Drayage Truck Replacement Programs Improve Air Quality in the Mid-Atlantic

EPA United States Environmental Protection Agency

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and

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Creating this case study would not have been possible without the enthusiastic cooperation and participation of several organizations and individuals. EPA would like to thank the Mid-Atlantic Regional Air Management Association (MARAMA), Maryland Environmental Services (MES), the Clean Air Council, EcoLogix Group, and the Virginia Department of Environmental Quality (DEQ) for providing invaluable first-hand information and perspectives for this case study. EPA would also like to thank the following individuals for participating in interviews: Debbie Thomas of MARAMA, Ted Kluga of MES, Eric Cheung of the Clean Air Council, and Susan Stephenson of EcoLogix.

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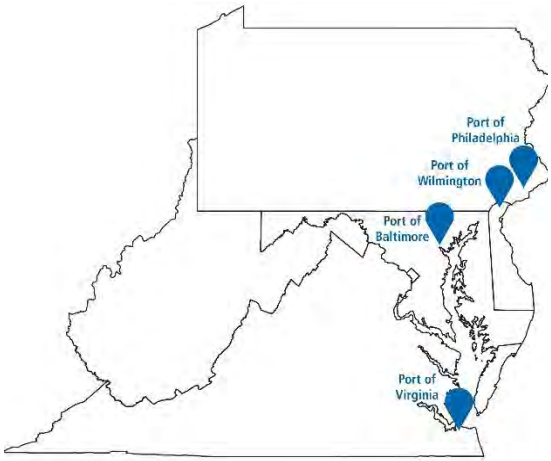
Overview

Since 2008, four key ports in the Mid-Atlantic region—Philadelphia, Wilmington, Baltimore, and Virginia—have implemented programs to replace aging drayage (or dray) trucks. Dray trucks play a critical role in transporting cargo from ships to other modes of transportation and warehouses. However, dray trucks often can release significant emissions as they make frequent trips throughout the port and idle while awaiting cargo. Many dray trucks are former long-haul trucks with high mileage, and these older engines tend to emit more pollutants than newer engines manufactured to meet stricter EPA regulations. Through a combination of national and state Diesel Emission Reduction Act (DERA) grant funding administered through various agencies and programs, the ports have collectively replaced over 270 dray trucks in the past 10 years. This case study looks at the air quality impacts of the replacements, identifies key lessons learned, and discusses possibilities for the future of the programs.



Map of EPA Region 3 within part of Mid-Atlantic United States with relevant ports.

History of Dray Truck Replacement Programs

When EPA first distributed funds in 2008 through the DERA National Grant Program, local stakeholders welcomed the opportunity to implement large-scale vehicle replacement projects. Communities with environmental justice concerns near the Ports of Philadelphia, Wilmington, and Baltimore were adversely impacted by emissions from port-related activities. Local demand for improved air quality and EPA encouragement led nonprofits and state agencies to set up mechanisms to help interested groups apply for the DERA grants. Throughout the region, MARAMA, MES, the Clean Air Council, EcoLogix Group, and the Virginia DEQ served as grant project coordinators and worked with ports and truck operators to publicize the grant opportunity and administer funding. Over time, truck operators provided feedback to grant project coordinators, which helped EPA modify funding mechanisms to better meet truckers' needs. Within the original framework, some DERA grants provided direct funding to cover up to 25 percent of the cost of a new truck, and truck owners often had to apply for loans to make up the rest of the cost. However, many truck operators did not have adequate credit, and they received loans with steep interest rates. Truck operators met with grant project coordinators and expressed their preference for

Truck driver in Delaware poses with new vehicle that his company, Bay Shippers, purchased through the dray truck replacement program.

receiving more money upfront in an accelerated timeframe, because missing a truck for longer than a week could hurt their business.

In response to the feedback, EPA now offers up to 50 percent of the cost of a truck replacement. Moreover, to address concerns about the time and staff capacity needed to fill out the grant application, grant project coordinators simplified the process and now provide technical assistance and support to potential applicants. MES created an online portal to help truck drivers easily fill out the grant application, streamline paperwork, and address frequently asked questions. Truck operators have largely reacted positively to these changes.

Improving Air Quality

EPA identifies ports as potential contributors to health risks associated with diesel emissions. Long- and short-term exposure to high levels of ozone and particle pollutants, which are byproducts of diesel exhaust, increase instances of asthma and heart attacks and can lead to other health problems.[4]

Prior to 2008, the Ports of Philadelphia, Wilmington, and Baltimore were in EPA nonattainment areas for ozone and particulate matter and are surrounded by densely populated areas. These areas are all currently in nonattainment for ozone. Farther south, the Norfolk–Virginia Beach–Newport News (Hampton Roads) region that surrounds the Port of Virginia was in a nonattainment area for ozone in 1997, but it reached attainment by 2008.

