

Environmental Advancements of the Goods Movement Industry in California – Spring 2007

Marine Terminal Contributions to Environmental Mitigation

- Marine terminal operators in California have replaced or retrofitted over 1,100 pieces of yard equipment – virtually all of those working at the ports - with post combustion technologies, such as Diesel Oxidation Catalysts (DOC), particulate filters and cleaner diesel technologies. In LA and Long Beach these retrofits and replacements have already reduced emissions from these sources by an estimated 50% over 2001 levels.
- Marine terminal yard equipment, railroad switch locomotives and harbor craft have either agreed by contract or are participating in incentive programs in place at the Ports of Los Angeles, Long Beach and Oakland to increase use of Ultra Low Sulfur Diesel (ULSD), emulsified fuels and alternative fuels used in their operations.
- Emulsified Diesel in Terminal Yard Equipment – The three major ports are all instituting some variation of emulsified diesel fuel. This fuel is verified to reduce diesel particulate emissions by over 50 percent and oxides of nitrogen by over 20%. Los Angeles terminals have consumed over two million gallons of the fuel and Long Beach has estimated that the program, combined with the use of diesel oxidation catalysts, has reduced diesel particulates by over 14 tons and oxides of nitrogen by over 43 tons.
- Ethanol Blended Diesel - A pilot program is underway at the Port of Long Beach to demonstrate the use of an ethanol blended diesel fuel for use in terminal equipment. This fuel is estimated to reduce particulate matter by up to 40 percent and oxides of nitrogen by six percent. The costs of this strategy are not yet known but expected to be approximately \$0.10 per gallon of fuel.
- Ultra-low Sulfur Diesel - Terminal operators not using emulsified diesel or ethanol blends are using the ultra-low sulfur diesel fuels, or soon will be. The fuel by itself offers only modest benefits in reducing particulate emissions, less than ten percent and no reduction of oxides of nitrogen. The additional cost for this fuel runs from \$0.05 to \$0.10 per gallon. In July of 2006 this fuel was required for all equipment operating in the ports of Los Angeles and Long Beach.
- Diesel Oxidation Catalysts (DOCs) – The ports of Los Angeles and Long Beach have instituted aggressive programs to equip all terminal equipment with diesel oxidation catalysts. To date over 1,000 pieces of equipment have been retrofitted in both ports at costs ranging from \$1,350 to \$2,500 per unit totaling over \$2 million for the ports.
- Alternative Fuel Yard Tractors – One terminal in the Port of Los Angeles is already running a fleet of over fifty propane powered yard tractors. The additional cost of these units is approximately \$12,000 per tractor. In addition to this additional investment of over one-half of a million dollars the operator also has additional fuel and maintenance costs above using conventional diesel technology. Two terminals are experimenting with LNG powered yard tractors. PMSA, CARB and terminal operators conducted comparative emissions testing in conjunction with UC Riverside, testing both LNG and diesel tractors.
- Electric Container Cranes – All container cranes at the California ports are electrified.

- Electric Gantry Crane – One major terminal in Los Angeles uses electric gantry cranes in their rail yard.
- PierPass Program – Conducted by marine terminal operators, this program has shifted approximately 40 percent of all cargo moves to off-peak hours. It has resulted in reducing congestion on Southern California freeways and reducing untold thousands of hours of idling and stopping on these freeways.
- Many members of the industry seek to reduce environmental loads by efficiently using resources, saving energy, reducing waste, encouraging material recycling, and particularly by minimizing emissions of greenhouse gases, ozone-depleting substances, and toxic matter; they endeavor to minimize environmental loads and adopt environmentally friendly technologies when ordering and purchasing necessary resources, such as vessels and aircraft, for transportation services and cargo operations.
- In the Port of Los Angeles, one terminal's on-dock rail program eliminates 8000 truck trips each week, and terminal equipment already meets - or exceeds - air quality standards set for implementation in 2010. In addition, truck idling has been greatly reduced by a new gate design and technologies which improve the flow of trucks through the terminal.
- Clean Fuel and Engines Program – Ports are using large numbers of alternative fuel and electric vehicles in their fleets to reduce emissions. At the Port of Los Angeles approximately 40% of all Port-owned equipment is powered by alternate fuel including compressed natural gas (CNG) or electric. Oakland has invested in significant number of CNG powered transit buses, shuttle vans, and taxis as part of their Vision 2000 program.
- Car Pool Program – All three major ports in California actively participate or operate employee car pool programs.

