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Diesel Emissions Reduction Project

Waterfront Drive, East Providence, RI

Presentation by:

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Motivation for D.E.R.P.

- Older diesel engines produce air pollution including fine particulate matter ($PM_{2.5}$), nitrogen and sulfur oxides (NOx and SOx), as well as other types of hazardous air pollutants (HAPs).
- These emissions have been cited as key factors in various health issues.

Motivation for D.E.R.P.

- Retroactive measures are taken to decrease off-road diesel emissions since federal regulations only apply to newly manufactured diesel engines.

Project Ground Breaking

Waterfront Drive Groundbreaking Ceremony – From left to right: Governor Lincoln Chafee, RIDOT Director Michael Lewis, Congressman David Cicilline, E.P. Mayor Bruce Rogers

Collaborative Effort

- RIDOT
- URI OC & TC
- Cardi Corporation
- Milton CAT
- RIDEM
- RIEDC
- East Providence
- RI Asthma Council
- Clean Water Action

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Construction Site

Pre-construction looking toward Dexter Rd, Henderson Bridge (New Red Bridge) and Seekonk River visible in the background

Post-construction ribbon cutting ceremony, looking toward Dexter Rd, Henderson Bridge visible in background; 1.1 miles total length

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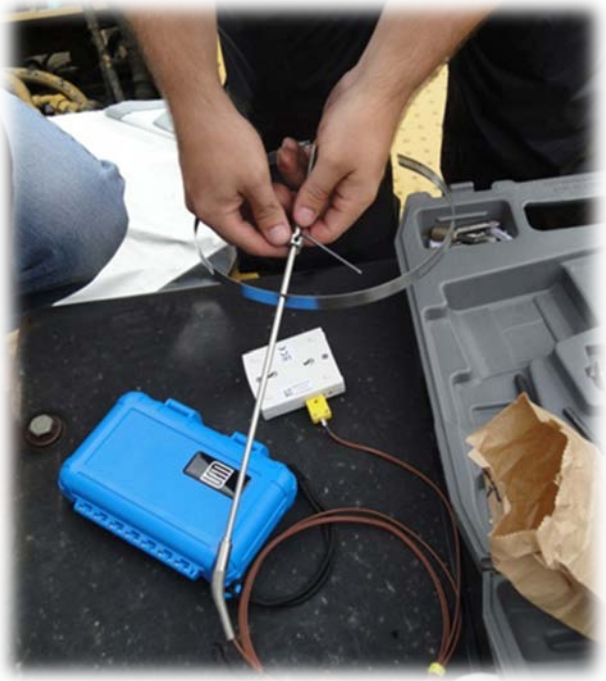
Goals

- Collect and review operational data to evaluate usage characteristics of construction equipment on a typical construction project.
- Select and install best retrofit technology for maximum reduction of diesel emissions.
- Analyze post-retrofit performance and emissions levels of retrofitted equipment.
- Use results of project to develop a diesel emissions reduction strategy for the State of Rhode Island entitled “Road Map for Diesel Emissions Reduction in Rhode Island”.
- Gain experience in the field of construction retrofits, outlining the process and pitfalls along the way.