SNAPSHOT OF MID-ATLANTIC PORT AREA POPULATIONS

- **3.3 million** people live in the four counties bordering the Ports of Philadelphia and Wilmington (2016).[1]
- **2 million** people live in the three subdivisions closest to the Port of Baltimore (2018).[2]
- **1.6 million** people live in the Hampton Roads region surrounding the Port of Virginia (2011).[3]

[1] Office of Transportation and Air Quality, U.S. Environmental Protection Agency, *Clean Diesel Funding Assistance Program*, EPA-OAR-OTAQ-17-04, September 2016.
[2] Office of Transportation and Air Quality, U.S. Environmental Protection Agency, *Clean Diesel Funding Assistance Program FY 2018,* EPA-OAR-OTAQ-18-03, June 2018.
[3] https://www.epa.gov/sites/production/files/2016-01/documents/hractionplan.pdf
[4] http://hero.epa.gov/index.cfm/reference/download/reference_id/42866

Throughout the Mid-Atlantic region, completed dray truck replacement projects have prevented nearly 3,000 tons of pollutants from entering the air each year. Furthermore, by taking old trucks out of service, the dray truck replacement programs will collectively prevent over 23,000 tons of pollutants that can contribute to significant health problems from being emitted (see table below).

Summary of Replacement Projects and Associated Emission Reductions by Port

ANNUAL EMISSION REDUCTIONS (TONS)

Port	Grants Received	Trucks Replaced	Annual Emission Reductions (Tons)				
			NO_x	PM	HC	CO	CO_2
Baltimore	7	137	134.2	7.2	5.9	31.9	952.6
Philadelphia & Wilmington	3	89	52.8	2.2	2.4	14.4	300.2
Virginia	3	25	22	1	1	7	1,065
Philadelphia, Wilmington & Virginia	1	21	36.7	1.4	1.7	9.6	241.8
Region	**14**	**272**	**245.3**	**11.7**	**11.0**	**62.6**	**2,559.6**

LIFETIME EMISSION REDUCTIONS (TONS)

Port	Grants Received	Trucks Replaced	Lifetime Emission Reductions (Tons)				
			NO_x	PM	HC	CO	CO_2
Baltimore	7	137	1,297.9	65.6	57.1	313.8	6,255.9
Philadelphia & Wilmington	3	89	739.6	29.5	32.9	200.0	4,202.1
Virginia	3	25	132	6	7	41	10,026
Philadelphia, Wilmington & Virginia	1	21	58.7	2.3	2.7	15.3	387.1
Region	**14**	**272**	**2,228.3**	**103.3**	**99.3**	**570.5**	**20,871.3**

This table summarizes all dray truck replacements to date in the Mid-Atlantic through EPA Region 3 projects. The number of trucks replaced includes ongoing projects, but ongoing projects are not included in the emission reduction counts, as these benefits have not been fully realized yet. While most grants are awarded to a specific port, one grant was awarded to the Ports of Philadelphia, Wilmington, and Virginia, and the emission benefits were recorded on a regional level.

Although the ports have made significant progress replacing aging dray trucks, many old trucks remain: in 2016, roughly 2,000 dray trucks served the Port of Philadelphia each day. As former long-haul trucks are repurposed into dray operations, new opportunities for replacements continuously arise. All ports reported that many eligible trucks remain, and there is usually a waiting list for truck owners to participate in the replacement program.

Key Lessons Learned

Throughout the region, grant project coordinators have identified three key lessons learned for ensuring successful dray truck replacement programs: engaging stakeholders and responding to local concerns, fostering relationships and clearly communicating with scrap yards, and working with vendors to make sure replacement trucks and their diesel particulate filters (DPFs) have been properly maintained.

Successful Outreach in Virginia

The Port of Virginia's Green Operator Program exemplifies the importance of garnering support and buy-in from port operators and stakeholders and surrounding communities at the beginning of a project. From the onset, local trucking associations were active in the area and had good relationships with the port authority. Through conversations with port operators and other stakeholders, grant project coordinators reached out to a few larger trucking companies that eventually became early participants in the program. Some smaller truck operators initially hesitated to join the program, because they would have to give up their trucks before receiving new ones and potentially be unable to work for several days. However, seeing involvement from larger companies and port leadership helped small operators embrace the program. To them, another benefit was the opportunity to own more trucks, because they generally owned a portion of their fleet and leased the rest. Although the grants specifically prohibit fleet expansion, DERA makes it possible in some cases for operators to maintain their fleets by owning vehicles instead of leasing them. Moreover, many truck drivers working in the Port of Virginia region live in communities adjacent to the ports and have a vested interest in improving air quality.

