

RYPOS
Active Diesel Emission Control Systems

AN ACTIVELY REGENERATED DIESEL PARTICULATE FILTER



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Frank DePetrillo
Mr. DePetrillo is the General Manager of RYPOS. He has over 30 years experience in sales and marketing. He interfaces with government agencies and manages customer service and oversees new applications for RYPOS products.

Amin Saeid
Mr. Saeid is a Senior Mechanical Engineer with experience in filtration technology. He manages filter production and is also in charge of designing and implementing test protocols for the RYPOS Diesel Particulate Filter product line.

Zachary Nardi
Mr. Nardi is a Senior Mechanical & System Engineer. He also serves as the RYPOS Engineering Manager. His responsibilities include managing the engineering team and directing the certification of the RYPOS technology.

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Outline
Technology Overview
The Market
Current Projects
MSHA Test
Discussion

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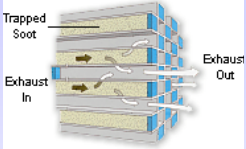


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Technology Overview

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Competitive Technologies

 <p>Trapped Soot Exhaust In Exhaust Out</p>		
<p>Ceramic Cell Cordierite</p> <p>Passive Regeneration Using Oxidation Catalyst</p> <p>Uncontrolled Regeneration Sensitive to Temperature</p> <p>Indirect Electric Heating Fuel Injection</p>	<p>Silicon Carbide Ceramic Fibers</p> <p>Passive Regeneration Using Fuel Additives</p> <p>Uncontrolled Regeneration Sensitive to Temperature</p> <p>Indirect Electric Heating Fuel Injection</p>	<p>Ceramic Fibers</p> <p>Active Regeneration Using Indirect Electric Heating</p> <p>Regenerates Off line Uses about 7KW for 14 Minutes; Also Needs Stream of Fresh Air</p>

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Diesel Exhaust After-treatment Options

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    graph TD
      DPFD[Diesel Particulate Filters] --> Passive[Passive]
      DPFD --> Active[Active]
      Passive --> FBC[FBC]
      Passive --> CSF[CSF]
      Passive --> CDPF[CDPF]
      Active --> ER[Electrically Regenerated]
      Active --> FR[Fuel Regenerated]
      ER --> OL[On-Line]
      ER --> OFF[Off-Line]
  
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Rypos core technology

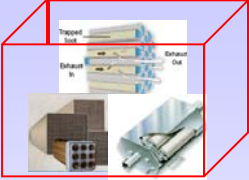
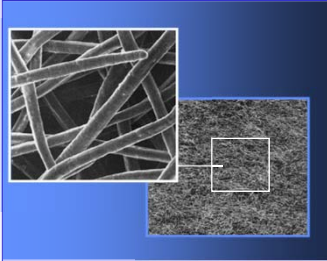
FBC: Fuel-Borne Catalyst
CSF: Catalyzed Soot Filter
CDPF: Catalyzed Diesel Particulate Filter (DOC + DPF)

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Outside the Box

Sintered Metal Fibers

- o Electro-conductive
- o High porosity (up to 95%)
- o Low back pressure
- o Withstands high temperatures (1000°C)
- o Fast heating (low thermal mass)
- o High filtering efficiency
- o High surface area

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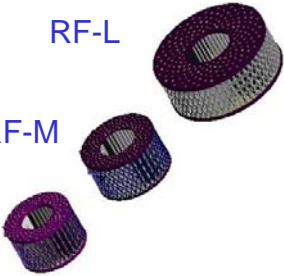
Active Filters

Active Filter Cartridges


RF-L

RF-M

RF-S



Electrical Regeneration*

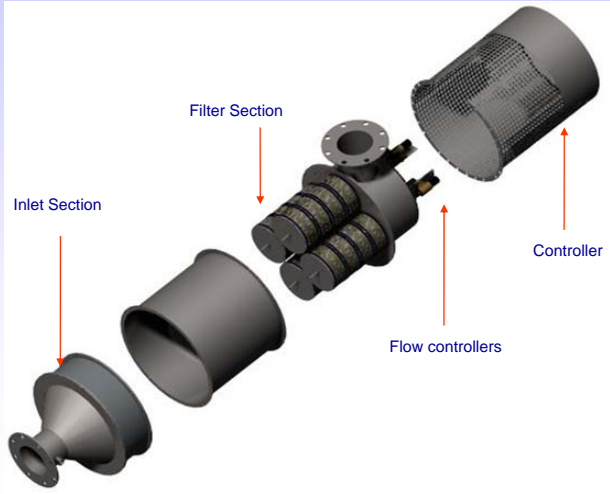


***World's only Active Regeneration DPF where the FILTER element IS the HEATING element**

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Active Filter System




The diagram shows an exploded view of the Active Filter System. From left to right, the components are: the Inlet Section, the Filter Section, the Flow controllers, and the Controller. Red arrows point from the text labels to their respective parts in the assembly.


