Diesel Emissions in Fire Stations

Greg Michalak

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SUMMARY

Firefighters are exposed to diesel emissions from idling fire trucks and generators inside fire stations. Diesel exhaust is a mixture of gases and microscopic solids. Gases include carbon monoxide (CO), carbon dioxide (CO_2), hydrocarbons (HC), and nitrogen oxides (NO_x), sulfide oxides (SO_x). The microscopic solids mainly consist of unburned fuel and oil in addition to other possible 18,000 substances that are attached to carbon atom and is referred to as diesel particulate matter (DPM). Diesel exhaust causes health problems including pulmonary disease and may be carcinogenic. It is mostly harmful to children, elderly, those with pulmonary and cardiovascular disease and other susceptible people. Even when vented from fire stations, diesel emissions can be circulated back into fire stations through air intakes. In addition, vented emissions can disperse up to 650 feet, creating an exposure pathway for people living near fire stations.

New emission standards for diesel vehicles are not retroactive. Some fire trucks are twenty years old and started daily and emit dangerous fumes in fire stations. Even older fire truck emissions can be reduced up to 90% using diesel exhaust filters, ultra low sulfur diesel or biodiesel. The air quality in firehouses can be increased by in-duct filters capable of removing ultra fine particles. There are no requirements to install filters or maintain DPM at certain level. EPA recommends truck retrofitting to lower emissions, and limiting chronic exposure to DPM under $0.05 mg/m^3$ to avoid health problems. Equipment cost to reduce emissions up to 90% starts at $5,000 and has been tested and approved by EPA. EPA can assist in selection of equipment and in funding projects.

DIESEL EXHAUST

Composition

Diesel exhaust is composed of gases and microscopic solids. The most significant gases are carbon monoxide (CO), carbon dioxide (CO_2), hydrocarbons (HC), nitrogen oxides (NO_x), and sulfide oxides (SO_x). The solid particulate matter (PM) is mainly composed of unburned fuel and oil in addition to other possible 18,000 substances.

Effects of Exposure to Diesel Exhaust

- CO upon entering the bloodstream reduces delivery of oxygen to the body's organs and tissues. Exposure to elevated CO levels can cause impairment of visual perception, manual dexterity, learning ability and performance of complex tasks.
- HC contributes to formation of ozone, which is responsible for choking, coughing, and stinging eyes associated with smog. Ozone damages lung tissue, aggravates respiratory disease and makes people more susceptible to respiratory infections. Children are especially susceptible to ozone's harmful effects, as adults with existing disease. Many hydrocarbons are also air toxins. Exposure to

air toxins is associated with cancer, birth defects and other serious health problems.

- NO_x can irritate lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections.
- SO_2 causes eye and mucous membrane irritation.
- High exposure to CO_2 can cause poisoning and death.
- PM causes breathing and respiratory problems, aggravation of existing respiratory and cardiovascular disease, damage to lung tissue, alteration in immunological system, and premature death. The most sensitive populations to PM includes children, elderly, and people with chronic pulmonary and cardiovascular disease. PM also soils and damages materials, including brick.

Dispersion Distance and Health Effect Study

The New York State Department of Health concluded that children living within 650ft of heavy truck traffic had significantly more asthma hospitalizations. The study compared the number of asthma hospitalizations to children living within 650ft of state roads that do not have truck traffic but only automobile traffic. Based on the hospitalization numbers, the study concluded that asthma hospitalizations were due to diesel emissions from truck exhaust. *Childhood Asthma Hospitalization and Residential Exposure to State Route Traffic,* Lin, full text available at http://www.sciencedirect.com/. Because long term exposure to diesel exhaust increases risk of pulmonary disease, it is potentially dangerous to every person residing within 650ft from fire stations. Installation of emission reducing equipment will benefit communities.

BUILDING VENTILATION AND INDOOR AIR QUALITY

Laws and Regulations

There is no federal regulation for levels of diesel exhaust or diesel particulate matter in buildings. EPA provides a Reference Concentration (RfC) recommending maximum long-term exposure to diesel particulates at $0.05mg/m^3$. This is not a regulation and cannot be enforced, but does provide a level that could present a hazard to individuals experiencing chronic exposure. Especially susceptible people may be affected at lower levels. According to NIOSH levels of DPM in fire stations ranges from 0.1 to 0.48 mg/m^3. Fact sheet http://www.epa.gov/air/tribal/attachmts/de_factsheet_8_29_02.pdf ; full study available http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.

