

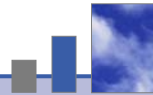
Faster Freight/Cleaner Air 2006

Diesel Retrofit Technology

Tim Taylor
Director of Strategic Market Planning

clēaire

ADVANCED EMISSION CONTROLS®

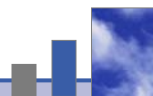


1

CARB Plans to Clean Up All Existing Diesel Engines in California

Partial list of existing diesel regulations

- On-road
 - Transit
 - Refuse
 - Public & Utility
 - Idling
 - **Private Fleets (2006)**
 - **School Bus (incentives)**
- Off-road
 - Port & Railyard
 - **Construction Equipment (2006)**
 - Transport Refrigeration Units (TRU)
 - Portable Engines
- Stationary
 - Standby Generators
 - Prime Power
- Locomotive
 - Memorandum of Understanding with Union Pacific and Burlington Northern/Santa Fe
- Marine
 - Auxiliary Engines
 - Ocean Going Vessel Speed Controls

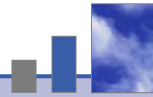


2

CARB Rule Structure

- Most CARB rules have a similar structure
- BACT + Compliance Milestone Dates
 - Best Available Control Technology (BACT)
 - The highest efficiency PM control device available
 - Compliance Milestone Dates
 - The schedule by which a fleet must meet BACT
 - Example: 20% of the fleet in compliance by 2008
30% of the fleet in compliance by 2009
40% of the fleet in compliance by 2010
Etc.

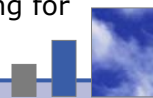
3



Private On-road Fleet Rule

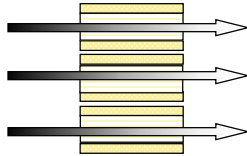
- CARB Manager assigned (Kitty Martin)
- Additional staff being hired to handle rule development
- Website created
 - <http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm>
- Rule proposed to be developed and to Board in 2006
- The rule will probably look like Refuse & Public/Utility rules
 - Probably with small fleet exemptions or extensions
 - They may have no requirement without funding for small fleets.

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Level 1 PM Strategies

Level 1 (25%) Reductions Oxidation Catalysts



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Level 2 PM Strategies

Level 2 (50%) PM Reduction

Particulate Reactor™



- Particulate Reactor
- Tortuous Path DOC
- Wire Mesh Filter

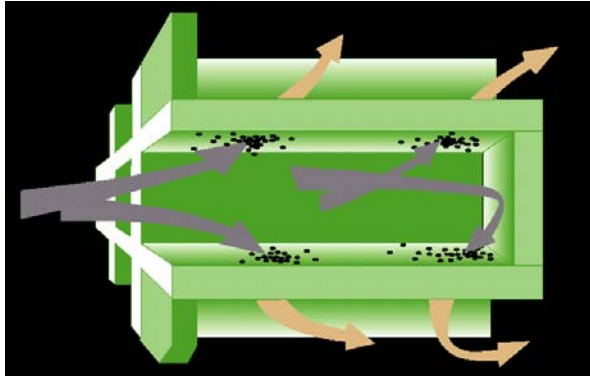


Emulsified Fuel (PuriNOx)

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Level 3 PM Strategies

Level 3 (85%) PM Reduction Diesel Particulate Filter



Combined PM/NOx Reductions

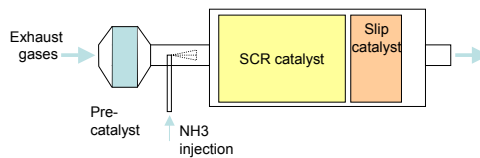
Lean NOx Catalyst + DPF
(Cleaire Longview)



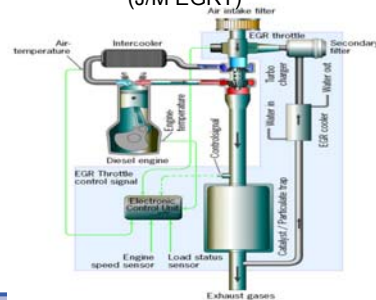
Emulsified Diesel Fuel + DOC or DPF
(Lubrizol PuriNOx)



SCR + DOC
(Extengine ADEC)



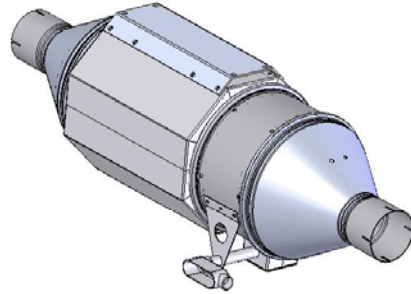
Low Pressure EGR + DPF
(J/M EGRT)



