

Recreational Marine Inboard and Sterndrive Boat Regulations

Air Resources Board Hearing
November 17, 2004

Outline

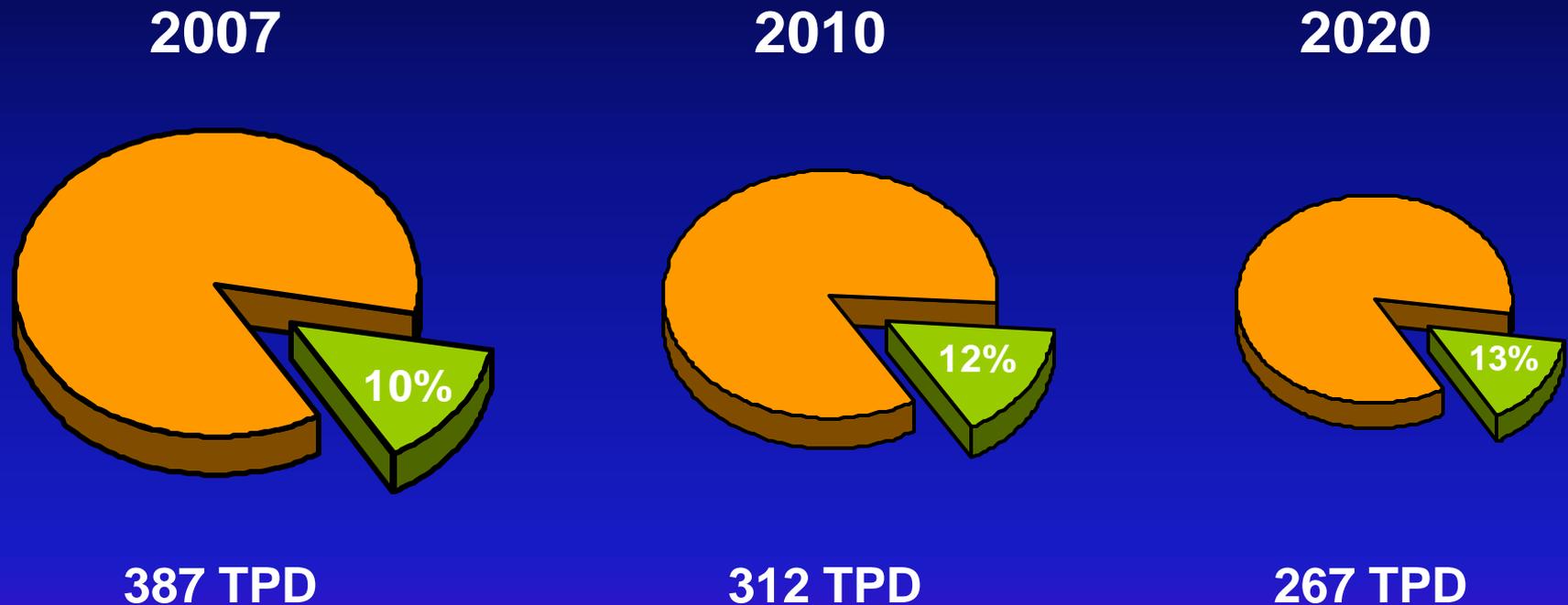
- Background
- Proposed Amendments
- Salt Water Testing
- Future Action
- 15-Day Changes
- Conclusions



Inboard and Sterndrive Boats



HC+NO_x Emissions Inboard and Sterndrive Boats



-  Inboard & Sterndrives
-  Other Off-Road Gasoline Engines

Current Regulation

- Adopted by the Board in 2001
- Two Phases of Exhaust Emission Standards

MODEL YEAR	POWER CATEGORY	16.0 g/kW-hr Averaged Standard	5.0 g/kW-hr Fixed Standard	DURABILITY
	[kilowatts]	[NMHC+NO _x]	[NMHC+NO _x]	[hours]
2003 - 2006	kW = 373	100%	-	-
2007		55%	45%	
2008		25%	75%	
2009 and later	ALL	-	100%	480*

* The durability period may be expressed as either 480 hours or 10 years, whichever occurs first.