OSHA in *29 CFR § 1910.1000* lists “Toxic and Hazardous Substances” and maximum allowed exposure during eight hour shift. Diesel exhaust and diesel particulate matter are not on the list, although some constituents of diesel emissions are regulated. For example, particulate matter can be classified as respirable dust limit of which is $5mg/m^3$.

While it is unlikely that DPM in fire station to reach this level, concerned workers can request for fire stations to be tested for all listed substances to determine if they are within the norm.

OSHA proposed Indoor Air Quality regulation Federal Register Entry 59: 15968-16039 (1994, April 5) which provides:

"Other indoor air contaminants.
(i) The employer shall implement measures such as the relocation of air intakes and other pathways of building entry, where necessary, to restrict the entry of outdoor air contaminants such as vehicle exhaust fumes, into the building;"
Because states modeled their Indoor Air Quality rules on the proposed rule, OSHA's rule has never reached approval stage. Quoted part of the rule was not adopted by states. *59 FR 15968-01*.

The American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ANSI/ASHRAE) sets standards to be enforced by OSHA. Addendum 62aa to standard 62-2001 Ventilation for Acceptable Indoor Air Quality is currently in development. Addendum 62aa, Air Intake minimum separation distance imposing requirements in Table 1 is pending. A study by New York State Department of Health concluded that diesel emissions disperse 650ft. Therefore, separating building air intakes 30ft from exhaust will not prevent diesel emissions from reentering the building. *http://www.ashrae.org*

Table 1
Air Intake Minimum Separation Distance

Object	Minimum Distance, ft (m)
Significantly contaminated exhaust (Note 1)	15 (5)
Noxious or dangerous exhaust (Notes 42 and 3)	30 (10)
Vents, appliances and equipment (Note 4)	15 (5)
Garage entry, automobile loading area, or drive-in queue (Note 5)	15 (5)
Truck loading area or dock, bus parking/idling area (Note 5)	25 (7.5)

Court Opinion

In *Culbert v. City of Jersey City, 175 N.J. 286, 291, (2003),* a Judge determined a study concluding that exposure to diesel exhaust increases risk of lung obstruction was persuasive. In *Culbert* plaintiff was awarded worker's compensation benefits ruling that occupational exposure as firefighter for thirty years materially contributed to the development of pulmonary disease. The Judge did not specifically state that diesel exhaust contributed to disability but that it could increase chances of pulmonary disease. See also: Frank Richter v.

Village of Oak Brook, Illinois workers compensation case involving a firefighter, available at arg-eroslaw.com.

Rule Limiting Level of DPM in Mines

The Mine Safety and Health Administration (MSHA) in 2001 enacted a regulation limiting DPM in mines to 0.4 mg/m^3 starting July 2002 and 0.16 mg/m^3 starting January 2006. *66 FR 5706-01.* The reason for developing the regulation was that …"underground miners are exposed to far higher concentrations of this fine particulate than any other group of workers." Levels of DPM in fire stations are similar to levels in some mines. A similar regulation could be proposed by U.S. Fire Administration to protect firefighters. To accomplish it fire fighters should contact union and other officials to lobby on their behalf for such regulation. Table 2 presents typical occupational DPM exposure levels. *NIOSH, Review of Technology Available to the Underground Mining Industry for Control of Diesel Emissions*
http://www.cdc.gov/niosh/mining/pubs/pdfs/ic9462.pdf

Table 2.
Typical occupational DPM exposure levels

OCCUPATIONAL GROUP	Exposure level, mg/m^3 (1 mg/m^3 = 1,000 µg/m^3)
Underground miners, coal, no aftertreatment	0.9 - 2.1
Underground miners, coal, disposable diesel exhaust filter	0.1 - 0.2
Underground miners, coal, wire mesh filter	1.2
Underground miners, metal/nonmetal, no aftertreatment	0.3 - 1.6
Surface miners	<0.2
Urban fire station	0.1 - 0.48
Forklift operators, dock workers, railroad workers	0.02 - 0.10
Truck drivers	0.004 - 0.006

Improvement of air quality by filtration in firehouses

The size of diesel particles is between 0.005µm to 1µm, amount of which can be reduced by in-duct electronic or regular air filters.

