California's Small Off-Road Engine (SORE) Regulations

Robert Sawyer, PhD, Chair CARB

Hearing on Request for Authorization to Enforce

Washington, DC

June 29, 2006

California Environmental Protection Agency
Air Resources Board

Outline

Three part presentation

1) The case for granting the waiver (Sawyer)
2) Legal requirements for a waiver (Jennings)
3) Feasibility of our regulation (Carter)

Small Off-road Engine Regulation: Summary

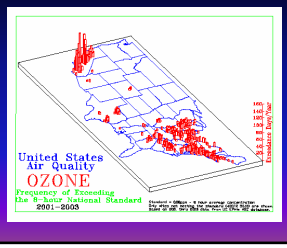
- Adopted 2003-2004
- Applies to engines less than 19 kW
- Used in lawn mowers, riding mowers, generators, string trimmers, etc.
- Includes exhaust and evaporative emission standards

Air Pollution Remains a Serious Health Threat

- The San Joaquin Valley Air Basin exceeded the federal 8-hour ozone standard on 72 days in 2005.
- The South Coast Air Basin exceeded the same standard on 84 days in 2005.

- 19,598,900 people exposed to unhealthy ozone levels for up to a quarter of the year.

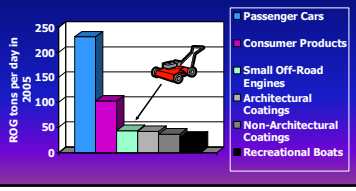
Nationwide Ozone Exceedances



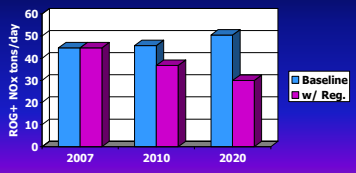
California Needs Cleaner Engines to Meet Public Health Goals

- Recent modeling shows how far we have to go to achieve clean air
- ROG and NOx emissions must be cut by more than 50% to comply with NAAQSs

Small Off-Road Engines are Third Largest Source of ROG in the South Coast Air Basin



Regulation Effectively Reduces Emissions from Small Engines



South Coast Air Basin

Technical Feasibility - Catalysts

- Widely used, commercial product
- Used on small engines in Europe and elsewhere
- Studies demonstrate efficacy
- Standards adopted require less than catalysts are capable of

Catalysts Are Safe

- If catalysts don't increase exhaust system temperatures, current level of safety will be unaffected.
  - Both studies confirm this premise
  - EPA study confirms with both in-field testing and failure mode analysis
  - Results are compelling
- No question that catalysts are safe
  - Good engineering will assure safe application
  - 4 engine manufacturers confirm safety

Cost is Reasonable Cost Effectiveness is Good

Mowers	Cost Increase	% Increase	Cost Effectiveness
Walk behind mower	$37-52	18%	$5000-7000/ton
Commercial turf care	$71-179	3%	$440-1100/ton

California Air Resources Board

California's Small Off-Road Engines Regulations – Legal Requirements

Tom Jennings, Chief Counsel, CARB

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CARB's SORE Rulemaking Action

- CARB's governing board conditionally approves SORE regulation at September 25, 2003 hearing
- Executive Officer adopts modified regulation July 26, 2004 per Board's direction after supplemental comment periods

Requested EPA Action

April 11, 2005 Request

- New authorization for evaporative emissions standards
- Confirm that amendments to exhaust standards are within the scope of July 1995 and November 2003 SORE authorizations
  - Or, alternatively, a new authorization

Federal Clean Air Act

- §209(e)(1)
  Preempts state nonroad standards/reqs. for new farm & construction equipment <175hp and for new locomotives/engines
- §209(e)(2)
  Directs EPA to authorize California to enforce its standards/reqs. on other nonroad engines unless EPA makes one of three specified findings

First §209(e) Finding - Protectiveness -

EPA can deny authorization if it finds California has been **arbitrary and capricious** in determining our standards are, in the aggregate, as protective of the public welfare as applicable federal standards

CARB's Protectiveness Determination Satisfies Authorization Requirement

- Protectiveness determination adopted by governing board in Resolution 03-24
  - No comparable federal evaporative emissions standards
  - California's exhaust standards in almost all respects are either as stringent or more stringent than federal exhaust standards in 40 CFR Part 90

Second §209(e) Finding Compelling & Extraordinary Conditions

EPA can deny authorization if California does not need such State standards to meet compelling and extraordinary conditions

Narrow Test: California's unique geographical and climatic conditions, combined with high number of and concentration of motor vehicles, demonstrates continuing need.