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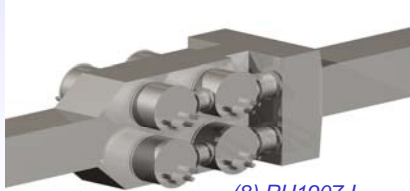
Flexible System Configurations



RH305-ML-C
Retrofit to CAT3126
Front-end Loader



RH707-M-C
Retrofit to Terex V-12 760hp
Earthmover



(8) RH1907-L
Integrated solution with SCR system for PM and NOx
reduction up to 90% for 18MW power generator

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Sample of Current Projects

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Milton CAT/Cincotta, Saugus, MA, 1/2006

CAT 3412

500kW

RYPOS RT-24



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Korean Coastal Power/Kangwonland Resort
11/2005

CAT 3516
2000kW
(4) RYPOS
RH1907-L-C




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Testing at Suisun Bay
11/2005- to date

DDC 12V71 (2-cycle)
Engine Year: 1974
Test Cycle: ISO 8178


2 RA24-2C



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**550kW Diesel Generator, New York, NY
1/2004**




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UNC Health Science Library, Chapel Hill, NC, 2003

Perkins D150P4
150kW
RYPOS RT8-C



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Testing of RYPOS Diesel Emission Control Systems

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EMISSIONS TEST

- Isuzu 4JG1T-MAP Engine
 - 3 L engine
 - Turbocharged and aftercooled
 - 83 hp at 2500 rpm
- Rypos Model RH204-M-C
 - Filter and DOC are 40% undersized
- Test done with and without a DOC.

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RYPOS' HDPF EMISSIONS TESTS: PM Emissions

DPM Emissions per mode (g/hr)								
Mode	Base1	Base2	RBase-1	RBase-2	HDPF1	HDPF2	(HDPF+DOC)1	(HDPF+DOC)2
1	14.79	13.48	14.93	13.96	3.02	2.68	4.22	5.31
2	14.31	13.77	13.76	14.33	3.54	3.29	3.35	2.08
3	11.00	10.82	9.80	9.58	1.60	1.97	1.26	1.45
4	8.91	8.78	7.99	8.19	1.32	1.22	0.86	0.66
5	12.50	11.83	15.14	19.44	1.00	1.40	1.10	1.26
6	7.21	8.04	8.56	8.12	0.88	0.80	0.69	0.80
7	4.81	5.14	4.79	5.05	1.04	1.10	0.66	0.36
8	0.75	0.80	0.81	0.83	0.21	0.29	0.09	0.09

Key:
 Base = Engine out baseline with manufacture backpressure setting
 RBASE = Engine out emission with RYPOS HDPF and DOC installed
 (HDPF+DOC) = Emission of RYPOS HDPF and DOC Combination
 HDPF = Emission of RYPOS HDPF without DOC

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RYPOS HDPF Test: DPM Emission by Mode

Mode	BASE Average	RBASE Avg.	(HDPF+DOC) Avg.	HDPF Avg.
1	14.79	14.93	4.22	2.68
2	14.31	13.76	3.35	3.29
3	11.00	9.80	1.26	1.97
4	8.91	8.19	0.86	1.22
5	12.50	19.44	1.10	1.40
6	7.21	8.12	0.69	0.80
7	4.81	5.05	0.66	1.10
8	0.75	0.83	0.09	0.29

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RYPOS' HDPF EMISSIONS TESTS: Summary

- Average PM removal efficiency RYPOS HDPF: 82.57%
- Average PM removal efficiency (HDPF+ DOC): 82.57%
- Average NO₂ reduction RYPOS HDPF: 55.31%
- Average NO₂ reduction (HDPF+ DOC): 28.86%
- Average CO reduction RYPOS HDPF: -21.88%
- Average CO reduction (HDPF+ DOC): 68.43%

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Conclusions

- Sintered metal fiber substrate maintains low backpressure
- Automatic active regeneration independent of exhaust temperature
- Directly heated, filter and heating element are the same
- Highly scalable and flexible design configuration options
- Very durable substrate-can withstand high temperature, shock and vibration.
- Significantly reduces NO₂

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