

Future Needs and Requirements



## Advanced Diesel Engines

Meeting New  
On-Highway Regulations



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**Table 1**  
**2001 and 2020 Statewide Emissions**  
**from Ports and International Goods Movement**  
 (tons per day)

Source	Diesel PM		NOx		ROG		SOx	
	2001	2020	2001	2020	2001	2020	2001	2020
Ships	8	21	94	223	3	6	59	158
Harbor Craft	4	4	86	83	9	9	1	<1
Cargo Handling Equipment	1	<1	21	6	3	<1	<1	<1
Trucks	3	2	129	50	14	9	2	1
Locomotives	2	1	77	45	5	4	3	<1
<b>Total</b>	<b>18</b>	<b>28</b>	<b>407</b>	<b>407</b>	<b>34</b>	<b>28</b>	<b>65</b>	<b>159</b>

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## Peterbilt 387 with Caterpillar 2007 HD Engine



### Mid-America Truck Show

Very clean exhaust stack ...



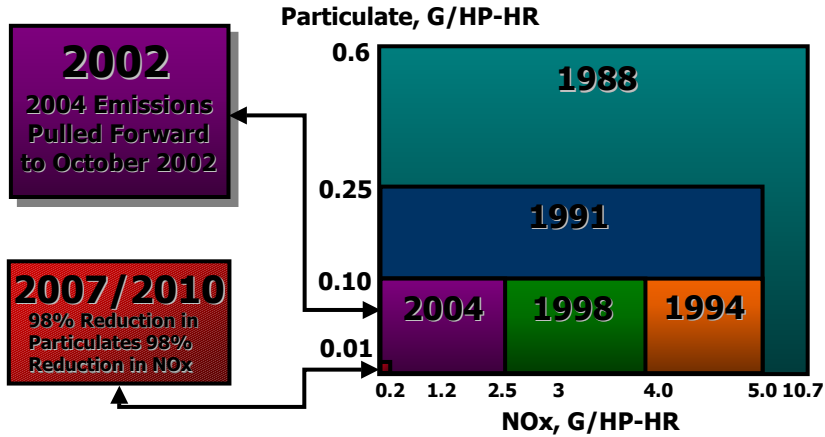
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## 2007 Emissions Requirements

$PM = 0.01 \text{ g/bhp-hr}$  –  
Requires Particulate Filter

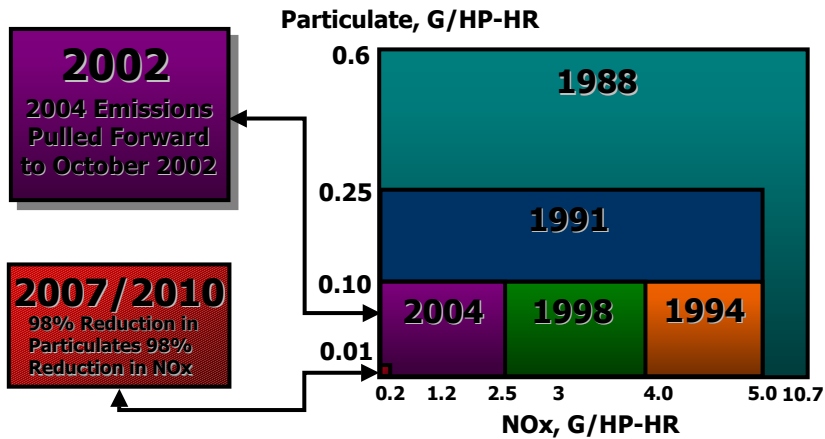


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## 2007 Emissions Requirements

$NOx + HC = 1.2 \text{ g/bhp-hr}$  –  
Introduction of Crankcase Ventilation



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## 2007 On-Highway Technology Paths

- High Pressure, Short Loop Cooled Exhaust Gas Recirculation

-OR-

- Enhanced In-Cylinder Combustion Management

-AND-

- Diesel Particulate Filters w/ Active Regeneration

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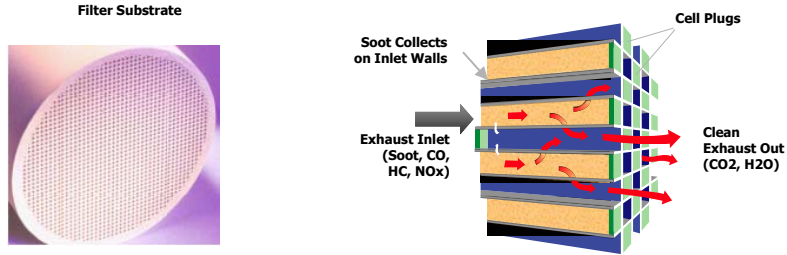
## Particulate Matter (PM) Reduction Technologies