Electronic filters

Electronic filters have three components: a prefilter, a positively charged section and grounding plates.

A prefilter removes all larger particulate matter, the size of which depends on the specifications of the filter. The positively charged section acts as "collection plate" for negatively charged particles and gives a powerful positive charge to neutral particles. Positively charged particles will attach to the grounding plates. In order to control volatile organic compounds, the optional odor absorbing activated carbon filter can be installed as the fourth component. The electronic air filter will remove DPM larger than 0.01µm.

An uninterrupted backup power supply is recommended. If the power supply fails the negative particles attached to positively charged section will be released and will contaminate ducting and building. The benefit over the regular filter is that an electronic filter does not clog and does not obstruct airflow. The clogged filter causes furnaces to run longer increasing ventilation costs. The filter requires washing and does not need to be replaced. The installation requires an electrical line and may require some modification to ducting. http://choiceaire.com/html/other_air_cleaners.html http://www.carrier.com/rcd/products/Literature/pdf/570-563.pdf

Regular filters

A nanofilter developed for NASA can trap ultra-fine particle matter of a diameter of 0.05µm. Hospitals and aircrafts are listed as potential nanofilter users. This filter has not been tested for diesel particulate matter; but its specifications indicate that it should trap some of the DPM. One Manufacturer's contact information is 203-757-5337 JJL203@AOL.COM http://usgn.com/products.htm

TRUCK EMISSIONS

Emission Standards

U.S. EPA emission standards for trucks are listed in table 3. Although some of the equipment required for trucks manufactured after 2004 can be installed on older trucks, EPA does not require its use. http://www.epa.gov/otaq/retrofit/overdieseltimeline.htm Some fire trucks in use are twenty years old. Most of these trucks have never had an emission test.

Table 3a.
Diesel emission standards

Model Year	Carbon Monoxide (CO)	Hydrocarbons (HC)	Nitrogen oxides (NO_x)	Particulate Matter (PM)
1985-1987	15.5 g/bhp-hr	1.3 g/bhp-hr	10.7 g/bhp-hr	None
1988-1989	15.5 g/bhp-hr	1.3 g/bhp-hr	10.7 g/bhp-hr	6.0 g/bhp-hr
1990	15.5 g/bhp-hr	1.3 g/bhp-hr	6.0 g/bhp-hr	6.0 g/bhp-hr
1991-1992	15.5 g/bhp-hr	1.3 g/bhp-hr	5.0 g/bhp-hr	0.25 g/bhp-hr
1993	15.5 g/bhp-hr	1.3 g/bhp-hr	5.0 g/bhp-hr	0.25 g/bhp-hr
1994-1995	15.5 g/bhp-hr	1.3 g/bhp-hr	5.0 g/bhp-hr	0.10 g/bhp-hr
1996-1997	15.5 g/bhp-hr	1.3 g/bhp-hr	5.0 g/bhp-hr	0.10 g/bhp-hr
1998-2003	15.5 g/bhp-hr	1.3 g/bhp-hr	4.0 g/bhp-hr	0.10 g/bhp-hr

g/bhp-hr (grams per brake horsepower hour)

EPA may require the following technology to achieve emission standards for 2004 – 2006.

- Exhaust Gas Recirculation (EGR) systems
- Oxidation catalysts
- Further combustion optimization
- High pressure unit injectors, injection rate-shaping
- Turbocharger, combustion chamber optimization

Table 3b

Model year	CO	NO_x + HC	PM
2004-2006	15.5 g/bhp-hr	2.5g/bhp-hr HC contribution cannot exceed 0.5 g/bhp-hr	0.10 g/bhp-hr

EPA may require the following technology to achieve emission standards for 2007.

