

*Port of Houston Authority
Air Adventure:
2000 and Beyond*

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Clean Air Adventure 2000

- Port of Houston—Who We Are
 - Why did We Start our Adventure?
 - How Did We Start our Adventure?
 - Implementation of the Adventure
 - The Future...
 - Lessons Learned for Future Adventures
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Port of Houston

- Diverse complex of public and private facilities
 - 52 miles from the Turning Basin to the Sea Buoy
 - First in the US in Foreign Tonnage
 - Second in the US in Total Tonnage
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Port of Houston Authority (PHA)

- PHA owns Eight Public Terminals Along the Ship Channel
- Commodities—Dry Bulk, Project Cargo, Containers, Break Bulk, etc.
- Operating and a Landlord Port
- Approximately 150 leased properties





Why Did We Start our Adventure...The Houston SIP

- State Agency Estimated Marine Emissions at 50 tons per day
 - Construction Ban--6 a.m. to noon
 - Diesel Fuel Emulsions in Offroad and Onroad engines
 - Acceleration of Tier II/III Engines
 - SCR/Diesel Fuel Emulsions in Tugs and Offroad Equipment
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The Houston SIP...

- Limit of five minutes idling time for trucks
- Considering reduction of ship speeds





WHY....continued

- Infamous phone call from the Regional Air Quality Planning Committee regarding the SIP.
 - “The Ports in California are doing it...”
 - The PHA’s desire to be a leader in Environmental Issues
 - The TNRCC’s Burglary of Voluntary Measures
 - Majority of Port Emissions are National/International Issues
 - Attempt to Demonstrate Proposed Measures for Tenants/Customers
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HOW????

- Key First Step: Buy in by PHA Top Management and Operations Department Department
- Emissions Inventory for the PHA Fleet.
- Improved Emissions Inventory for the Houston-Galveston Maritime Sector



HOW??? Part Two

- Visited Ports in California
 - Committees formed:
 - Onroad –Purchasing, Operations, and Environmental
 - Offroad – Operations, Environmental, and Legal
 - Maritime- Containers, Tugs, Tankers, Stevedores
 - VMEP-EPA, TNRCC, and the PHA
 - Researched and Brought Vendors in to Discuss Technologies
 - Identified any and all Funding Sources.
 - Brought EPA and TNRCC to the Table
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Emissions Inventory

- Evaluate current inventory
 - Identify data needs for improving inventory
 - Identify data sources
 - Determine funding sources
 - Determine confidentiality issues
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Technology Evaluation

- Select Technologies Best Suited to your Company
 - Evaluate Fuel Changes, Retrofits, and Purchase of New Equipment
 - What is your Biggest Bang for the Buck?
 - Where can you get Funding and What for?
 - What is Available in your Time Frame?
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*Results of the PHA Air
Adventure 2000...*



PHA Emissions Inventory

- 100 Onroad Fleet Vehicles
- 800 Offroad Vehicles
 - 258 Yard Tractors
 - 26 RTG's
- 1998—6 tons per day for Offroad equipment







Maritime Emissions Inventory

- Decreased Inventory from 50 to 32 tons per day of NO_x
 - Common Inventory Assumption Errors
 - Estimates of dwell time
 - Distribution of types of vessels
 - Types of vessels entering Houston
 - Types of fuel used
 - Engine Operations
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Onroad Solution...Propane Trucks and Hybrid Electric Cars

- Purchased one “demo” propane truck.
 - Set up Account For Fueling close to the PHA
 - Received Grant to Install Two Fueling Stations.
 - Next Purchasing Cycle in January
 - Purchase one “demo” hybrid electric car
 - Purchase 20 propane trucks
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First Stab at an Offroad Solution

- Lubrizol's PuriNOx
- Propane
- SCR



Lubrizol's PuriNOx

- Estimated 25% reduction in NOx and 30% reduction in PM
- Ease in Converting Fleet
- Potential for Loss in Horsepower
- First fueling and Emissions Testing in March 2000...2 yard tractors
- Emissions Testing Showed Expected Reduction
- No Loss in Horsepower

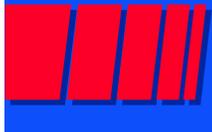


PuriNOx (continued)

- Currently PHA has 5 yard tractors and 3 yard cranes fueled with PuriNOx
- Fueled and Operated a Tour Vessel for one week.
 - 2000 HP Engine
 - Engine Operated Extremely Well
- Highly Successful Demonstration Project—
 - Operations Staff Like the Technology
 - True Partnership with Lubrizol

PuriNOx...the future

- Infiltrate into entire PHA fleet, including Tour Vessel and Workboat
 - Set up fueling stations at facilities.
 - Encourage tenant fleets to switch to PuriNOx.
 - Encourage demonstration of fueling tugs and dredges
 - Test PuriNOx in an Onroad Truck
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Propane

- Two propane fueled yard tractors delivered to Port of Los Angeles
 - PHA received grant to purchase 5 yard tractors in 2001
 - All forklifts will be propane powered
 - Bid item for equipment purchases for propane
 - Note: Retrofits are difficult
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Selective Catalytic Reducer (SCR)

- Selected two manufacturers of SCR technology using urea as the catalyst.
 - Potential for 70 to 90% reduction in NO_x.
 - RJM SCR delivered and installation has begun
 - Siemens SCR purchased and delivery is expected early next year
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SCR...the future

- Urea must become available
- Costs must come down
- Manufacturers must be willing to partner with users
- Potential for infiltration into marine engines





Cruise Ship Fuel Cell

- Onshore Natural Gas Fuel Cell to Provide Power to Cruise Ship While at Port
 - Partnership between Fuel Cell Manufacturer, HARC, TNRCC, EPA, Reliant Energy, PHA, Port of Galveston, and Carnival Cruise Lines
 - Provide Power to Restaurants on Port property during the week
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The Future...

- Distribute Maritime Emission Inventory
 - Ceryx Oxidation Catalyst Demo
 - Engineer a new propane yard crane
 - Air Quality Incentives for Tenants
 - Air Quality Requirements in Construction Projects
 - Expansion into Other Industries/Ports
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The Future...

- Expansion into other Related Industries
- Expansion into other Ports



Lessons Learned.....

- Need Emission Inventory
- Commit to a Technology After Thorough Research
- Funding..
 - It's out there...
 - Be careful of requirements and restrictions
- Form a True Partnership with Technology Company
 - Discuss Failures and Risks
 - Get Commitments Upfront



Lessons Learned...

- Establish a Good Contract
 - Installation
 - Warranty
 - Supplies
 - Maintenance
 - What if something goes wrong?
- Get Agency to approve testing upfront
- Begin “Credit” Discussions



Strategies for the Future...

- US Coast Guard Quality Shipping Program
 - Bring ships into compliance with MARPOL sooner
 - Focusing Maritime Regulations at the National/International Level
 - Getting Credit for Reductions in SIPs
 - EPA's Voluntary Measure Emissions Program (VMEP)
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- Demonstrating Emission Reductions



Strategies....

- Need Clearinghouse for Demo Projects
- National Workgroup to Track and Evaluate Technologies, Emission Inventories, and Potential Regulatory Measures

