



Port of Tacoma

TOTEM Ocean Trailer Express (TOTE) continued to use shore power at berth, greatly reducing particulate and greenhouse gas emissions from two container ships servicing Alaska. TOTE also announced its plans to convert both vessels from diesel-powered engines to LNG -powered engines, further reducing greenhouse gases and eliminating DPM emissions. Ship conversions are scheduled to be completed by 2016.

Three frequent-calling vessel lines continued to burn low-sulfur fuel (0.5% sulfur or less) in 2012, going beyond the current ECA fuel sulfur standard of 1.0%.

Port Metro Vancouver

Through its EcoAction Program, PMV continued to offer reduced harbor fees to recognize and encourage vessels that went beyond the existing requirements to reduce emissions. Vessels are eligible to participate through a variety of options such as shore power, use of lower-sulfur fuel, alternative fuels/technologies, or by having acceptable environmental designations from classification societies or other programs. Results of the program for 2012 include:

- 2,266 tonne and 3.5 tonne reduction in GHGs and DPM (PM2.5) respectively from cruise vessels connecting to shore power at Canada Place
- 10% reduction in SOx emissions over the entire OGV sector

PMV's Blue Circle Award recognizes marine carriers with the highest participation in the EcoAction Program.

Recipients in 2012 included:

- APL (Canada)
- Grieg Star Shipping (Canada) Ltd.
- Hapag-Lloyd (Canada) Inc.
- Holland America Line
- "K" Line
- Maersk Line
- Princess Cruises
- Silversea Cruises
- Westwood Shipping Lines

In 2012, PMV completed the EcoAction Program Improvement Project. The improvements are scheduled to take effect beginning in January of 2013 and include the following:

- Further emission reductions and increased vessel participation.
- Preparation for the IMO's North American ECA.
- Improvement of the administrative processes and technology interface.



Cargo-Handling Equipment

The CHE sector addressed in this report includes equipment used to handle cargo. Examples include straddle carriers, RTG cranes, reach stackers, top and side picks, forklifts, skid loaders, yard tractors/trucks, wharf cranes, and conveyor belts. The CHE performance measures set in the 2007 Strategy are included in Table 3.

Table 3 –2007 CHE Performance Measures

| | |
|-------------|---|
| 2010 | <ul style="list-style-type: none"> Reach the port-wide equivalent PM reduction of Tier 2 or Tier 3 engines (0.15 g/hp-hr for most CHE) operating with ultra-low sulfur diesel (ULSD) or a biodiesel blend of an equivalent sulfur level (15 ppm sulfur), and promote early implementation of the requirements between now and 2010. All new terminals will be equipped with new CHE equipment meeting the highest standards that are practicable for the anticipated use at the time of purchase. |
| 2015 | <ul style="list-style-type: none"> Reach a port-wide equivalent of Tier 4 engines, for 80% of equipment. Retrofit the remainder of equipment with best available verified retrofit technologies. Purchase the cleanest available CHE that is practicable for the anticipated use at the time of scheduled capital upgrades. |

Progress toward the 2007 Strategy’s 2010 Performance Measures: In 2012, 74% of CHE met or surpassed Tier 2 or Tier 3 engine standards. All CHE have used ULSD fuels or biofuel with equivalent sulfur levels since 2008 at the Port of Seattle and Port of Tacoma, and since 2010 at Port Metro Vancouver.³

Table 4 – Progress towards the 2007 Strategy’s 2010 Performance Measures for CHE (Percent of CHE with Tier 2 Equivalent or Better Engines)

| Port | 2008 | 2009 | 2010 | 2011 | 2012 |
|----------------------|------|------|------|------------------|------|
| Port Metro Vancouver | 29% | 32% | 53% | 69% ⁴ | 72% |
| Port of Seattle | 9% | 68% | 55% | 58% | 79% |
| Port of Tacoma | 47% | 70% | 77% | 68% | 71% |
| Average | 28% | 57% | 62% | 63% | 74% |

Progress towards the 2007 Strategy’s 2015 Performance Measures: As the CHE fleet has implemented a variety of emission reduction activities, the ports have investigated the best way to express the progress towards a “port-wide equivalent of Tier 4 engines.” Retrofitting older equipment can have significant air quality benefits even if the retrofitted equipment doesn’t meet Tier 4 engine standards. The ports have developed a new way to show progress towards the 2015 goals by calculating the percent progress in DPM reductions towards a Tier 4-equivalent engine. Table 5 shows the method for determining the port-wide percent of Tier 4 equivalent CHE.