Ocean Carrier Contributions to Environmental Mitigation

- Ocean carrier voluntary vessel speed reductions when entering and leaving the San Pedro Bay Harbor have resulted in a decrease of over 450 tons of NOx emissions per year, and in 2006 82% of all vessels visiting the Port of Long Beach voluntarily reduced their speeds to cut air pollution. The Green Flag Incentive Program, as the program is called, was approved by the Harbor Commission in 2005 in an effort boost compliance with the Voluntary Vessel Speed Reduction Program. The board approved as much as \$2.2 million a year in discounted dockage fees for ocean carriers that achieved high rates of compliance with the program.
- The industry sponsored AJR 8 in the California Assembly last year, which was widely supported by the Legislature and environmental groups, calling for the U.S. to become a signatory to MARPOL Annex VI and the creation of a North America Sulfur Emission Control Area.
- The industry has proposed demonstration projects to use on-board emulsification of residual fuels and sea water scrubber technologies to reduce NOx, SOx and particulate emissions from vessels. The most recent proposal is under consideration by the U.S. Environmental Protection Agency-led West Coast Diesel Collaborative.

- By investing in larger and more efficient vessels, the industry has provided economies of scale that have resulted in the movement of increased volumes of cargo with a very small increase in the number of vessel calls.
- In order to prevent the depletion of the earth's ozone layer, "R-134A" is substituted for Freon gas(CFC) in some refrigerated containers. Instead of using Halon gas in our fire extinguishers, we use Co2. All ships are provided with technical guidelines about how to minimize air pollution during incinerator operation. This includes instructions on how to minimize garbage by separation and recycling.
- All Ocean-Going Vessels in California waters burn low sulfur diesel fuel in their auxiliary engines, reducing SOX, PM, and NOX, under a regulatory schedule that is accelerated beyond even the European Union's 2010 standard for all vessels when alongside.
- Many ocean carriers are experimenting with various technologies and fuels that go beyond their existing lease or regulatory requirements, including utilization of lower sulfur fuels in their mains and auxiliary engines, using distillate fuels to reduce emissions associated with residuals, implementing slide-valve technology and retrofitting vessels when feasible to accommodate shoreside electrification.
- The shipping industry has lobbied Congress to ratify MARPOL Annex VI, which allows the creation of a sulfur emission control area (SECA).
- Ocean carriers are building newer "green vessels" with latest NOX-reducing technologies, including slide valves and common-rail technologies, ready-to-go plug-in capabilities for shoreside electrification, low-sulfur fuel systems and additional tankage, waste storage and grey water holding tanks and storage, additional cargo hold bilge tanks, electric deck machinery and airspace stern tube sealing systems to eliminate oil leakage risks, and new advanced oily water separators.
- Industry is actively working with the IMO to create international, industry-wide standards for ship electrification.

