The Need to Reduce Marine Shipping Emissions: A Santa Barbara County Case Study

Tom Murphy
Santa Barbara County Air Pollution Control District
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Overview

- 2001 Clean Air Plan
- Emission inventories
- Marine shipping inventory
- Regulatory efforts
- Technologies and challenges
- Partnerships and incentives
- Demonstration project
- Conclusions
2001 Clean Air Plan

- Federal attainment: 1-hour ozone standard
- Develop emission inventories
- Evaluate emission control measures
- Forecast emissions
- Provide for continued attainment
- Marine shipping contribution: Large and growing
Santa Barbara County
NOx Emissions Comparison

1999 - 77.64 tons per day
- Marine Shipping: 36.5%
- On-Road Mobile: 32.5%
- Other Mobile: 22.3%
- Stationary: 7.7%
- Areawide: 1.0%

2015 - 77.55 tons per day
- Marine Shipping: 60.8%
- Other Mobile: 18.5%
- On-Road Mobile: 12.6%
- Stationary: 6.6%
- Areawide: 1.6%
Santa Barbara County NOx Emission Forecast (Tons Per Day)
Marine Shipping Inventory

• Over 6,700 traverses
• 130 miles of coastline
• Large 2-stroke engines
• 9% of vessels = 50% NOx emissions
• 56 vessels over 50 tons per year NOx
• 94% of NOx from foreign flagged vessels
Vessel Transits by Ship Type

Year 2002 Vessel Transits by Ship Type
(Total Transits = 6,701)

- Auto Carrier: 482
- Bulk Carrier: 660
- General Cargo: 584
- Container: 643
- Tanker: 248
- Other**: 4084
~ 30 MW 2-stroke main
Regulatory Efforts

- MARPOL Annex VI
- USEPA Category 3 Rulemaking
- California Air Resources Board
  - More Stringent Standards
  - Clean-up existing fleets/fuels
  - Reduce land-based port emissions
Potential Control Technologies

• Emulsified fuels
• Water injection
• Humidification
• Exhaust gas recirculation
• Selective catalytic reduction
• Cleaner fuels, oxidation catalysts
Technology Challenges

- Quick installation
- Reliability
- Low maintenance
- Safety
- Pollutant trade-offs
- Fuel consumption
- Industry buy-in
Partnerships and Incentives

- CARB Maritime Working Group
- Maritime Administration
- BSR
- Potential incentives
  - Credits
  - Fees
  - Cost-sharing
  - Awards
Demonstration Project

Objectives-
• Demonstrate emission controls
• Develop support for potential economic incentive programs
• Develop in-use testing protocol

Participants-
• U.S. EPA, MARAD, California air pollution control agencies, Ports, and ship operators
Challenges

• Ship owner participation
• Funding sponsors
• Project scope
• Cooperative agreements
• Assignment of reductions
• Vessel routes
• Project life
Conclusions

- Marine shipping emissions are significant and growing
- Regulatory efforts largely ineffective to date
- Control technologies available and cost effective
- Significant capital expenditure
- Technology & implementation challenges
- Pursuing a partnership approach
- Once proven, additional partnerships and incentives programs needed