³ Note ULSD was a regulatory requirement for off-road engines in 2010 for both Canada and the U.S. At Port Metro Vancouver, 55% of CHE used ULSD and/or biodiesel blends in advance of the regulatory requirement (as reported in the 2009 Implementation Report)

⁴ Port Metro Vancouver % for 2011 has been recalculated to include equipment powered by electricity or other non-diesel fuel, consistent with calculation for 2012. As a result 2011 and 2012 data cannot be compared with 2008-2010 which included only diesel-powered equipment.



Example of Tier 4 Equivalency Calculation:

Installing a diesel oxidation catalyst (DOC) retrofit on CHE with a Tier 2 engine would provide 30% of the emission reductions that would result from replacing a Tier 2 engine with a Tier 4 engine. If a terminal installed DOCs on ten CHE with Tier 2 engines, the emissions reductions would be equivalent to replacing three CHE that have Tier 2 engines with three CHE that have Tier 4 engines.

*Equation 1: Equivalent Number of CHE = Actual Number of CHE * Percent Progress from Tier 2 to Tier 4*

Equation 2: Percent of Tier 4 equivalent engines = Equivalent Number of Tier 4 CHE/Total Number of CHE

Table 5. Methodology & Calculations to Determine the Percent of Port-Wide Tier 4 Equivalency

| CHE engine category | Percent Progress from Tier 2 toward Tier 4 | PMV | | POS | | POT | |
|---------------------|--|----------------------|---------------------------------|----------------------|---------------------------------|----------------------|---------------------------------|
| | | Actual Number of CHE | Equivalent Number of Tier 4 CHE | Actual Number of CHE | Equivalent Number of Tier 4 CHE | Actual Number of CHE | Equivalent Number of Tier 4 CHE |
| Tier 0-1 | 0% | 478 | 0 | 85 | 0 | 152 | 0 |
| Tier 2-3 | 0% | 514 | 0 | 75 | 0 | 149 | 0 |
| Tier 2-3 with DOC | 30% | 0 | 0 | 116 | 35 | 50 | 15 |
| Tier 0-1 with DPF | 65% | 0 | 0 | 0 | 0 | 11 | 7 |
| Tier 2-3 with DPF | 100% | 0 | 0 | 31 | 31 | 42 | 42 |
| Tier 4 or Onroad | | 141 | 141 | 10 | 10 | 68 | 68 |
| Electric | | 0 | 0 | 9 | 9 | 3 | 3 |
| Gasoline | | 56 | 56 | 8 | 8 | 1 | 1 |
| Propane | | 401 | 401 | 62 | 62 | 43 | 43 |
| CNG/LNG | 92 | 92 | 0 | 0 | 0 | 0 | |
| Total | | 1682 | 690 | 396 | 155 | 519 | 179 |

In 2012, 38% of CHE were equivalent to Tier 4 engines as shown in Table 6.

Table 6 – Progress towards the 2007 Strategy’s 2015 Performance Measures for CHE (Percent Tier 4 equivalent engines)

| Port | 2011 ⁵ | 2012 |
|----------------------|-------------------|------------|
| Port Metro Vancouver | 37% | 41% |
| Port of Seattle | 38% | 39% |
| Port of Tacoma | 28% | 35% |
| Average | 34% | 38% |

⁵ The 2011 performance numbers have been adjusted based on the new equivalency calculation method described for Table 5



Summary of Implementation Efforts in 2012

Port of Seattle

Under an EPA DERA grant, the Puget Sound Clean Air Agency replaced 12 Tier 0 yard trucks with 10 new 2011 yard trucks equipped with Tier 4 equivalent on-road engines. In March 2012, the Washington Department of Ecology awarded the Clean Air Agency a grant to install idle-reduction technologies on CHE used at the Port of Seattle, as well as other retrofit devices that will improve the longevity of exhaust control retrofits the Agency has previously installed using other funding sources. The total grant award was \$287,200. The Agency entered into agreements with some Port of Seattle terminal operators in 2012 and will begin installing idle-reduction equipment on CHE in 2013.

Under Ecology Clean Diesel grants, two CHE were retrofitted with diesel oxidation catalysts (25% PM reduction) and 17 CHE were retrofitted with diesel particulate filters (85% PM reduction).