In 2019, MARAMA created a decal for participants who complete the dray truck replacement program in Philadelphia or Wilmington to place on their new vehicles.

Outreach Challenges in Philadelphia

In 2008, the Clean Air Council began working on a replacement program in Philadelphia. Although the port authority and the port terminal owners engaged in talks with EPA and the Clean Air Council, some challenges arose, and the program was unable to progress. Ultimately, the grant project coordinators determined that the most efficient way to move forward was to work with truck drivers directly.

Despite these early challenges, the Ports of Philadelphia and Wilmington have had recent success implementing dray truck replacement programs. This time, MARAMA connected directly with local truck operators. A truck vendor who spoke fluent Spanish urged MARAMA to market the replacement program in Spanish to potential Spanish-speaking applicants. To circumvent the language barrier, MARAMA worked with the University of Maryland Environmental Finance Center to translate the English grant application into Spanish. While it took time for the applicants to begin supporting the program, once they did, they readily promoted it within their community and encouraged their fellow truck operators to apply. To date, the Ports of Philadelphia and Wilmington have replaced nearly 90 trucks (see table above).

One fleet owner replaced four of his twelve trucks and noticed that cleaner trucks have made a big difference for his employees. The new trucks help attract new drivers and retain existing drivers. Drivers much prefer the new trucks because they are better for their health and for their communities.

- Anecdote from Debbie Thomas, MARAMA

Scrappage

For the grant project coordinators, having a good relationship with scrap yards is essential to running a successful program. After truck operators are approved to receive a new truck, they must scrap their old vehicle before they can purchase a new one. EPA has strict requirements for verifying scrappage, which can take time for scrap yard operators to learn and follow.

In each state, grant project coordinators visited scrap yards to talk to owners about the program and explain the photo verification process. They also worked closely with scrap yards to complete the EPA certificate that confirms the engine was fully destroyed according to EPA-approved procedures. Since scrap yards are generally very cautious of accepting stolen goods, they have been largely accommodating of the EPA documentation requirements, such as proof of regular truck use within the last year, engine plate, and VIN number.

"A scrap yard contacted us when it suspected that one of the trucks it received was not eligible for replacement because it clearly had not been in service for several years. We investigated the case and ultimately revoked the down payment for the replacement truck. By working together, we were able to prevent a fraudulent replacement, which shows the importance of a good working relationship between the [scrap yards and agencies]."

- Anecdote from Debbie Thomas, MARAMA

The scrappage process operates differently in Virginia. While grant project coordinators in Maryland, Delaware, and Pennsylvania select eligible scrap yards, Virginia gives truck operators the option to compare scrap yards and negotiate prices. While this process can be cost-effective, it also adds another step for documentation. Virginia also allows truck operators to self-scrap, which creates some challenges. Initially, the pictures from the truck operators were not of high quality, so grant project coordinators subsequently sent a staff person to oversee the process on site.

Diesel Particulate Filters

Grant project coordinators encountered unforeseen issues with DPFs in dray trucks throughout the region. DPFs were first widely installed on new trucks starting in the 2007 model year, and truck operators found the 2007-2013 replacement dray trucks were experiencing premature DPF plugging. For proper operation, periodic DPF maintenance (cleaning) is required, and the engine duty cycle needs to meet time and temperature requirements (minimum time at elevated exhaust temperature), achieved through extended high load and highway driving that burns off soot for DPF regeneration. Additionally, if an engine needs service, a DPF can temporarily hide an engine problem, but eventually the DPF will experience plugging or other problems as well. In these grant projects, EPA Region 3 learned the shorter trip dray truck duty cycles did not meet the time and temperature requirements for DPF regeneration which was causing DPFs to clog and the engine to go into a reduced power mode. Clogged filters led to trucks routinely breaking down after purchase. Because many dray truck drivers did their own maintenance, but they could not clean the DPFs without necessary equipment, the drivers were experiencing increased maintenance costs. Drivers began to lose interest in expensive replacement trucks as their old trucks did not have DPFs, and they were accustomed to their prior maintenance requirements.

Similarly, EPA Region 3 learned that in EPA Region 4 (located in the southeastern United States), dray truck operators were experiencing DPF problems in certain truck duty cycles. For example, in Savannah, Georgia, most trucks service depots and warehouses are a few miles from the port. Because typical routes follow surface streets without highway operation, the DPFs could not reach operating conditions (i.e., extended higher speeds and loads) necessary to properly burn off accumulated soot.