Freight Railroad Contributions to Environmental Mitigation

Railroad MOU's

- The railroads have voluntarily worked with the California Air Resources Board to develop and implement two MOU's, one in 1998 and another in 2005. As a result of the 1998 MOU, by 2010, emissions around rail yards will be reduced by 65% from 1998 levels. No other mode of transportation in Southern California can claim such a substantial reduction. Furthermore, the 2005 MOU will achieve a 20% reduction of PM emissions from locomotives in and around Railyards by 2008.
 - 2005 MOU: The 2005 MOU achieves PM reductions through the installation of automatic idle reduction devices on the intrastate fleet, the dispensing of low sulfur (15 ppmw) diesel fuel for at least 80% of the gallons dispensed in California and subjecting locomotives to in-use smoke testing, The Railroads have also agreed to limit all non-essential idling. Furthermore, the MOU calls for the development of emission inventories and health risk assessments at 16 railyards, as well as regular meetings with local communities. As of today, the

railroads have met or exceeded every requirement of the MOU. Over 60% of intrastate locomotives are equipped with automatic idling shutdown devices, 99% of all locomotives comply with stringent smoke regulations, and CARB staff estimates that both railroads dispense at least 90% low sulfur diesel into locomotives when fueling in California--six years earlier than required by federal regulations.

- 1998 MOU: By 2010 the Railroads will reduce NO_x emissions from all locomotives operating in the SCAQMD by 65% by operating a fleet that averages the emission level of the most advanced new locomotives (the Tier 2 standards). In order to comply with the 1998 MOU, the railroads will virtually scrap, replace and/or retrofit all locomotives operating in the South Coast Air Basin with the latest, low-emitting locomotives. As a result of the 1998 MOU, the railroads invested in the development of new technologies that would push the limits of cost effective emission control, and as a result they have developed and purchased new locomotives that are cleaner than the current Tier 2 standards. As a result of this investment, by the end of 2007 at least 50% of the switch locomotives serving the Los Angeles region are expected to have Ultra Low Emissions Level certification by the CARB (better than Tier 2).
- As a result of the MOU's, the railroads are continuing to fund and test a number of new cleaner locomotive and equipment technologies to further reduce emissions from locomotives, yard equipment and rail operations. The railroads have invested their own research dollars to evaluate diesel particulate filters (DPF), diesel oxidation catalysts, Advanced Locomotive Emission Control Systems (ALECS) and remote sensing. From 2000 to 2010, the railroads together will have spent at least \$260 million investing in new locomotives and other technologies to do their fair share to reduce emissions and to improve air quality in California

Class I Rail Development of New Technology

- The Railroads have rebuilt over 4,600 locomotives to meet U.S. EPA Tier 0 emissions standards, purchased over 1,800 locomotives that meet U.S. EPA Tier 1 emissions standards, and purchased over 1030 locomotives since January 2005 that meet U.S. EPA Tier 2 emissions standards.
- The combined 2004 fleets of BNSF and UP (12,855 units) include 4,250 units equipped with idle control technology, and all future locomotive purchases will be similarly equipped.
- By the end of 2008, at least 60% of the switch locomotives serving the Los Angeles region are expected to have Ultra-Low Emissions Level certification by the CARB including: approximately 70 Gen-set switchers using state of the art clean truck emissions technology, 12 hybrid switchers and 4 LNG switchers. The hybrid switchers (commonly referred to as "Green Goats") are light to medium duty switchers powered primarily by a bank of newly designed batteries and secondarily by a small diesel engine that recharges the batteries and provides more power as needed (the concept is akin to the Toyota Prius). The hybrid locomotive's rechargeable batteries are expected to last about 10 years and are recyclable.

Compared with diesel-powered switch engines, hybrids use 40 to 70 percent less diesel fuel and reduce particulate emissions by 80 to 90 percent.

