



**Public Workshop to Discuss
Reducing Emissions from
In-Use Commercial Harbor Craft**

Technology Demonstration Projects

March 23, 2004

California Environmental Protection Agency



Air Resources Board

Overview

- Completed Technology Demonstration Projects
- Technology Demonstration Projects Underway
- Planned Technology Demonstration Projects

Technology Demonstrations Key Element in Defining Reduction Strategy

- Demonstrate feasibility of controls to reduce NOx and/or PM emissions
- Provide venue to evaluate parameters which affect control technology
- Provide actual in-use operational experience

Completed Technology Demonstration Projects Blue & Gold Fleet - M/V Oski Technology: Alternative Diesel Fuel and Water Injection

- Converted fuel from off-road diesel to soy-based biodiesel
- Tested between 9/01 to 4/02 with and without water injection into the inlet stream



Completed Technology Demonstration Projects

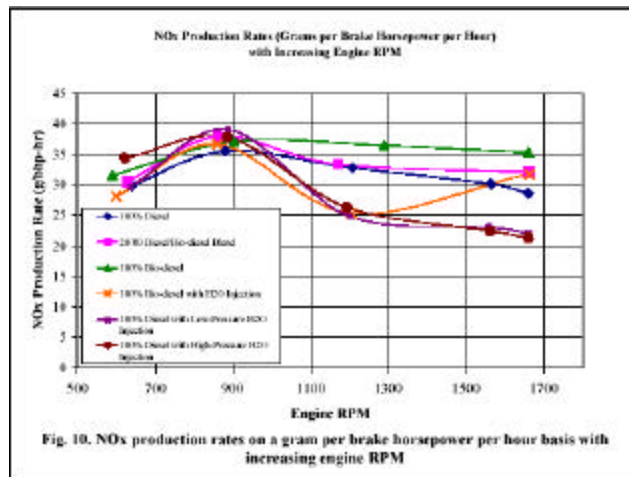
Blue & Gold Fleet - M/V Oski

Technology: Alternative Diesel Fuel and Water Injection

- Emission changes from EPA Diesel
 - NOx increased 24% with 100% biodiesel
 - NOx increased 11% with 20% biodiesel
 - NOx decreased 26% with water injection
 - NOx increased 12% with water injection and 100% biodiesel
 - 100% biodiesel reduces PM by 50%

Blue & Gold Fleet - M/V Oski

NOx Emissions with Different Control Technologies



Blue & Gold Fleet - M/V Oski PM Emissions with Different Control Technologies

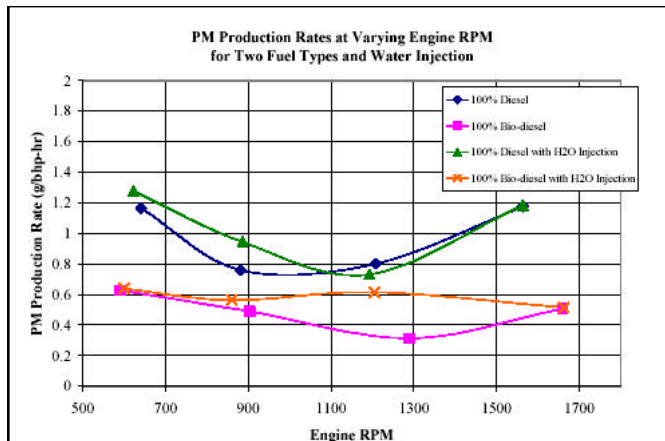


Fig. 13. Particulate matter production rates on a gram per brake horsepower per hour basis at varying engine RPM for two fuel types and water injection