Port of Tacoma

In March 2012, Ecology awarded the Clean Air Agency a grant to install idle-reduction technologies on CHE used at the Port of Tacoma. The total grant award was \$228,150. The Agency entered into agreements with some Port of Tacoma terminal operators in 2012 and will begin installing idle-reduction equipment on CHE in 2013.

Under Ecology Clean Diesel grants, 35 CHE were retrofitted with diesel oxidation catalysts (25% PM reduction) and three CHE were retrofitted with diesel particulate filters (85% PM reduction). Six CHE with Tier 0 engines were repowered with Tier 3 engines in 2011, but this project was not reported in the 2011 implementation report. Ecology also funded an idle-reduction demonstration project at one terminal, which led to the larger idle-reduction projects mentioned above.

Ecology also funded the purchase of two DPF filter-cleaning machines and DPF filter-cleaning services in support of DPF retrofit projects.

Port Metro Vancouver

Two PMV tenants participated in the “Terminals and Shipyards” category of the Green Marine Program in 2012, including Seaspan Marine Corporation and Neptune Bulk Terminals (Canada) Ltd. Green Marine is a voluntary program through which Canadian and American ship owners, terminals, shipyards and ports track and report improvements to environmental performance.

In 2012 PMV began planning a program to further reduce particulate matter emissions associated with cargo handling equipment. The program will expand anti-idling policies, encourage newer equipment, and promote innovation and alternative energy. The program is intended to become effective in 2014.



Trucks

Drayage (or container) trucks are primarily diesel-fueled, heavy-duty trucks that transport containers and bulk cargo to and from ports and rail yards. The Strategy calls for all trucks operating at the Ports to meet specific PM emissions levels. The trucks performance measures set in the 2007 Strategy are included in Table 7.

Table 7 – 2007 Trucks Performance Measures

| | |
|-------------|--|
| 2010 | <ul style="list-style-type: none"> Reach the equivalent PM emissions level of 1994 or newer heavy-duty truck engine model year through vehicle purchase or by using approved retrofit packages. |
| 2015 | <ul style="list-style-type: none"> Eighty percent of heavy-duty drayage trucks will reach the equivalent PM emissions level of 2007 or newer engine model year through vehicle purchase or by using approved retrofit packages. This is an interim objective on the way to the goal of 100% of heavy-duty drayage trucks by 2017. All gates will have an automated system using best available technology to reduce truck waiting times. |

Table 8 shows that all ports have successfully met the 2010 truck performance measure.

Table 8 – Progress towards the 2007 Strategy’s 2010 Performance Measures for Trucks

| Port | 2008 | 2009 | 2010 | 2011 | 2012 |
|----------------------|------------|------------|------------|-------------|-------------|
| Port Metro Vancouver | 95% | 100% | 100% | 100% | 100% |
| Port of Seattle | 76% | 77% | 100% | 100% | 100% |
| Port of Tacoma | 86% | 90% | 94% | 99% | 99% |
| Average | 86% | 89% | 98% | 100% | 100% |

Table 9 shows the ports’ progress towards achieving the 2015 performance measures from the 2007 Strategy.

**Table 9 – Progress towards the 2007 Strategy’s 2015 Performance Measures for Trucks
(Percentage of trucks meeting 2007 Engine Standards)**

| Port | 2011 | 2012 |
|----------------------|------------|------------|
| Port Metro Vancouver | 26% | 35% |
| Port of Seattle | 10% | 15% |
| Port of Tacoma | 20% | 17% |
| Average | 19% | 22% |

Summary of Implementation Efforts in 2012

Port of Seattle

The Port of Seattle continued its plans to replace its clean truck sticker program with RFID tags. This will allow the Port to better track the number and frequency of truck trips and age of trucks to help plan more effectively to meet future program goals. In 2012, RFID readers were installed at the in-gates of container terminals, and the Port conducted outreach to roll-out initial distribution of RFID tags to trucks servicing those terminals. The program’s “soft start” launched in September 2012; and by April 2013 all container trucks were required to have an RFID to access a terminal.



In December 2012, the Puget Sound Regional Council approved federal Congestion Mitigation and Air Quality funding for a Port of Seattle proposal to provide financial incentives for drayage truck owners to scrap or retrofit older trucks and replace them with model year 2007 or newer engines, similar to the Scrappage and Retrofits for Air in Puget Sound (ScRAPs) program conducted in 2009-2011. The new incentive program will begin in late 2013 or early 2014.