Third §209(e) Finding - Consistency -

EPA can deny authorization if the California standards and accompanying enforcement procedures are inconsistent with §209

Only significant issue here is consistency with §202(a) under a two-prong test

Third §209(e) Finding - Consistency - (cont'd)

EPA can deny authorization if California:

- regulates new on-road motor vehicles or engines
- regulates a preempted nonroad category
- is not consistent with §202(a) under a two-prong test

Consistency: Lead-time

1st Prong – §202(a): Federal emission standards must take effect after the period necessary to permit development and application of the requisite technology, giving appropriate consideration to the cost of compliance

Technological Feasibility - International Harvester Case –

U.S. Court of Appeals (1973): "We are inclined to agree with the Administrator that as long as feasible technology permits the demand for new passenger automobiles to be generally met, the basic requirements of the Act would be satisfied, even if this might occasion fewer models and a more limited choice of engine types."

Technological Feasibility - International Harvester Case – (cont'd)

"Basic market demand" invoked by EPA in past waiver proceedings

- 43 F.R. 25729 (June 14, 1978) – fewer (or no) diesel-powered passenger car models as a result of 1980 MY passenger car standards
- 49 F.R. 18887 (May 3, 1984) – 1986 passenger car standards triggered need for trap oxidizers on diesels
- 41 F.R. 44209 (Oct. 7, 1976) – California standards could result in elimination of two stroke motorcycles

Technological Feasibility - NRDC Case -

- Have theoretical objections been answered?
- Have the major steps needed to refine the technology been identified?
- Have plausible reasons been offered for believing steps can be completed in time?

Consistency: Comparing Test Procedures

2nd Prong – Federal and State Test Procedures should not preclude demonstrating compliance with the same test unit or engine

Safety Considerations Bond Amendment

Public Law 108-199, January 23, 2004

Sec. 428. REGULATION OF SMALL ENGINES

(a) In considering any request from California to authorize the State to adopt or enforce standards or other requirements relating to the control of emissions from new non-road spark-ignition engines smaller than 50 hp, the Administrator shall give appropriate consideration to safety factors (including the potential increased risk of burn or fire) associated with compliance with the California standard.

Key Principles of Authorization Proceedings

- EPA's consideration is limited to the three issues in statute, including safety
- EPA must give substantial deference to California's policy judgments
- The burden is on the opponents of an authorization

Limited Issues

"The law makes it clear that the waiver requests cannot be denied unless the specific findings designated in the statute can be properly made. The issue of whether a proposed California requirement is likely to result in only marginal improvement in California air quality not commensurate with its cost or is otherwise an arguably unwise exercise of regulatory power is not legally pertinent to my decision under §209, …."

-- Administrator William Rukelshaus, 1971 (36 FR 17458)

According Deference to California

"The structure and history of the California waiver provision clearly indicate both a Congressional intent and an EPA practice of leaving the decision on ambiguous and controversial public policy to California's judgment."

-- Administrator Russell Train, 1975 (40 FR 23104)

Burden on Waiver Opponents

"The language of the statute and its legislative history indicate that California's determination that they comply with the statute, when presented to the Administrator are presumed to satisfy the waiver requirements and that the burden of proving otherwise is on whoever attacks them."

-- U.S. Federal Court of Appeals in MEMA v. EPA (1979)

California's Small Off-Road Engines Regulations – Technical Summary

Michael Carter

Mobile Source Control Division

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California Environmental Protection Agency
Air Resources Board

The California Regulation

- Was developed with stakeholder input
- Is Technologically Feasible
- Provides Sufficient Lead time
- Is Cost Effective
- Is Safe

Stakeholder Participation

- Workshops and public meetings
  - November 2000 –evaporative emissions workshop
  - April 2002 –evaporative emissions workshop
  - November 2002 – combined exhaust and evaporative emissions workshop
  - July 2003 – final workshop
  - August 2003 – Proposal published
  - September 2003 – Board Hearing
- Private meetings
  - Approximately 40 meetings with trade associations
  - Approximately 20 meetings with individual companies

Small Engine Regulation - Exhaust Emissions

- Handheld type engines
  - Aligned with U.S. EPA standards as of 2005
- Lawn mower type engines
  - Effective in 2007 - catalyst-based levels
- Riding mower type engines
  - Effective in 2008 - catalyst-based levels

Small Engine Regulation Evaporative Emissions

- Handheld type engines
  - Fuel tank permeation standards beginning 2007
- Walk behind lawn mower type engines (Class I)
  - Fuel hose permeation requirements – 2006
  - Diurnal standards in 2007 and 2009
- Other Class I engines
  - Fuel hose permeation requirements - 2006
  - Diurnal standards in 2007 and 2012
- Riding mower type engines (Class II)
  - Fuel hose permeation requirements in 2006
  - Diurnal standard in 2008