- Catalyzed traps
- Oxydation catalysts
- NO_x adsorbers S
- Selective Catalytic Reduction systems
- Use of ULSF with maximum sulfur content 15 ppm (parts per million)

Table 3c

Model year	CO	NO_x	Non-Methane Hydrocarbon (NMHC)	PM
2007	15.5 g/bhp-hr	0.20 g/bhp-hr	0.14 g/bhp-hr	0.01 g/bhp-hr

Maintenance

Proper truck maintenance is important to reduce emissions. Maintenance should include all parts of the vehicle. A NIOSH study found that trucks with leaking air brakes run a minute longer, unnecessarily emitting pollutants. *A Summary of Health Hazard Evaluations: Issues Related to Occupational Exposure to Fire Fighters, 1990 to 2001. p. 10*

Some maintenance problems can be identified from smoke colors. Blue and black smoke indicates engine problems. Blue smoke (mainly oil and unburned fuel) indicates a poorly serviced and/or tuned engine. Black smoke (soot, oil and unburned fuel) indicates a mechanical fault with the engine. White smoke (water droplets and unburned fuel) is produced when the engine is started from cold and disappears when the engine warms up. http://www.hse.gov.uk/pubns/indg286.htm

Retrofitting

EPA has Voluntary Diesel Retrofit Program, which provides assistance in retrofitting trucks for lowering emissions. EPA will help to choose best filtration method for the application. http://www.epa.gov/otaq/retrofit/sitemap.htm

Retrofitting is the installation of equipment in the exhaust line that combined with ultra low sulfur diesel (ULSD) can reduce emissions up to 90%. Use of ultra low sulfur diesel increases the effectiveness and longevity of the equipment.

The following filters can be combined for better emission reduction. According to a study by Manufacturers of Emission Controls Association (MECA) filters can reduce DPM to 0.03 g/bhp-hr and NO_x + HC to 1.5 g/bhp-hr exceeding 2004 emission standards. *Demonstration of Advanced Emission Control Technologies Enabling Diesel-Powered Heavy-Duty Engines to Achieve Low Emission Levels (MECA).* ArvinMeritor manufacturers full line of filters including active PM filters. http://www.arvinmeritor.com/home/default.asp 1-800-535-5560

Active diesel particulate filter
This filter is installed in the exhaust line and can reduce PM and CO up to 90%. The filter traps soot and burns it off. An active filter, in contrast to a passive, does not require high exhaust temperature to operate. While a passive filter will not work on startup because of low temperature, active filters activate an internal burner that burns of particulate matter at startup. An active filter requires simple electrical modifications to supply power to the burner. Rypos Trap is the PM filter that works with any exhaust temperature and does not require any special diesel fuel. It removes up to 90% of PM and CO and 70% VOC with oxidation catalyst. It is installed into the exhaust pipe.

Catalytic converter
A catalytic converter uses chemical reaction to NOx by 25-50% by converting NO_x to nitrogen and oxygen. There are two types of catalytic converters: selective catalytic reduction (SCR) devices and NO_x absorbers.

Crankcase ventilation
Crankcase emissions from unburned oil and fuel can also contribute to emissions that are not routed though the tailpipe. The Donaldson Spiracle filtration system is an example of technology that can eliminate crankcase emissions from engines. A replaceable two-stage filter offers the highest level of filtration efficiency. Uncontrolled crankcase emissions can be up to 25 percent of total vehicle emissions.
http://www.donaldson.com/en/exhaust/support/datalibrary/002421.pdf

Diesel oxidation catalysts (DOCs)
DOC initiates a chemical reaction in the exhaust stream, oxidizing pollutants into water vapor and other gases, such as sulfur dioxide and carbon dioxide. DOC can reduce PM by up to 50%, HC by up to 90% and CO by up to 90%.

Exhaust gas recirculation (EGR)
EGR reduces NO_x by reducing the temperature at which fuel burns in the combustion chamber. Engine employing EGR recycles a portion of engine exhaust back to the engine air intake reducing the oxygen content in combustion chamber. The reduction in oxygen lowers the temperature and reduces NOx emissions by up to 40%.

NO_x catalysts
There are two technologies that reduce NO_x emissions by up to 70%.
"Lean NO_x catalyst" injects diesel fuel into the exhaust gas to add hydrocarbons. Hydrocarbons act as reducing agents to convert NO_x to nitrogen and water vapor in catalyst. A "NO_x Adsorber" converts NO_x and adsorbs into chemical storage within the system. The NO_x is converted to nitrogen and oxygen that is emitted from the system.