Data Logging



Thermocouple probe, mounting clamp, data logger, and protective housing

Completed data logger installation

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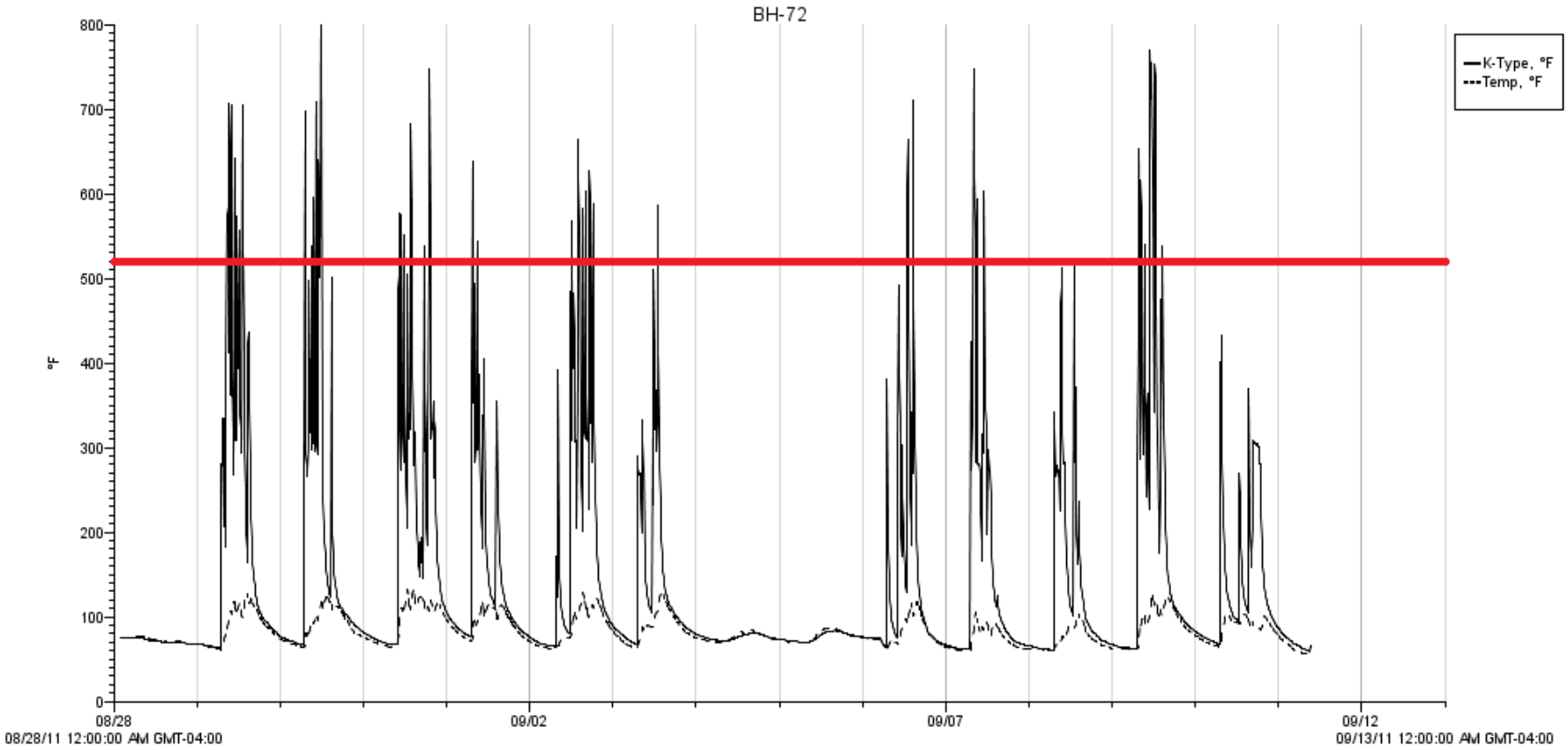
Duty Cycle Histograms



