

RESEARCH BRIEF: FREIGHT INDUSTRY

ABSTRACT

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This brief examines different methods of reducing the environmental impact of the freight and commercial trucking industry. EPA regulations beginning in 2006 will, over time, significantly reduce the emissions of commercial trucks. However, current commercial trucks, which will be used for decades, emit a significant amount of air pollution. There are many technological and logistical improvements that would improve fuel economy and reduce air pollution. In addition, truck stop electrification and auxiliary power units could significantly reduce emissions from truck idling (truck drivers often idle their engines while they rest to produce heat and air conditioning). Biodiesel emits significantly less carbon monoxide, sulfur dioxide, and particulate matter than conventional diesel, although regulatory changes in 2006-7 will eliminate most of these differences; however, even after the regulatory changes, biodiesel will emit much less carbon dioxide than diesel over the life-cycle. The EPA currently has a SmartWay program designed to reduce the environmental impact of the commercial freight industry. There are few foundations funding in this area.

Environmental Impact of Commercial Trucks

- In 2002, commercial trucks consumed about 36.7 billion gallons of fuel, roughly 22 percent of the energy consumed by the U.S. transportation sector¹
- Heavy-duty trucks account for about 32 percent of nitrogen oxide (NOx) emissions, 27 percent of particulate matter (PM), and 18 percent of carbon dioxide emissions from all transportation sources;² trucks account for roughly 18 percent of all NOx emissions and 0.5 percent of all PM emissions³
- In 2006-7, EPA regulations affecting heavy trucks and diesel fuel will take effect; over time, these regulations will significantly reduce air pollution (new vehicles will produce 90 percent less emissions and the sulfur content in diesel fuel will be reduced by 97 percent); for example, by 2030 NOx emissions and PM from heavy trucks are predicted to decline by 90 and 75 percent, respectively⁴

Methods of Reducing the Environmental Impact of Commercial Trucks

- Reduce truck idling: long-haul truck drivers often rest for many hours in their sleeping compartments and frequently leave their engines running to heat or cool the sleeping area and to operate electrical appliances and charge batteries
 - Each year, about 840 million gallons of diesel fuel are consumed by idling long-haul trucks causing 10 million tons of carbon dioxide, 50,000 tons of NOx, and 2,000 tons of PM⁵
 - Truck stop electrification allows truckers to "plug in" vehicles to operate necessary systems without idling the engine; in some cases, a stand-alone system can provide heating, ventilation, and air conditioning directly to the sleeper compartment (see included New York Times article)
 - Auxiliary power units installed on individual trucks can also be used to eliminate truck idling
 - The California Air Resources Board recently prohibited truck idling
- There are efficient technological methods that can increase fuel efficiency (many of these technologies involve higher up-front costs that are eventually recouped through future reductions in fuel costs):⁶
 - *Advanced transmission and engine lubricants*: can improve efficiency by 3-5 percent; the higher costs of the lubricants is usually covered by the reduction in fuel costs
 - *Wide based tires*: using one wide tire instead of two tires side-by-side can increase fuel economy by 3-5 percent; previous problems that kept these tires from being widely adopted have mostly been fixed

¹ U.S. Department of Transportation, Federal Highway Administration Office of Operations, "Freight Facts and Figures 2004," Table 5-7.

² www.epa.gov/smartway/swresources.htm

³ "Assessing the Effects of Freight Movement on Air Quality at the National and Regional Level," U.S. Federal Highway Administration, (prepared by ICF Consulting)

⁴ These precise estimates are based on particular assumptions, and the total reduction could be slightly more or less. EPA, Office of Transportation and Air Quality

⁵ Argonne National Laboratory study; summary can be viewed at: www.transportation.anl.gov/research/technology_analysis/idling.html

⁶ www.epa.gov/smartway/swresources.htm

- *Reduced weight*: lighter materials can increase fuel economy by 3 percent
- *Automatic tire inflation systems*: underinflation of tires can reduce fuel economy by up to 1 percent
- *Improving aerodynamics*: could increase fuel economy by 15 percent at highway speeds; many improvements must be ordered when purchasing a truck, while others (e.g. cab extenders) can be added later
- *Hybrid technology*: more efficient than hybrid cars due to larger truck weight; especially beneficial in pick-up and delivery vehicles due to frequent starts and stops (another option may be hybrid technology in mass transit or school buses)
- There are logistical and training methods that can increase fuel efficiency
 - *Driver training*: certain techniques (e.g. block shifting) can improve fuel efficiency by 5-10 percent
 - *Improved freight logistics*: load matching strategies (i.e. ensuring fewer empty trucks on the return journey) and flexible receiving schedules to avoid traffic congestion can significantly improve fuel efficiency
- Retrofitting engines—adapting engines using new technologies can reduce emissions of PM and NOx
 - Although beginning in 2007 EPA regulations will require new diesel engines to emit significantly less pollution, current diesel engines (which have a lifespan of up to 30 years) will emit significant amounts of air pollution over their remaining lifespan
- Biodiesel—fuel made from renewable resources (e.g. plant oils or animal fats)
 - Biodegradable and non-toxic
 - Renewable source of energy, although making biodiesel can require the use of fossil fuels
 - Usable in any conventional diesel engine with little or no modification most engine manufacturers have affirmed that using B20 (20 percent bio and 80 percent petrodiesel) will not void warranties
 - Compared to pure petrodiesel fuel, biodiesel fuel can significantly reduce pollution (for B20, a reduction of carbon monoxide by 11 percent, reduction in PM emissions by 10 percent, a reduction in hydrocarbons by 21 percent and an *increase* in NOx emissions by 2 percent)⁷
 - Biodiesel reduces net carbon dioxide emissions (greenhouse gas) by 78 percent compared to petroleum diesel because of biodiesel’s closed carbon cycle: the carbon dioxide released into the atmosphere when biodiesel is burned is recycled by growing plants, which are later processed into fuel
 - One disadvantage of biodiesel is that it congeals at a higher temperature than petrodiesel, reducing biodiesel’s usability in cold weather
 - The emissions benefits of biodiesel (aside from carbon dioxide reduction) will be reduced as the new, less-polluting heavy truck engines and low-sulfur diesel fuel required by EPA regulations are introduced⁸

