

Evaluation Of Evaporative Emissions From Pleasure Craft



June 27, 2007

Presentation Outline

1. **Objective**
2. Plan Overview
3. Control Technology Testing
4. Inventory Development
5. Fuels Comparison Study
6. Boat Safety
7. Quality Assurance/Quality Control
8. Next Steps
9. Comments and Contact Information

Objective

Generate data to:

- Support setting evaporative emissions standards
- Determine evaporative emissions rates (running loss, hot soak, and diurnal emissions)
- Supplement a fuels comparison study for all off-road equipment

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Test Plan Overview

The test plan accomplishes its objectives through three key elements:

- Evaluation of control technologies
- Development of emissions inventory
- Evaluation of evaporative emissions with different fuels

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Control Technology Testing

Test Boat and Engine

- Test to be performed on a boat equipped with an outboard marine engine
 - Crestliner Model 1750 Sport Angler
 - The boat will be fitted with a 4-stroke 90 HP Honda carbureted engine

Control Technology Testing (cont.)

Potential Technologies

- Potential control technologies will be evaluated in the following order:
 1. Low permeation fuel hose
 2. Low permeation fuel tank
 3. Passively purged carbon canister
 4. Fuel injected outboard engine
 5. Low permeation vent and filler hose
 6. Low loss fittings and connectors

Control Technology Testing (Cont.)

Component Durability

- We at ARB expect evaporative emission components to be effective throughout the boat's useful life
- ARB wants to work very closely with industry to develop appropriate procedures for evaluating component durability

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Inventory Development

Temperature Study

- A temperature study will be conducted to measure temperatures on a boat during storage and usage.
 - Thermocouples will monitor the following temperatures:
 - Ambient air
 - Water
 - Fuel
 - Importance of conducting this study
 - Boats stored on water will have a different temperature profile than those stored on land

Inventory Development (cont.)

Activity and Usage

- How Pleasure Craft are stored and used has a substantial effect on evaporative emissions
- Users will be surveyed to determine:
 - How the Pleasure Craft are prepared for storage
 - Where and how long are the Pleasure Craft stored
 - What the fuel level is during storage
 - How often Pleasure Craft are used

Inventory Development (cont.)

Activity and Usage

- To determine Pleasure Craft usage:
 - A comprehensive survey will be implemented
 - Pleasure Craft usage will be measured by equipping popular models with data loggers

Inventory Development (cont.)

Background Emissions Testing

- Background emissions from new Pleasure Craft will be measured using a 65-105-65°F diurnal temperature profile
 - All new boats will be tested in same condition as received
 - Testing on new boats will begin a minimum of 30 days following the date of manufacture

Inventory Development (cont.)

Baseline Emissions Testing

- Measurement of baseline emissions from new and used Pleasure Craft will follow a prescribed sequence:
 1. Preconditioning
 2. Running Loss
 3. Hot soak
 4. 24-Hour Diurnal
- Baseline emissions data will:
 - Be used as a reference for Pleasure Craft control technology
 - Provide a basis for the emissions inventory

Inventory Development (cont.)

Baseline Emissions Testing - Preconditioning

- New Pleasure Craft will be preconditioned for no less than 30 days
- When changing test fuels, Pleasure Craft will be soaked for no less than 30 days
- Used Pleasure Craft are assumed to be fully preconditioned

Inventory Development (cont.)

Baseline Emissions Testing - Running Loss

- Running loss tests will be performed using an ARB developed load profile based on engine RPM
 - Pleasure Craft will be run at various RPMs to match load percentages
 - Emissions will be captured through a carbon canister at ambient conditions
- Approach will not capture all running loss emissions

Inventory Development (cont.)

Baseline Emissions Testing - Hot Soak

- A hot soak test will be performed to measure emissions immediately after the engine is shut off
 - Engine will be operated until a normal operating temperature is achieved
 - Hydrocarbons will be measured over a 3 hour period at a constant 95° F

Inventory Development (cont.)

Baseline Emissions Testing - Diurnal

- Diurnal emissions will be measured over a 24 hour period using a 65°F-105°F- 65°F profile
 - Equipment will be soaked for 6 hours at 65°F prior to the initial diurnal sequence
 - During the diurnal testing, hydrocarbons will be measured every minute for 24 hours
 - California Annual Average Profile may be modified as a result of the temperature study

Inventory Development (cont.)

Surveys and Field Studies

- A survey of California boat owners will be conducted to determine how, when, and where Pleasure Craft are operated and stored
 - The survey will be conducted by California State University, Sacramento
 - Ten boat owners will be selected for a detailed usage study
 - Log date and time, GPS location, engine rpm, engine run time, ambient temperature, fuel temperature, and water temperature

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Fuels Comparison Study

- A fuels comparison study will be conducted as a part of the predictive model for off-road equipment.
- Fuel variations will include:
 - E0
 - E6
 - E10
- Temperature profile variations will include:
 - Summer episodic ozone profile
 - California annual average profile for boats as discussed earlier
 - California wintertime profile

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Boat Safety

- ARB will coordinate with the following groups to confirm boats with evaporative systems can meet fire and safety standards:
 - U.S. Coast Guard
 - California Department of Boating and Waterways
 - Department of Consumer Affairs
 - California State Fire Marshal

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Quality Assurance/Quality Control

- Testing will be conducted pursuant to 40 CFR, Part 86
- SHEDs will undergo monthly background, recovery, and retention checks
- ARB laboratory will evaluate all fuels used for testing
- SHED temperature data is collected and evaluated on a minute by minute basis

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Next Steps for Rule Development (Tentative)

- Control Technology Evaluation
Summer 2007 – Summer 2008
- Emissions Inventory Development
Summer 2007 – Winter 2008
- Fuels Comparison Study
Summer 2007 – Until Completion
- Development of Staff Proposal
Late 2008
- Board Hearing
2009

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Comments?

Contacts

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