Evaporative Emissions Standards

- **Handheld standards**: Apply to engines ≤80cc such as use in string trimmers, chainsaws, and leaf blowers

Model Year	Design Requirement Fuel Tank ROG/m²/day
2007 and later	2.0

- **Class I walk-behind engine standards:** Apply to walk-behind mowers with engines >80cc to <225cc

	Performance	Design		
Model Year	Diurnal HC/day	Fuel Hose ROG/m²/day	Fuel Tank ROG/m²/day	Carbon Canister
2006	None	15	None	None
2007 & 2008	1.3	N/A	N/A	N/A
2009	1.0	N/A	N/A	N/A

Evaporative Emissions Standards Cont.

- **Class I non walk-behind engine standards**: Apply to equipment other than non walk-behind mowers with engines >80cc to <225cc such as edgers, tillers, and pressure washers

	Performance	Design		
Model Year	Diurnal HC/day	Fuel Hose ROG/m²/day	Fuel Tank ROG/m²/day	Carbon Canister
2006	None	15	None	None
2007 through 2011	1.20 + 0.056*tank volume (liters)	15	2.5	Specified in TP-902[1]
2012	0.95 + 0.056*tank volume (liters)	15	1.5	Specified in TP-902[1]

[1]Canister working capacity standard based on fuel tank volume

Evaporative Emissions Standards Cont.

- **Class II engine standards:** Apply to engines ≥ 225 cc such as lawn tractors and generators

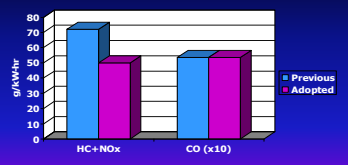
	Performance	Design		
Model Year	Diurnal HC/day	Fuel Hose ROG/m²/day	Fuel Tank ROG/m²/day	Carbon Canister
2006 and 2007	None	15	None	None
2008	1.20 + 0.056*tank volume (liters)	15	2.5	Specified in TP-902[1]
2013	1.20 + 0.056*tank volume (liters)	15	1.5	Specified in TP-902[1]

[1]Canister working capacity standard based on fuel tank volume

Evaporative Emissions Status

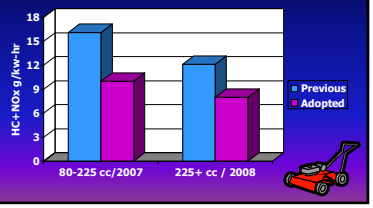
- 2006 engines are using improved fuel lines
  - More durable = improved safety
  - Less likely to cause collection of vapors = improved safety
- 30 approvals of components to be used in design standard based compliance
- No significant issues are impeding implementation

Handheld Exhaust Standards Tier 3



Standards for displacement < 50 cc.
≥ 50 and ≤ 80 cc standards remain the same.

Nonhandheld HC+NOx Exhaust Standards Tier 3



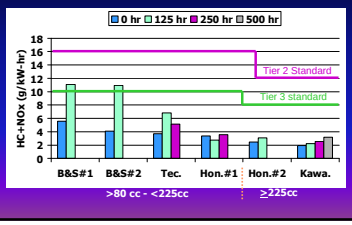
Lower emissions

- Standards are based on the use of a catalytic converter, but are performance standards, not prescriptive

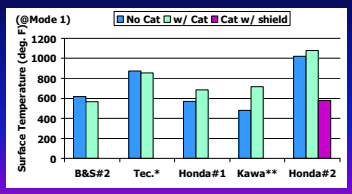
Southwest Research Institute Evaluation

- Demonstrate proof of concept
- Conducted with participation of numerous companies
- Included emissions and durability testing
- Monitored exhaust and catalyst surface temperatures
- Demonstrated successful 50 percent emission reduction
  - Adopted standard requires only 33-38 percent reduction

Southwest Research Institute Exhaust Levels Achieved



Muffler Surface Temperatures



* At 250 hours

** At 125 hours

Engine Manufacturers and Safety Organizations Supported Regulation

- "We think that the modified exhaust emissions proposal presented today of 10 and 8 grams will make it possible to have an exhaust system with a lower risk of being a fire safety hazard. It's manageable today on our current products. And with this revised proposal it will be manageable on the future engines " -- David Raney, American Honda Motor Company, 2003
- "My review of the record . . . leads me to believe the safety issues have been resolved." -- John Tennant, California State Fire Marshal, 2003
- "We support the regulation moving forward . . . . our safety concerns will be addressed through the independent study." -- California Fire Chiefs Association, 2003