To address the DPF issues, MARAMA asked truck vendors to provide an initial cleaning of DPFs on second-hand trucks being repurposed as dray trucks before releasing them to the grant recipient. Although this process increased the price of the vehicle, it ensured that the new vehicle owner started with a clean DPF and properly operating engine and did not incur additional maintenance costs immediately after purchase. Some truck vendors also provided technical support to the grant recipients if they experienced mechanical issues within the first 30 days after purchase. MARAMA received very positive feedback from truck drivers in response.

Additionally, MARAMA encouraged warranties included in the grant funding. While warranties increased the initial truck price and subsequent down payments, they minimized the amount of work time grant recipients lost to repairing faulty new DPF systems. The DPF issue is becoming increasingly less prevalent as truck drivers opt for newer trucks.

Looking Forward

While the EPA Region 3 dray truck replacement programs have successfully replaced older trucks with newer ones, funding and new technology could influence the programs' longevity along with improved education to vehicle operators regarding effective maintenance practices.

Funding Availability

DERA grant funds support drayage truck projects through both the DERA program's national competitive program as well as its state-level program. Replacement programs are popular among many truck operators, and the number of interested applicants and eligible trucks exceeds the funding available in each grant cycle. In Baltimore, there is a continuous waitlist as many truckers are eager to replace their trucks. Continued funding levels would ensure that the maximum number of trucks could be replaced, but there is uncertainty around sustained funding. Some grant project coordinators also suggested that additional funding dedicated to outreach would be beneficial to their programs and could strengthen educational opportunities for truck operators.

> *"Individual owner-operators view any opportunity to get a new truck as a great opportunity, so there has been no problem getting truckers to participate."*
>
> - Ted Kluga, Maryland Environmental Service

Newer, less conventional technologies also pose a potential funding concern: alternative fuel and zero-emission vehicles are more expensive than standard diesel engines. If the cost of each vehicle increases, fewer replacements would occur with the same amount of money.

New Technologies

Although stakeholders ranging from truck operators to environmental groups have expressed a growing interest in zero-emission vehicles and alternative fuels, EPA Region 3 grant project coordinators have found that few are feasible or cost-effective options for dray trucks as of 2020. While electrification is gaining popularity for light duty passenger cars, there are fewer zero emission truck offerings from manufacturers. Nevertheless, the Port of Los Angeles, located in EPA Region 9, is building, testing, and evaluating several class-8, heavy-duty, on-road, zero-emission vehicles. If this technology proves to be successful at the Port of Los Angeles, other port operators in the U.S. may become interested in adopting it (and thus help to create an economy of scale).

> *"Everyone needs to do their part…buying a greener vehicle; it helps."*
>
> - William Thomas, Truck Driver at the Port of Baltimore

Compressed natural gas (CNG) is a potential alternative fuel option. At one point, MARAMA researched the prospect of replacing diesel-powered trucks with those fueled with CNG, but ultimately decided that it would be cost-prohibitive.

VW Settlement Impacts

The 2016 Volkswagen Clean Air Act Civil Settlement (VW Settlement) has been highly publicized, which has helped increase public awareness that funding is available for vehicle upgrades. Across the region, truck operators are starting to ask about VW Settlement funding options. VW Settlement funding varies from state to state, and each state has its own plan to determine how to spend the funds (e.g., Maryland's share of the VW Settlement is $75.7 million, with $2 million set aside for dray trucks, while Virginia received $93.6 million with no specific allocation for dray

trucks). Throughout the region, DERA grant project coordinators and VW Settlement state administrators could find opportunities for collaboration.

Conclusion

The EPA Region 3 dray truck replacement programs demonstrate that with effective community outreach, clear communication with scrap yards, and proactively addressing maintenance issues, grant project coordinators can replace large numbers of dray trucks in a relatively short timeframe and reduce emissions in port areas. Program participants have provided positive feedback about the replacements, and with many eligible dray trucks remaining, interest in the programs will likely continue. Innovative technologies and additional funding sources could provide new opportunities and directions for the program to grow.

"EPA Region 3 is proud of the progress we and our partners have made in replacing older, dirtier drayage fleets serving major port facilities in the Mid-Atlantic. We remain committed to continuing work to improve the health of near-port communities by reducing diesel exhaust pollution related to port truck traffic."

- Cosmo Servidio,
Regional Administrator

FOR MORE INFORMATION:

Ports of Philadelphia and Wilmington
https://efc.umd.edu/de_patruckreplacement.html

Port of Baltimore
https://efc.umd.edu/portofbaltimore

Port of Virginia
http://www.greenoperator.org/replacements/