Maintenance consists of replacing or cleaning filter parts. The frequency depends on the fuel quality and the load of the vehicle. Nine out of ten trucks tested were operated for 140,000 to 180,000 miles without having filters cleaned. EPA tests different filters and posts results at http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm

NIOSH evaluations of diesel exhaust filters in fire stations

NIOSH performed air tests in two fire stations before and after installations of DPM filters. Levels of elemental carbon which makes up 80% of DPM were reduced by 76% in first station and 91% in second station. The study does not indicate if the filters were installed on trucks or on other diesel equipment. The reductions support effectiveness of DPM filters.

New York City Transit PM Filter Test

The New York City Transit Authority equipped selected buses with PM filters made by Johnson Matthey model CRT. Tests were performed involving buses not equipped with filters using regular diesel fuel and ultra low sulfur diesel (ULSD), and buses equipped with CRT filters fueled by ULSD. NOx increased by approximately 3% which can be reduced by incorporating NOx catalysts. The results in table 4 indicate significant reduction of diesel emissions. *Emission Results from Clean Diesel Demonstration Program with CRT Particulate Filter at New York City Transit.*

Table 4

	Percentage reduction from regular diesel fuel				
Fuel Type	CO	PM	HC	CO_2	NO_x
ULSD	29%	29%	76%	0.15%	-3%
DPM filter + ULSD	94%	88%	92%	-4.4%	-2.5%

Fleet replacement

NIOSH tests indicate that firehouses that replaced trucks had significantly lower concentration of diesel exhaust in buildings. *A Summary of Health Hazard Evaluations: Issues Related to Occupational Exposure to Fire Fighters, 1990 to 2001. p. 9.* Although truck replacement will reduce emissions, it is very expensive and similar results can be achieved by filter installation.

OTHER TECHNOLOGY FOR EXPOSURE REDUCTION

BIODIESEL

Biodiesel may temporary but solvable maintenance issues when used in trucks previously fueled by regular diesel, due to biodiesel's solvent-like properties. Biodiesel will provide significant emission reductions for some pollutants and slight increases in others. It can be used and will provide emissions reductions in new trucks. Table 5 provides a general emissions reduction comparison of biodiesel and ultra low sulfur diesel (ULSD) (15ppm sulfur content).

Table 5

	Reduction Compared to #2 Petroleum Diesel					
	CO_2	**HC**	**CO**	**PM**	**NO_x**	**Toxics***
Biodiesel - B100	78%	70 to 93%	50%	30 to 50%	**-13%**	80 to 90%
Biodiesel - B20	16%	21 to 30%	11 to 20%	10 to 22%	**-2%**	13 to 50%
ULSD (15ppm sulfur content)	1%	13%	6%	13%	3%	N/A

ULSD w/particulate filter	N/A	up to 90%	up to 90%	**80%-90%**	15 to 20%	70%
ULSD w/oxidation catalyst	N/A	up to 90%	up to 90%	20 to 50%	N/A	90%

* Toxics: Reports vary in their description of toxics tested. Some refer to Toxic HCs, while others refer to polycyclic aromatic hydrocarbons (PAH) and nitrated polycyclic aromatic hydrocarbons (NPAH).

Biodiesel fuel is made from new and used vegetable oils and animal fats. It is made from domestic renewable sources and is biodegradable. It can be used as 100% biodiesel (B100) or as diesel bled. A blend of 20% biodiesel and 80% petroleum (B20) is used the most. B20 and lower blends are acceptable with the hoses and gaskets of all existing engines. B20 provides similar horsepower and torque to regular diesel, but the consumption increases by 1 to 2%. Pure biodiesel (B100) increases fuel consumption by 4.6 to 10% and can soften and degrade certain types of gasket, hose and seal compounds like natural rubber, Buna-N, and nitrile, which can create fuel system leaks. This effect has not been observed with blends of B20 and lower over the last 10 years of B20 experience, so B20 or lower blends can be used without changes.

For higher blends than B20, hoses and gaskets in some trucks can deteriorate. While natural rubber elastomers are affected, synthetic materials such as Viton compounds tend to be compatible with biodiesel. If vehicle's fueling system contains hoses, seals and gaskets made from synthetic materials it should be fine at higher blends. Most vehicles made after 1993 use synthetic materials. It is always recommended to check with the vehicle manufacturer to determine the types of hoses, gaskets and seals used on particular vehicle.