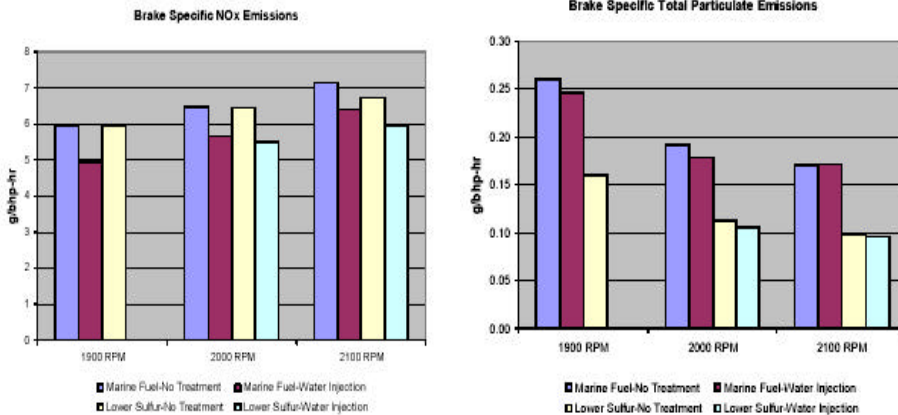
Completed Technology Demonstration Projects SCX Ferry

Technology: Lower Sulfur Diesel Fuel and Air Humidification

- Emissions tests compared marine and LSD Fuel with & without Air Humidification from M.A. Turbo/Engine Ltd.
- Tests conducted Summer 2003



SCX Ferry Emissions Test Results



Technology Demonstration Projects Underway Staten Island Ferry, M/V Alice Austin Technology: **Selective Catalytic Reduction and Diesel Oxidation Catalyst**

- SCR and DOC will be retrofitted on both CAT 3516 main engines
 - Contract award by 4/04, system testing by 7/04
 - Expect 70% reduction in NOx
 - Substantial reduction in PM
- DOC retrofit option on auxiliary CAT 3406 engine



Technology Demonstration Projects Underway
New York City Harbor Private Ferry
Emissions Reduction Program
Technology: To Be Determined

- **NYSERDA Initiated \$6.8 million Emission Reduction Technologies Demonstration**
- **Seaworthy Systems, Inc. awarded prime contract in September 2003**
 - ▶ **Conduct an inventory of all area ferries**
 - ▶ **Data log four candidate vessels**
 - ▶ **Evaluate suitable emissions reduction technologies**
 - ▶ **Install and demonstrate selected systems**
 - ▶ **Measure emissions reductions**

Planned Technology Demonstration Projects
Retrofit Blue & Gold Ferry
Technology: Cleaire Longview

- **San Francisco based Blue & Gold Fleet is considering a retrofit of Cleaire's Longview System on new main propulsion engines**
- **Reduce both NOx and PM**
- **Expect 30+% NOx reduction and 85+% PM reduction**
- **Project to be initiated mid 2004**



Planned Technology Demonstration Projects
New-Build Vallejo Ferry with SCR
Technology: Selective Catalytic Reduction

- City of Vallejo is purchasing passenger ferry to service Vallejo and North Bay residents to and from San Francisco
- Low emissions ferry utilizing Urea based SCR
- Expect 50% NOx reduction and 10% CO, THC, PM reduction
- Scheduled for delivery in April 2004



Planned Technology Demonstration Projects
Naval Pilot Emission Control Program
~~**Technologies: Cleaner Fuels, PM Retrofits, Improved Injectors**~~

- ARB co-funding program with Navy and others
- Program will evaluate several potential retrofit control technologies
- Research will focus on technologies that could be used on harbor craft
- Evaluate technologies on a '74 Detroit Diesel engine 12V-71
- Plan on completing tests in June 2004

Planned Technology Demonstration Projects
Naval Pilot Emission Control Program

Technologies: Cleaner Fuels, PM Retrofits, Improved Injectors

- Several fuels - Naval distillate [F-76] and aviation [JP-5], ULSD, soy based methyl ester/diesel blend, and Fischer Tropsch
- Air Humidification Technologies (intake air water injection)
- Biodiesel blend B20 (alone, and with Air Humidification)
- Catane DFA Diesel Fuel Upgrade (ferrocene fuel additive)

Planned Technology Demonstration Projects
Naval Pilot Emission Control Program

Technologies: Cleaner Fuels, PM Retrofits, Improved Injectors

- Clean Cam Technology System (combustion chamber and injector modifications and turbocharger addition)
- ECOTIP Superstack Fuel Injector (small sac volume)
- Active DPF with Low Sulfur Diesel (alone, and with Clean Cam Technology System)

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