- The Railroads and CARB are working together in funding, engineering and scientific research to develop a diesel particulate filter to reduce particulate emissions from roots-blown switch locomotives. Each railroad has pledged \$2.5 million toward the effort, which is primarily being conducted at Southwest Research Institute in San Antonio, Texas. After several years of laboratory evaluation and testing, the new filters are being tested on one (currently) locomotive from each company in 2007. If the tests show promise, two more units will be retrofitted to obtain even more operating data. The particulate filter is expected to achieve approximately 80% reductions in particulate emissions.
- UP has partnered with U.S. EPA to develop an Oxidation Catalyst which can be inserted in the exhaust manifold of high horsepower locomotives. The first demonstration unit is now operating in California, and it is expected to achieve approximately 50% reduction in particulate matter.
- The Railroads have partnered with ARB and SCAQMD to create a Remote Sensing pilot program. The railroads will provide funding and technical expertise to determine how remote sensing technology can be utilized for to determine locomotive emissions, similar to highway monitoring.
- Routine self-inspections also help BNSF stay in compliance. BNSF performs routine stack opacity tests on all of our locomotives to ensure our engines are in good operating condition. A minimum of 5,000 opacity tests are conducted annually. This program is not required, but helps reduce visible emissions and helps improve air quality and locomotive efficiency. An inspection program also is in place for locomotives in the Southern California air basin. Approximately 140 to 160 inspections are conducted per month in this area, with 30 percent of the inspections conducted in local yards. When a locomotive inspection indicates that additional maintenance work may be needed, the locomotive is sent to a shop for repairs. UPRR has very similar programs for self inspections. More than 17,000 visual observations (average) are performed annually. The same processes are followed in Southern California.

Community Outreach

- The Railroads have established a system to enable local residents to report locomotives that do not comply with smoke limits or idling restrictions and we have met with community members to discuss community concerns and ways to address those concerns, and to identify measures to reduce the impact of railroad emissions on adjacent residential neighborhoods.
- As part of the 2005 MOU, the Railroads have established a program in conjunction with ARB to study and identify potential health risks from emissions at designated railyards, and to work cooperatively by meeting and conferring voluntarily with ARB, local Air Districts and the community to create a process to communicate and mitigate identified risks, and put the risk in appropriate context.

Ports of Los Angeles and Long Beach

- Through Carl Moyer Grants, contributions from the Ports, and South Coast Air Quality Management District the industry has supported the future replacement of the entire Pacific Harbor Line fleet of locomotives to meet or exceed any regulatory requirements and include the demonstration of hybrid, LNG, clean diesel fuels and after-combustion treatment
- Since its opening in April 2002, the Alameda Corridor's operation has resulted in 1,688 fewer tons of Nitrous Oxide (NOx), and 69 fewer tons of particulate matter (PM). In 2005 alone, the Corridor's operation resulted in more than 1,400 tons of total emission reductions, and nearly 5,300 tons of cumulative emission reductions have occurred since the Corridor's opening."

Southern California International Gateway (SCIG) Environmental Highlights:

- SCIG will be the greenest intermodal facility in the country.
- SCIG sets a new standard for environmental stewardship in Southern California and the United States.
- Quiet, Electric Rail-Mounted Gantry (RMG) will be used at SCIG.
- Hostling at SCIG will be done with LNG (or equivalent) hostler tractors.
- Switching operations at SCIG will use LNG, multi-engine or "hybrid" switch engines.
- Road locomotives will feature low-sulfur fuel and idle shut-down.

Trucking Industry Contributions to Environmental Mitigation

- Trucking is the first intermodal freight industry stakeholder to use advanced diesel emission control systems;
 - New 2007diesel trucks will produce 90% fewer particulate emissions than trucks sold in 2006;
 - These new trucks also mark the beginning of the first half of what ultimately will be a 90% reduction in nitrogen oxides (NOx) emissions;
 - To enable the use of the new technologies needed to achieve these reductions, the trucking industry began the transition to a new ultra-low sulfur diesel fuel (ULSD) in 2006;
 - ULSD, which represents the majority of the on-road diesel fuel sold in the United States, is being refined to lower the sulfur content to near-zero levels (15 parts per million);
 - To show the significance of these reductions, it will take 60 new trucks sold in 2007 to equal the particulate emissions of just one new truck sold 20 years ago.
- These latest environmental efforts continue a nearly quarter-century trucking/motor carrier trend of reducing truck emissions;
 - In 2002 (the most current year data is available), on-road diesel engines contributed approximately 1% of the nation's total emissions of volatile organic compounds and carbon monoxide, less than 1.5% of the nation's total emissions of fine particulate