Biodiesel has a solvent effect that may release deposits accumulated on tank walls and pipes from previous diesel fuel storage. This effect is much more significant with B100 than with B20. The release of deposits may clog filters upon the initial use of B20 and should be closely monitored when switching to B20. Always ensure that only fuel meeting the biodiesel specification (D6751) is used.

Biodiesel may degrade and create sediments if in prolonged contact with brass, bronze, copper, lead, tin, and zinc. Lead solders and zinc linings should be avoided, as should copper pipes, brass regulators, and copper fittings. Effected equipment should be replaced with steel or aluminum. The effect of B20 on vulnerable materials is significantly reduced compared to higher blends.

Due to its chemical characteristics, biodiesel does freeze faster than diesel. B100 is worse in cold flow than the popular blend B20. B20 has been used in a variety of climates including winter usage in Northern Minnesota and Montana without cold flow problems. The cold flow properties of the B20 blend are mostly determined by the petroleum fraction of the blend. Most of the testing data shows a 3 to 5 degree F increase in cold flow properties of a 20% blend of biodiesel and Number 2 diesel fuel and for many users this small increase has not resulted in cold filter plugging. The cold flow properties of B20 can be enhanced by implementing the same solutions used with Number 2 diesel

fuel: blend the fuel with kerosene, use cold flow enhancing additives, turn on fuel filter or fuel line heaters, or store vehicles in a building. Neat biodiesel and biodiesel blends should not be stored for longer than 6 months. http://www.biodiesel.org, http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf

Exhaust Removal System (No Smoke)

An exhaust removal system is installed into the exhaust pipe. It can trap the exhaust for up to 100 seconds providing enough time to enter or exit the building. The device activates when the truck is started and when it is in reverse gear. "The ceramic filters have been lasting approximately 11 months before needing to be cleaned." *Indianapolis Fire Department* This device does not reduce emissions and is not suitable for reduction of emissions from idling trucks. 800-845-4665 http://warddiesel.com/

Hydrogen Cell

EPA, Daimler Chrysler and UPS are testing hydrogen fueled delivery trucks in Michigan. Hydrogen fuel generates electricity that powers electric motors. It releases energy through an electro-chemical process and does not release any pollution. The vehicles powered by hydrogen cell are in testing stage. Some problems to solve include delivery of hydrogen to fueling stations and safety. Detroit Diesel, truck manufacturer, is a subsidiary of Daimler Chrysler. http://epa.gov/otaq/fuelcell/deliveryvans.htm

FUNDING

EPA

EPA offers funding to retrofit trucks, specific information is available at Grants Administration Division at (202) 564-5305. Grant application package can be requested at http://www.epa.gov/ogd/grants/how_to_apply.htm Grant and retrofit related questions can be addressed to Steve Albrink (202) 343-9671 albrink.steve@epa.gov and Jim Blubaugh (202) 343-9244 blubaugh.jim@epa.gov. The awarded grants are usually in exchange for testing of new products or for commitment to use environment friendly products such as ultra low sulfur diesel or biodiesel. For faster response do not use first class mail because security screening increases delivery time. Latest EPA projects are available at http://www.epa.gov/otaq/retrofit/latestnews.htm Current funding information is available at http://www.epa.gov/otaq/retrofit/retrofunding.htm

Sample of EPA Grants Awarded

Chattanooga-Hamilton County, Tennessee - $100,000

- Grant is awarded to the Chattanooga-Hamilton County Air Pollution Control Bureau to fund a public/private partnership retrofit project involving school buses.

Chattanooga-Hamilton County and First Student, Inc., a local private school bus contractor, will equip 83 buses with diesel oxidation catalysts.

Lane Regional Air Pollution Authority, Oregon - $100,000

- Grant is awarded to demonstrate the use of ultra low sulfur diesel (ULSD) fuel with a wide variety of nonroad equipment and heavy duty highway vehicles in the state of Oregon. The funds will help the local agencies and fleets pay for the difference in cost between regular highway fuel and cleaner ULSD.

City of Boston, Environment Department, MA – $64,000

- Grant funds the demonstration of oxidation catalysts on up to 32 diesel touring trolleys in the City of Boston. A partnership match, in the form of a commitment to use ULSD, will be required of participating touring companies.

