



**Hybrid Passive Active Diesel Particulate
Filters**
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Outline

- Combining Active with Passive Regeneration
- Benefits
- Durability Demonstrations

ECS DPF Product Line Overview



Catrap™

Basemetal catalyst, passively regenerating
Decreased NO₂



Purifilter™

Pt / base metal catalyst, passively regenerating
Modest Increase in NO₂



Combifilter™

Electrically Regenerated
Decreased NO₂

ECS DPF Options

Filter Type / Regeneration Method	Catrap	Purifilter	Combifilter
Regeneration Temperature	25% time > 380 – 420 C	25% time > 280 – 320 C	Not Required
Regeneration Catalyst	Base Metal Coating	Precious & Base Metal Coating	Electrical Connection
Regeneration Downtime	None	None	30 minutes to 8 hours

What about Combining Passive and Active Regeneration?

- **Allows soot oxidation by two methods**
 - Primary method is passive regeneration
 - Secondary method is active regeneration
- **extends application range of passive DPF's without applying more highly active NO₂ generating catalysts**
- **increases passive filter tolerance of duty cycle and mechanical condition variations**
 - Allows a back-up regeneration method

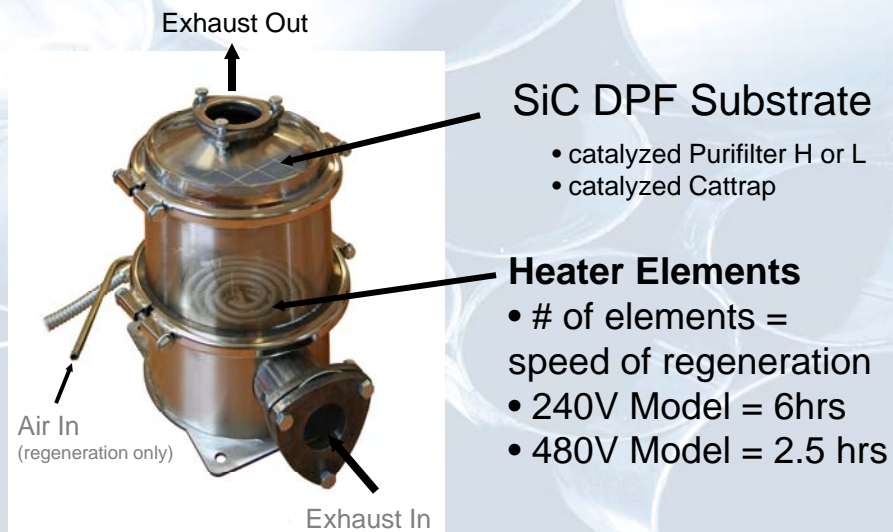
What about Combining Passive and Active Regeneration?

- **Allows DPF use on higher emitting engines**
- **Reduce filter size employed on smaller non-road engines over traditional uncatalyzed active systems**
- **Greatly reduces panel infrastructure over traditional Combifilter**

Three Components to a Hybrid Passive – Active System

- Filter Assembly
 - Includes DPF, inlet with elements, electrical harness, plug, air line
- Backpressure Monitor & Logger
- Common Off-board Regeneration Control Panel

1. Filter Assembly



2. ECS Backpressure Monitor / Loggers

- ECS BP monitors
 - Extended datalogging capability (up to 2 yrs)
 - BP and Temperature
 - Regen. frequency
 - Multi-light displays to indicate system faults, warnings and alarm conditions
 - Real time monitoring
- Systems come with software to allow data analysis



3. Common Off-Board Panel

- **Can be used by multiple pieces of equipment with different sizes of Purifiers, Cattraps and Combifilters**
- **Can be located in various locations in the mine to facilitate plug-in**



Purifilter Plus Hybrid Examples



Cargo Handling

Highway



Construction



Purifilter Plus Hybrid

Example:

Volvo Wheel Loaders



Equipment	Model Year	Engines	# of vehicles /equipment retrofit	Purifilter Model	Combifilter Type Elements	Installation Dates	Location
Volvo L60-L120 Wheel Loaders	2005-2007	Volvo D6D or D7E 5.9L – 7.2L 140 – 243hp	10	SCP20	240V	2005-2007	Berlin Area Germany

Purifilter Plus Hybrid Demonstration in Port of LA (POLA)



- >1000 engine hours without active regeneration
- >2000 engine hours
- Cummins QSM, 375hp, Tier 2 and 3
- Purifilter Plus Model SCP23H; 480V



Purifilter Plus Hybrid Demonstrations at POLA

- Tier 2 Side Handler
- Purifilter Plus
 - Model SCP17H
 - 2002 Cummins QSC
 - 240hp



Additional Purifilter Plus Hybrid installations at POLA- Large Forklift



>250 engine hours to date without active regeneration

Plug-in allows on-board servicing of DPF without removal

Tier 2 Cummins QSB, 155hp

Purifilter Plus SCP13H

• 480V

LA County Beaches & Harbor



2 John Deere
Model 7520 Tractors
Tier 3 6068T @ 125kW
SCP17H
>1000 engine hrs



When to employ Active Regeneration?

- **At Preventative Maintenance Intervals**
 - Service tool to maintain benefits of low backpressure and extend DPF life
- **When indicated by backpressure monitor**
 - Duty cycle or engine condition variances
- **At pre-determined pro-active intervals**
 - Based on data-logging of equipment in operation over a period of time

Summary

- **Combining Passive and Active Regeneration**
 - allows equipment with marginal or variable duty cycles to be equipped with DPF's
 - Greatly reduces the need to remove a DPF
 - Reduces Labor
 - Insures condition of the DPF
 - Maximizes equipment up-time

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