Cleaire Products



Longview®



Horizon™

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On-road Projects

- Most on-road projects have been driven by regulation aided by incentives
 - Refuse Rule
 - Public Agency/Private Utility Rule
 - Transit Buses
- Smart fleets will take advantage of incentives now rather than pay the “full fare” later
- Incentive funding sources include: Moyer, DMV, occasionally CARB and EPA

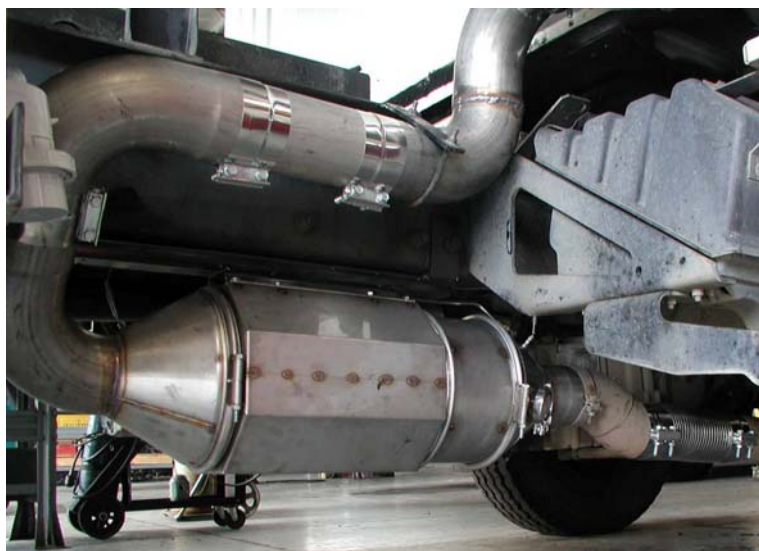
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Longview® On-road Applications



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Horizon On-road



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Off-road Projects

- Most off-road projects have been driven by political/community pressure aided by incentives
 - Ports of Long Beach, LA and Oakland
- Upcoming regulations will start to affect off-road equipment in California next year
 - Cargo Handling Rule
 - Construction Equipment Rule
- Demonstrations: some equipment has been retrofitted because of the technology provider need for verification
- Smart fleets will take advantage of incentives now rather than pay the “full fare” later

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Longview® Off-road Applications



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Horizon Off-road



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Stationary Projects

- Most stationary projects have been driven by regulation and/or the permitting process
 - Stationary engines are regulated by the local air district and require permits
 - Recent regulations force standby generators to reduce emissions or reduce maintenance hours
 - Many standby engines won't pass toxic screen analyses without retrofits
- Occasionally, an unpermitted engine is "caught" and must retrofit in order to get a permit
- Incentive funding is not generally available for stationary engines

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Longview® Stationary



Horizon Stationary Back-up



Filter Cleaning "Watchouts"

- Filtrate has been determined to be a hazardous waste in California primarily due to zinc content
- Look for cleaner meets OSHA standards, can be permitted by the local air agency (i.e. can pass the toxics screening analysis) and sequesters the filtrate material for safe disposal



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Filter System "Watchouts"

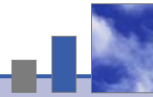
- Look for a system that minimizes equipment downtime:
 - Facilitates inspection and system maintenance
 - Allows for engine exhaust inspection without system removal
 - Allows easiest and quickest filter exchange process
 - Has local, dependable sales, service, parts, warranty and support

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The "Real World" of Retrofits

- The technology is the EASY part!
- Exhaust systems are old, dirty, rusty
- Frame rails have utility boxes, battery boxes, hydraulic fluid tanks, fuel tanks
- Truck bodies have compartments, tool hangers, custom fittings (crash barriers, spray bars, vacuum hoods)
- Muffler mounts may be too weak to support additional weight of retrofit system
- Operator visibility and equipment range of motion must not be compromised
- Even "Identical" vehicles may not be identical
 - Hose routing, wiring harness routing, bracket mounting hardware

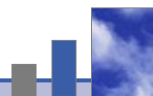
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Real World "Watchouts"

- Every retrofit is a "custom" job
- Make sure you match the technology to all possible duty cycles
- Make sure the installer is well trained, has experience and is factory certified
- Make sure that the installer has been there for a long time and will be there for a long time

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