- Durability and Warranty
- On-Board Diagnostics

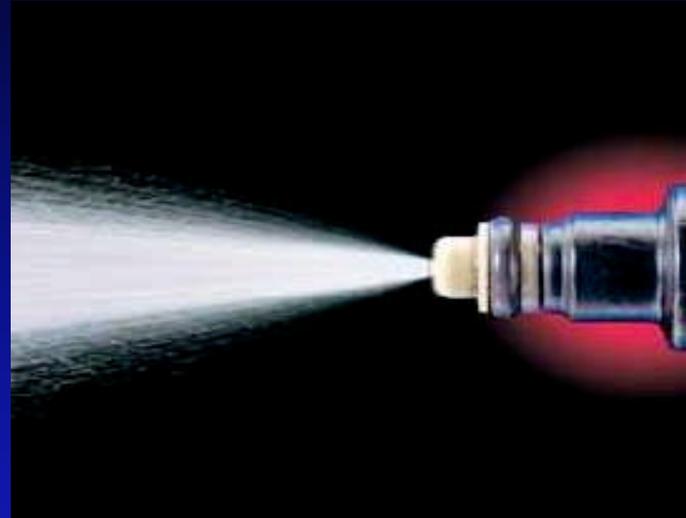
Fresh-Water Test Program

- Objectives
 - Equip four engines with three-way catalyst systems
 - Protect catalyst system from water
 - Accumulate 480 hours of on-water operation
 - Monitor catalyst temperature
- Conclusions
 - Three-way catalysts are durable and can be operated safely in marine applications
 - The 5.0 g/kW-hr HC+NO_x standard can be met with three-way catalysts



Emission Control Technologies

- Electronic Fuel Control
- Three-Way Catalysts
- Oxygen Sensors



California Environmental Protection Agency

Marine Industry's Concerns with Current Regulation

- Lead-time to comply with the 5.0 g/kW-hr HC+NO_x Standard in 2007
- Compliance of engines with rated power greater than 373 kW (500 HP)



Proposed Amendments

- Choice of Implementation Options
- Revisions for High-Performance Engines > 373 kW



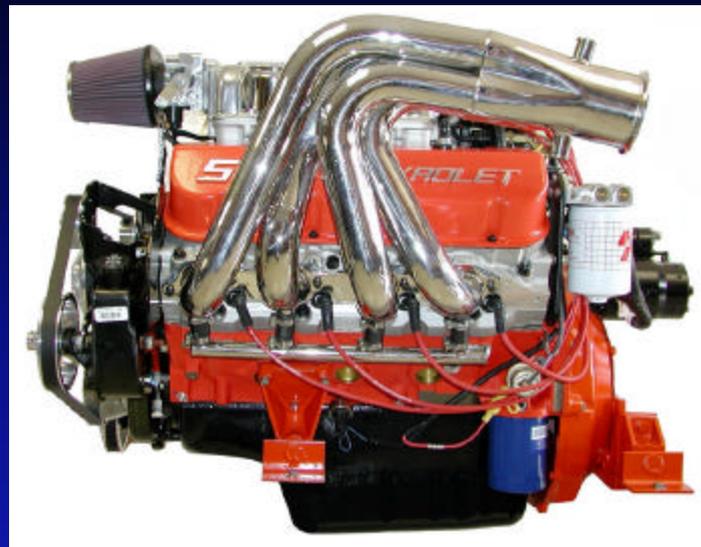
California Environmental Protection Agency

Implementation Options

- Option 1
 - Existing 5.0 g/kW-hr HC+NO_x Phase-in Schedule
 - 45% in 2007 75% in 2008 100% in 2009
- Option 2
 - Alternative 5.0 g/kW-hr HC+NO_x Schedule
 - 100% in 2008
 - Additional Emission Reductions in 2007

High Performance Engines > 373 kW

- Emissions may be averaged with those from engines = 373 kW
- Mechanical parts warranty
 - 3 yrs/150 hrs (373 = kW < 485)
 - 1 yr/50 hrs (> 485 kW)
- Engine durability
 - 1 yr/50 hrs (> 485 kW)



California Environmental Protection Agency



Air Resources Board

Salt-Water Test Program

- Objectives
 - Demonstrate the durability of catalysts and oxygen sensors
 - Demonstrate the feasibility of monitoring the catalyst
- Summary of Activities
 - On-water phase to end on November 30, 2005
 - Accumulation of hours less than expected
 - No initial indications of excessive deterioration

Future Action

- Carbon Monoxide Standard
- Evaporative Standards
- Small Volume Issues
- White Paper on Turnover



Proposed 15 Day Changes

- Transfer low-permeation hose installation responsibility to the boat builder
- Revise mechanical parts warranty for high-power engines ($373 = \text{kW} < 485$)
- Include 480-hour limit along with yearly warranty
- Minor procedural and definition changes

Conclusions

The Proposed Amendments:

- Facilitate Compliance
 - Additional lead-time
 - Averaging of standards
 - Revised warranty/durability
- Preserve Benefits
 - 56.8 tons per day reduction of HC+NO_x in 2020
 - \$2.08 - \$3.39 /lb HC+NO_x reduced

