight to add the filter separate from the existing muffler. Special inlet or outlet configurations and brackets can be used on the PERMIT™ Filter/Muffler combination that will allow the filter to replace an existing muffler. Typical sound attenuation for this design is 15-20 dBA.

A filter/silencer replacement design is available for applications that require higher levels of sound attenuation or that require multiple PERMIT™ Filters. The corrosion-resistant stainless steel shell has a removable panel allowing complete access to the filters mounted inside. The fully-insulated, double-walled body also helps keep surface temperature lower. The PERMIT™ Filter/Silencer is available in three sound reduction levels.

Silencer Type	Typical Attenuation
Industrial Grade	22-29 dBA
Critical Grade	27-35 dBA
Super Critical Grade	30-38 dBA

Optional Equipment for System:

- AeroCLEAN™ Filter Cleaning System for built up noncombustable ash
- Load Bank - increases engine load, optimizes filter performance
- Custom-designed insulating blankets – reduces heat loss, optimizes filter performance
- Extra filter unit – minimizes system down-time



To submit an online request for pricing, go to www.cleanairsys.com/rfp.asp



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