⁷ “A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions” Draft Technical Report, EPA Office of Transportation and Air Quality.

⁸ No formal testing has examined how biodiesel will respond in the new engines required by EPA regulations. A *preliminary* review of the data does not indicate that there are likely to be different

Relevant Government Organizations

- **SmartWay Transportation Partnership:** a voluntary partnership between companies in the freight and shipping industries and the federal EPA
 - Partner companies can use the SmartWay logo; to become a partner:
 1. Freight companies commit to measure and improve the efficiency of their freight operations, using an EPA-developed FLEET (Fleet Logistics Energy and Environmental Tracking) Performance Model; the companies submit an action plan describing how they will improve the efficiency of their fleet and report their progress annually to the EPA
 2. Shipping companies commit to ship at least 50 percent of their goods with SmartWay freight companies and to improve their facility transportation emissions
 - Developing a nationwide network of idle-reduction options along major transportation corridors
 - Highlighting practical opportunities where rail can be better utilized and to encourage more efficient rail operations and technical innovation
 - It would possible to sponsor a SmartWay conference in Colorado to provide freight companies with ideas on how to reduce diesel pollution (see attached document for a recent conference in Wisconsin)
 - There is room for growth in Colorado; currently there are no SmartWay partner companies in Colorado⁹ (Wisconsin has 7)
 - SmartWay has a loan program that may be of interest to Argosy¹⁰
- **EPA Office of Transportation and Air Quality:** regulates air pollution from motor vehicles, engines, and the fuels used to operate them, and encourages travel choices that minimize emissions; oversees SmartWay partnership
- **Relevant Colorado state/regional government agencies:**
 - Colorado Department of Public Health and the Environment (Air Pollution Control Division and Air Quality Control Commission)
 - Denver Regional Air Quality Council
 - North Front Range Metropolitan Planning Organization

responses. “A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions” Draft Technical Report, EPA Office of Transportation and Air Quality, p. 99.

⁹ <http://www.epa.gov/smartway/region8.htm>

¹⁰ One of the main reasons companies don't install equipment that can improve fuel economy is that all the costs (which can be substantial) are upfront, while the savings occur over time. For many of the smaller owner-operators, the up-front costs are just too high to justify the investment. Companies also tend not to install pollution control devices that don't increase fuel economy because they pay all the costs and the benefits of cleaner air are enjoyed by society (the classic negative externality). One idea is to provide financing for loans that can be used to buy kits that bundle fuel economy equipment (which saves companies money) with pollution control devices. That way the costs of the equipment are borne at the same time the savings in fuel are realized. Moreover, since the pollution control devices that the companies don't care as much about, come with the fuel economy equipment that saves companies money, the companies install both sets of equipment. Also, since the loans are repaid, the money can be recycled again and again (sustainability).

- Colorado Department of Transportation (studies environmental impact of transportation projects)
- **American Trucking Associations** (www.truckline.com)
 - Serves as national voice for trucking industry; the relevant state organization for Colorado is the Colorado Motor Carriers Association
 - Supports a research organization (American Transportation Research Institute) that does work on environmental issues the trucking industry

Foundations Funding Freight Industry Programs

- **The John Merck Fund**—has donated money for the following programs
 - Connecticut Coalition for Environmental Justice (\$30,000), Connecticut Fund for the Environment (\$50,000 Environment Northeast (\$10,000)
 - Clean Air Task Force (\$350,000): to work with partner groups in six to twelve states to advance diesel engine cleanup in the United States through a variety of strategies at the local, state, and national levels
- **Beldon Foundation**
 - Clean Air Task Force (\$250,000): to create a constituency for heavy engine cleanup and monitoring and publicizing effects of diesel pollution
- **Grand Victoria Foundation**
 - Southeast Environmental Task Force (\$25,000): to create a forum with the freight industry in order to obtain government grants for diesel engine retrofits