- matter and approximately 16% of the nation's total emissions of oxides of nitrogen (NO_x);
- On-road diesel engines have cut fine particulates emissions by more than half over the past decade;
 - Over the last 18 years, emission levels from the new diesel engines used primarily by over-the-road trucking companies have been lowered by 80% for particulate matter and NO_x.
- Nationally, on-road heavy-duty diesel trucks produce half as much fine particulates as off-road sources, including construction and farm equipment, locomotives, and marine vessels:
 - When compared to 2002, PM and NO_x emissions from heavy-duty trucks will be reduced by more than 40% by 2010 and by more than 70% by 2020 due to the stricter engine and diesel fuel standards;
 - While the trucking industry has worked with both federal and state government to improve the environmental profile of truck engines, it should be recognized that newly imposed engine requirements will nevertheless:
 - Add up to \$10,000 to the cost of a traditional Class 8 power unit.
 - Make these engines less energy efficient due to the need for additional fuel to regenerate their particulate filters;
 - Will require additional maintenance costs to clean the particulate filters; and
 - These new trucks will thus burn more fuel to move the same amount of freight.
 - Because older diesel trucks are a major contributor to port-related air pollution throughout the region, a number of ports have invested in Truck Fleet Modernization programs. Port funding provides incentives of \$20,000 to \$50,000 per truck for commercial truck owners to trade in pre-1984 vehicles for newer models with cleaner-burning engines. More than 220 trucks have been replaced to date in LA alone, saving up to 812 tons of nitrogen oxide (NO_x) and 200 tons of particulate matter (PM) over the next five years.

Shipper Contributions to Environmental Mitigation

Generally shippers and cargo owners do not own or operate trucks, ocean vessels, locomotives, or marine terminal equipment. The cargo owner and the shipper pay for the improvements made by their service suppliers through higher rates and the imposition of surcharges and fees. (See Appendix B for a listing). In addition, shippers have made contributions to the environment in other ways, at their facilities located in California and across the nation.

Shippers are a diverse group, comprising manufacturers, agri-business, wholesaling, importing, and retailing. The scope of this paper is not sufficient to outline the contributions these industries make in the states where their facilities are located. Below are some best business practices that many shippers follow in their warehousing and distribution functions:

- **Modal shift:** Many shippers have moved away from air shipments to consolidate product into ocean shipments - reducing number of airflights needed to move cargo to the United States. This is particularly true of shippers with high-value product.

- **Transport loading:** Almost every U.S. shipper has worked to improve truck loading to ensure the use of full truck loads rather than partial loads. The pressure is on to increase truck utilization rates across the nation—a move that reduces air pollution, but also reduces costs in the form of better fuel efficiency. Many shippers, especially those moving high-value, low weight consumer products, support easing the federal and state restrictions on truck length—a move that would further reduce the number of trucks on the highways, improve fuel efficiency, and reduce air emissions.
- **Pallet Programs:** Shippers of all kinds have worked hard to re-design shipping pallets to improve capacity utilization and reduce weight. Focusing on volume and weight is a good way to improve capacity utilization, reduce fuel costs, and eliminate unnecessary truck trips.
- **PierPass:** Many of the largest shippers operating transload and warehouse operations near the San Pedro Bay ports played a leadership role in supporting off-hour truck gates. In 2005, after several years of work in support of night-gates, the members of the Waterfront Coalition provided a framework for assessing a use fee for daytime operations that ultimately became the PierPass program. Shippers have responded to this market-driven approach by opening up their facilities and container yards to accept freight during non-peak travel times. Today, more than 30% of all containers move off terminal during non-peak times. This program has significantly reduced congestion, and the concomitant idling of trucks, on the I-710 freeway. Recent surveys show that truckers operating at night are making better wages because of this program—a program that underscores the dynamic forces of the market to drive business practice changes.