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Opacity Testing

Preparing for testing – laptop, opacity meter, sensor head

Opacity metering in progress

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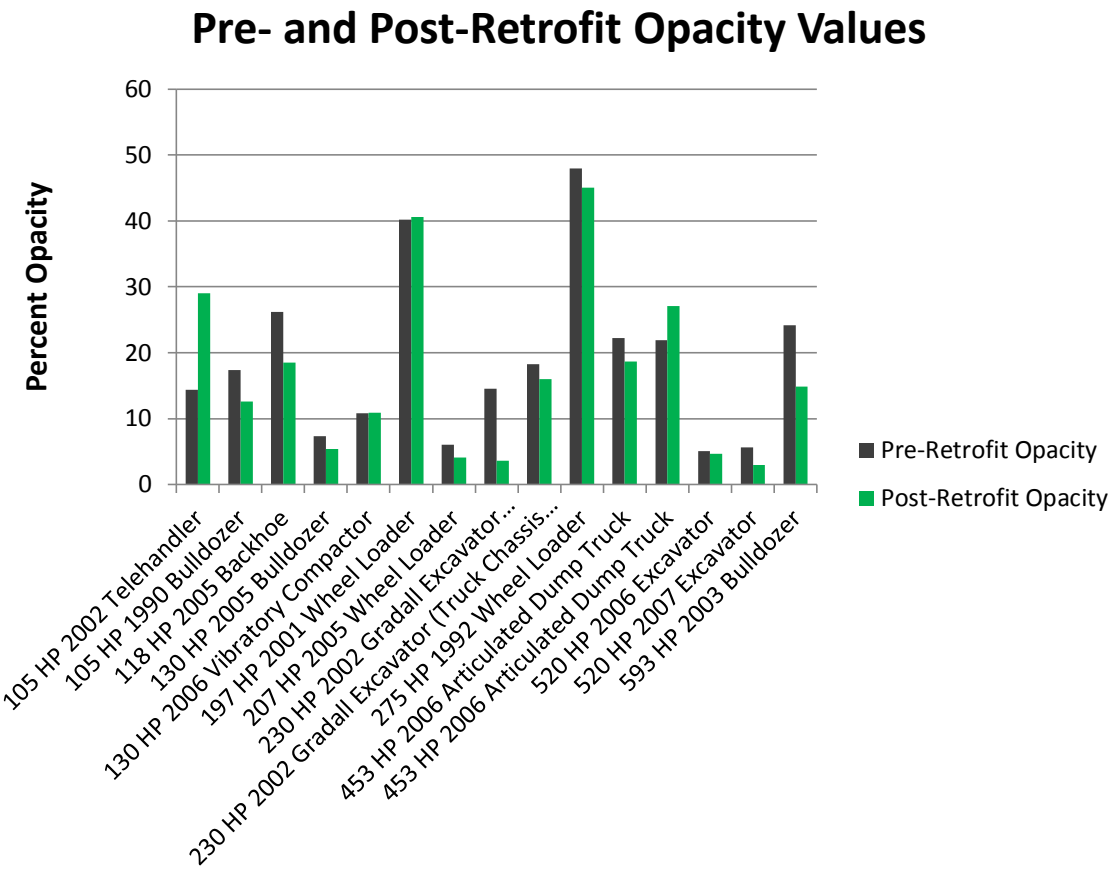
Opacity Test Results

Maximum allowable opacity for 1991 and newer off road vehicles is 40%



Note: varying exhaust temperatures and duty cycles, as well as maintenance can affect the opacity results.

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Retrofit Equipment

- Diesel Particulate Filter (DPF)
  - Pollutants in the diesel exhaust are trapped by the special filter made from porous ceramic-like material. This type of device must be cleaned regularly.
  - Often difficult to meet installation requirements.
  - Price range of $10,000 - $25,000 ($15,000 - $50,000 for active DPFs), with $PM_{2.5}$ reductions of 85-95%.
- Flow-Through Filter (FTF)
  - Pollutants in the diesel exhaust are directed through corrugated metal foils and metal fiber fleece into channels in the filter and oxidized by the interior catalytic coating.
  - Widely applicable.
  - Price range of $5,000 - $15,000, with $PM_{2.5}$ reductions of 50-70% (affected by exhaust temperatures).
- Diesel Oxidation Catalyst (DOC)
  - Pollutants in the diesel exhaust are broken down into less harmful components by palladium and platinum catalysts using simple oxidation.
  - Most universally applicable.
  - Price range of $2,000 - $6,000, with $PM_{2.5}$ reductions of 20-30% (affected by exhaust temperatures).

Retrofit Installations

DOC →

← FTF

DPF (active) →

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Project Outcomes

- Over the life of the project, 14 pieces of construction equipment (15 engines) were pre- and post-tested, assessed, and retrofitted.
- An overall 20% reduction in opacity was observed.
- An overall 40% reduction in $PM_{2.5}$ was guaranteed by the retrofit manufacturers and verified by the EPA/CARB certification process.
- Much experience and insight was gained into the retrofit process, especially as it applies to offroad construction equipment and the legacy fleet in Rhode Island and in general.

Report

- Details the methods, procedures, experiences, and pitfalls throughout the two year pilot project.
- Puts forth recommended best practices for the most efficient and cost effective approach to retrofitting diesel construction equipment.
- Contains a standalone Road Map for Diesel Emission Reduction in Rhode Island to detail the overall process and technical issues in reducing diesel PM in the legacy fleet of construction equipment in Rhode Island.
- Contains information outlining what other states in the region have done to address PM reduction and the legacy fleet.
- Being released and disseminated later in 2013

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Questions?

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