Marine Shipping Emissions

Maritime Working Group Meeting

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Great Circle Route
Santa Barbara Case Study

- Over 7,000 annual transits
- 130 miles of coastline
- Large 2-stroke engines
- Vessels burning heavy bunker fuels
- Majority of the vessels are foreign flagged
- Trade volumes expected to continue increasing
Santa Barbara County
NOx * Emission Forecast

* Percentage of total emissions from foreign and US vessels in transit

* NOx = Onshore + OCS
Santa Barbara Marine Emissions Inventory

2005 SB Marine Inventory
- 7,086 Transits
- 14,918 Tons of NOx
- 10% of the vessels were responsible for about 56% of the total NOx emissions
- 83% of all of the NOx emissions from container ships
- 92% of the NOx emissions from foreign-flagged vessels

Comparing the SB inventories for 2000 and 2005
- 8% increase in the annual number of vessels
- 10% increase in annual transits
- 35% increase in annual installed power
- 30% increase in annual NOx emissions
Santa Barbara Marine Emissions
Inventory vs. Forecast

Year

2000 2001 2002 2003 2004 2005

NOx (TPY)

11,512 11,584 11,927 12,396 12,839 14,918

Inventory NOx

Forecasted NOx
## Vessel Information

<table>
<thead>
<tr>
<th>Vessel</th>
<th>APL Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship type</td>
<td>Containership</td>
</tr>
<tr>
<td>TEU Capacity</td>
<td>5,108</td>
</tr>
<tr>
<td>Flag</td>
<td>United States</td>
</tr>
<tr>
<td>Built</td>
<td>1995</td>
</tr>
</tbody>
</table>

## Engine Information

<table>
<thead>
<tr>
<th>Engine</th>
<th>MAN B&amp;W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>11K90MC-C</td>
</tr>
<tr>
<td>Type</td>
<td>2-Stroke</td>
</tr>
<tr>
<td>Engine power</td>
<td>66,398 hp</td>
</tr>
</tbody>
</table>

### 2005 Santa Barbara Impact (Source: SB Inventory)

<table>
<thead>
<tr>
<th>Transits</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx rank</td>
<td>43 (out of 1,468 vessels)</td>
</tr>
<tr>
<td>NOx emissions</td>
<td>67 Tons</td>
</tr>
<tr>
<td>PM emissions</td>
<td>5 Tons</td>
</tr>
<tr>
<td>SOx emissions</td>
<td>46 Tons</td>
</tr>
</tbody>
</table>
Demonstration Project
Emission Control Technologies

- **Technologies:**
  - Fuel-water emulsification system
  - Slide valves

- **Project Cost:**
  - About $780,000 for hardware + Installation
  - CARB Carl Moyer multi-district funding award (2005)
  - Contract between APL and BAAQMD

- **Annual Emissions Reductions in CA Coastal Waters:**
  - NOx = 65 TPY, PM = 4 TPY
  - CA weighted Moyer cost-effectiveness = $1,370/ Ton

- **Participants:** APL, BAAQMD, SLOAPCD, VCAPCD, SBCAPCD, EPA, CARB, MARAD, PoLA, PoLB, MAN B&W
**Demonstration Project**

**Emissions Testing**

- **Cost:** About $100,000
- **Emissions Testing:**
  - **Pollutants:** NOx, PM, SOx, HC, CO, CO2
  - Various vessel operating modes
  - Fuel oil and lube oil analysis
  - In-use, ocean-going vessel emissions testing protocol
- **Funding Partners:**
  - PoLA and PoLB
  - VCAPCD, SLOAPCD and SBCAPCD
- **Testing Contractors:**
  - UC Riverside and MAN B&W
Questions ?