Port of Tacoma

The Tacoma ScRAPs program launched by the City of Tacoma in collaboration with the Port of Tacoma, Puget Sound Clean Air Agency and Ecology concluded in 2012. The program replaced pre-1997 trucks with low-emission trucks. A Federal Highways Administration Congestion Mitigation and Air Quality grant, Ecology's Clean Diesel Grant program, and truck owners provided the funding for this project. The program scrapped and replaced a total of 132 trucks⁶, resulting in total annual emission reductions of 10 tons of particulate matter.

Port Metro Vancouver

Through its Truck Licensing System (TLS), PMV continued to implement increasingly stringent requirements on drayage trucks accessing port terminals. Requirements include mandatory age limits and/or exhaust gas retrofits as well as opacity and idling limits. In 2012 PMV implemented the following drayage truck requirements:

- Trucks new to the TLS had to be 2007 or newer.
- Trucks 1998 and older already in the TLS were required to have an approved age exception, such as an exhaust gas treatment device (e.g. .DOC).
- Trucks 2002 and older had to be tested and pass a 20% opacity limit.
- Maximum 3 minutes continuous idling in any 60-minute period on port property.

In 2012 PMV also:

- Participated in a collaborative study with Metro Vancouver and other partners to explore the potential for remote sensing technology on heavy-duty vehicles. This study provided greater insight into the PMV drayage truck fleet's emissions and the technology that may inform future emissions management programs in the region.
- Undertook extensive industry and stakeholder engagement with the drayage truck sector, leading up to the development of the Smart Fleet Trucking Strategy. One component of the strategy completed in 2012 included the Container Truck Efficiency Pilot Program, a successful six month Global Positioning System (GPS) communication pilot to further improve efficiency and reliability. 700 additional GPS units will be rolled out in 2013 to cover 50% of the PMV drayage fleet, in partnership with Transport Canada under the Clean Transportation Initiative, and with the Ministry of Transportation and Infrastructure.

⁶ Total trucks scrapped include some near-port class 7 & 8 trucks operating in Pierce County that may not enter major port terminals.



Rail

Within the Ports, emissions from rail yard activities occur from both line-haul and switch locomotives. Line-haul locomotives typically move across the country whereas switch locomotives are used for building and breaking apart trains on-site and moving rail cars or built trains from the marine terminals to rail yards for long distance transportation. Due to the limited ability of the Ports to influence this sector, the performance measures promote both supporting and working with railways and with regulatory agencies to implement emission reduction techniques.

The Strategy outlined the following performance measures.

Table 10 – 2007 Rail Performance Measures

| | |
|-------------|--|
| 2010 | <ul style="list-style-type: none"> At the Ports of Tacoma and Seattle, expedite the implementation of the SmartWay Partner commitments at intermodal facilities where BNSF, Union Pacific, and Tacoma Rail have operations in the Puget Sound region. At Vancouver Port Authority [now Port Metro Vancouver]⁷, work with the industry and regulatory agencies to develop a British Columbia Locomotive and Rail Air Quality Work Group in 2008, through which collaborative efforts to reduce emissions from the rail sector will be developed. |
| 2015 | <ul style="list-style-type: none"> Compliance with the EPA [then-proposed] 2007 Locomotive and Marine Diesel Engine Rule to reduce PM emissions from all new locomotive engines by 90%. |

2012 Progress Toward the 2010 Performance Measure: The 2010 performance measure was achieved in 2008. At the Port of Tacoma and Port of Seattle, Burlington Northern Santa Fe Railway (BNSF), Union Pacific, and Tacoma Rail became partners in the EPA SmartWay program in 2008. Likewise, Port Metro Vancouver took part in the creation of the British Columbia Locomotive and Rail Air Quality Work Group in 2008. Canadian National and Canadian Pacific are currently Smartway members.

2012 Progress Toward the 2015 Performance Measure: So far, data is not available to the Ports to determine the railways’ progress towards meeting the U.S. EPA’s Inland Marine and Locomotive Rule, issued in March of 2008. The Ports and Strategy partners will propose updates to the rail sector 2015 performance measure in the Draft 2013 Strategy Update.

Summary of Implementation Efforts in 2012

Port of Seattle

No changes to switcher engines in 2012; no data available on line-haul locomotives.

Port of Tacoma

No changes to switcher engines in 2012; no data available on line-haul locomotives.

⁷ Vancouver Port Authority amalgamated with the Fraser River Port Authority and the North Fraser Port Authority in 2008, creating Port Metro Vancouver.