Industry Supports Standards, and asked for National Implementation

- August 25, 2005 letter from Kohler
- September 1, 2005 letter from Honda
- September 2, 2005 letter from Kawasaki
- September 7, 2005 letter from Tecumseh

U.S. EPA Safety Evaluation Input

- Consumer Product Safety Commission
- Outdoor Power Equipment Institute
- National Association of State Fire Marshals
- National Institute of Standards and Testing
- Others

U.S. EPA Safety Evaluation

- Scenario Identification
- Emissions Testing
- Thermal Imaging
  - Laboratory
  - Field
- Failure Mode and Effects Analyses
- Peer Review
- Consumer Product Safety Commission Review

Specifically, What Are The Safety Issues?

Q: Will exposed surface temperatures increase and cause an increased risk to operators of fire or burns?
A: NO. Properly designed catalysts do not increase surface temperatures exposed to debris or the operator.

Q: Are failure modes, such as ignition misfire or rich operation, a problem?
A: NO. The risk of misfire can be easily addressed with properly designed catalysts. The EPA study showed other abnormal conditions, such as rich operation, can also be managed.

U.S. EPA Safety Evaluation Conclusion

- "New emission standards would not cause an incremental increase in risk of fire or burn to consumers in use. Instead, compliance with the new standards should reduce certain safety concerns presented by current technologies"
- CATALYSTS ARE SAFE.

Catalysts Are Not New

Catalysts Are Not New . . . Not Even on Lawn Mowers

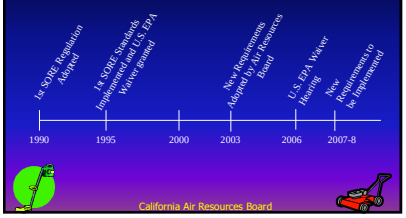
Will Another Study Provide Any Useful Information?

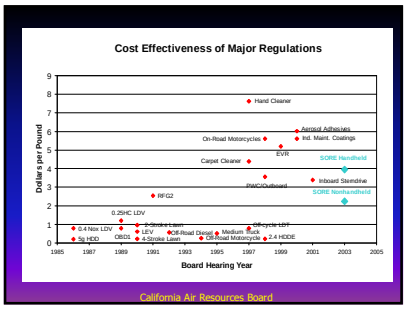
- Redundant
  - EPA has done off-nominal testing already
  - Current product as base has already been studied
- Unrealistic and Overall Bad Assumptions
  - Air "pumped into [the] exhaust stream at a location upstream of the catalyst" to provide conditions not found in the real world
  - Assumes conclusion that prototypes won't comply

Future Safety Standard?

- Equipment manufacturers (OPEI) propose developing new ANSI safety standards
  - Benefits industry
- Development of industry safety standards should not be used to delay emission regulations
  - OPEI has told CA it agrees no delay intended
  - Catalyst standards have been shown to be safe

Plenty of Lead Time





Nonhandheld Exhaust Standards Are Already Being Met

- 11 model year 2006 engine families between 80 cc and 225 cc meet the 2007 exhaust standard.
- 60 model year 2006 engine families equal to or greater than 225 cc meet the 2008 exhaust standard.

Summary The California Regulation

- Developed with stakeholder input
- Is Technologically Feasible
- Is Safe
- Provides Sufficient Lead time
- Is Cost Effective

Manufacturers Support Regulation

- "We are confident that the resulting compliant product will perform satisfactorily in every way, including safety." -- **Kohler**
- "Honda has publicly committed its support of the California Air Resources Board exhaust emission standards that take effect in 2007, and we have a compliance plan prepared for that regulation . . . this level of standard stringency for exhaust emissions should not have a significant impact on the safety of future Honda engines or products." - **Honda**
- "Kawasaki is confident there will be no increase to risk to public safety as a result of the addition of catalysts to Kawasaki brand products." - **Kawasaki**
- We have confidence that … we will be capable of manufacturing products …even if catalysts are required, without compromising our commitment to consumer safety." -- **Tecumseh**

Summary

- California's program meets all applicable legal requirements for a waiver.
- The regulations are feasible, cost-effective and safe.
- EPA must act before the end of the year to allow CARB to enforce its regulation.

National Academy of Sciences Agrees

"Recommendations: California should continue its pioneering role when setting emissions standards for small engines to aid its efforts to improve air quality and be a proving ground for new emissions-control technologies."