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# Wall Flow Filter Technology



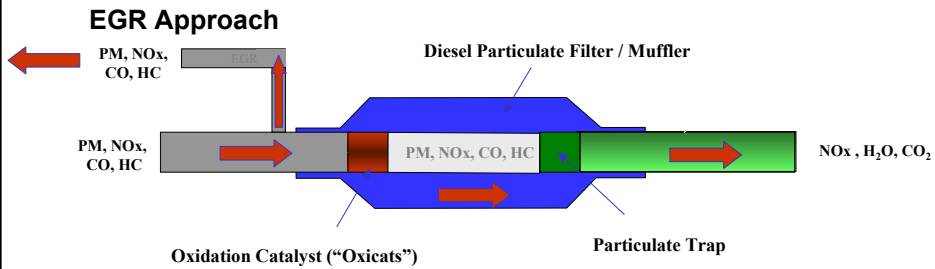
- Diesel Particulate Filter (DPF)
- Collects Soot
- "Regeneration" Process Oxidizes Accumulated Soot
- Requires < 15PPM Ultra Low Sulfur Diesel (ULSD) fuel

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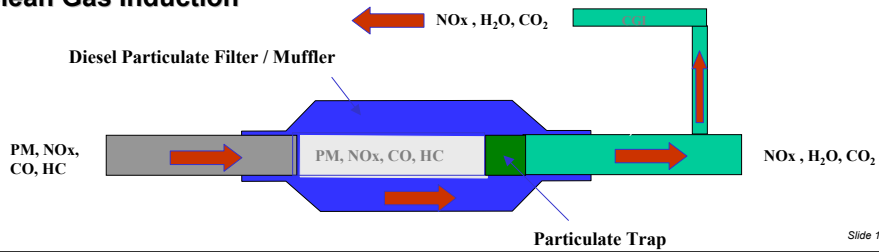
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# PM After-Treatment Configurations



## Clean Gas Induction

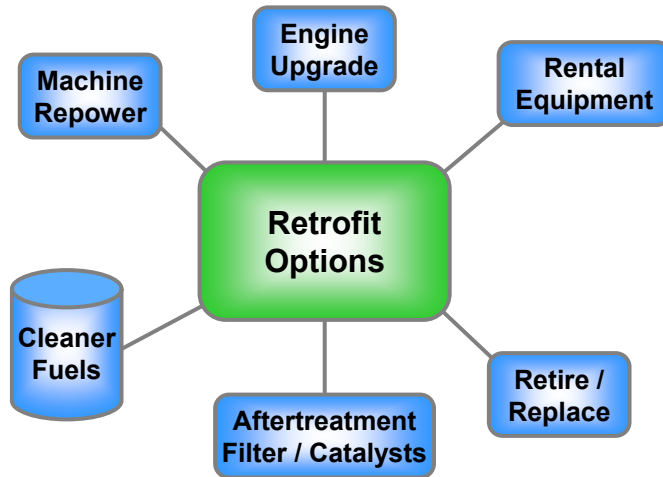


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## Retrofit Overview



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## Public Policy Is The Change Driver



**“Today I saw a diesel-powered truck that can get up to 30 percent better fuel economy than gasoline-powered vehicles, without the harmful emissions of past diesels. I mean, the fellow got in the truck and cranked it up, and another man got on the ladder, and he put the white handkerchief by the emissions port, and the white handkerchief remained white. In other words, technology is changing the world. Our engines are becoming cleaner.” (President George W. Bush, 16 May 2005, West Point, VA)**

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## Summary

- Fuel Neutrality/Diversity
- Diesel as part of that mix
- The regulatory path

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**Future Needs and Requirements**



**Driven By**

**Clean Air...**

**Advanced Diesel  
Engines**

**Meeting New  
On-Highway Regulations**

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