Hamilton County, Department of Environmental Services, OH – $95,500

- Grant funds the demonstration of oxidation catalysts on 20 school buses in the Cincinnati Area, including low-income areas that are disproportionately effected by pollution, and a 10 month supply of biodiesel (B-20) to fuel 74 school buses.

Maryland Department of the Environment, MD – $100,000

- Grant funds the demonstration of ULSD at the Maryland Mass Transit Administration's Eastern Maintenance Facility which services 165 diesel transit buses in the Baltimore Metropolitan region.

Mount Rainier National Park, WA – $100,000

- Interagency agreement funds the demonstration of ULSD with the National Park's 37 diesel vehicle fleet and oxidation catalysts and/or diesel particulate filters for up to 18 of the highest use vehicles (construction equipment, plow trucks, snow blowers, snow groomer, tractor, dump trucks, refuse truck). The project will also use a 50% biodiesel/50% ULSD blend for 2 generators.

New York State, Department of Transportation, NY – $98,600

- Grant funds the demonstration of ULSD and oxidation catalysts on 20 highway maintenance vehicles in Rockland, Westchester and Bronx counties.

Sacramento Metropolitan Air Quality Management District, CA – $100,000

- Grant funds the demonstration of oxidation catalysts on privately-owned heavy-duty diesel trucks participating in the region's Fleet Modernization program. The

oxidation catalyst retrofits will augment the program's emission reductions from engine upgrades.

Applications for funding if not indicated otherwise should be mailed to:

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF GRANTS AND DEBARMENT
1200 PENNSYLVANIA AVENUE, NW (3903R)
ROOM 51288
WASHINGTON, D.C. 20460

COURIER HAND DELIVERY ADDRESS:

U.S. ENVIRONMENTAL PROTECTION AGENCY
1300 PENNSYLVANIA AVENUE, NW (3903R)
FIFTH FLOOR, ROOM 51288
WASHINGTON, D.C. 20004

US Department Of Homeland Security

The U.S. Fire Administration (USFA) under the patronage of U.S. Department of Homeland Security (DHS) offers Assistance to Firefighters Grant (AFG) for equipment and building modifications. Grants are available for purchase of new firefighting vehicles, used fire apparatus, or refurbished apparatus. The funds may also be used to refurbish a vehicle the department currently owns. *2004 Program Guidance for the Assistance to Firefighters Grant Program p. 19.* USFA provides additional grants for the purchase and installation of a vehicle-mounted exhaust filtration system for any vehicle purchased with grant funds. *p.21* Applicants may apply for only one vehicle per year under this program. Applicants that have been awarded vehicle grants from the AFG program in previous years are not eligible for a vehicle award in this program year. *p.18* USFA offers grants to modify fire stations, fire training facilities, and other facilities to protect the health and safety of firefighting personnel. *P. 17 (e)* USFA will not fund any other requests for modifications of fire stations than vehicle exhaust extraction systems, smoke/fire alarm systems, sprinkler systems, or emergency generators. *P. 18* The grant is limited to one per year, $100,000 per fire station. *P.18*

The program is offered every year but the deadline passed for year 2004. There is no information about program for 2005. USFA can be contacted at 866-274-0960 http://www.firegrantsupport.com *2004 Program Guidance for the Assistance to Firefighters Grant Program* available at http://www.firegrantsupport.com/docs/2004AFGguidance.pdf

RECOMMENDED STRATEGIES FOR REDUCTION OF EXPOSURE TO DIESEL EXHAUST

NIOSH recommendations

- Open garage doors before starting the trucks
- Minimize vehicle operation inside the station
- Keep doors to other areas closed and sealed.
- Maintain living and office areas at positive pressure with respect to the garage
- Keep a record of health symptoms and nuisance complaints
- Perform regular maintenance on furnace and air handling system and install humidifiers *A Summary of Health Hazard Evaluations: Issues Related to Occupational Exposure to Fire Fighters, 1990 to 2001. p. 7-8*

Strategy

Improvement of Indoor air and reductions of emissions

- Perform regular maintenance of trucks and diesel equipment.
- The most efficient and cost effective way to reduce emissions is to install active diesel particulate filters with oxidation catalyst in all diesel trucks and equipment used in fire station. Other filters can be installed providing they will not interfere with PM filter and oxidation catalyst. Contact NIOSH at 800-356-4674 to perform indoor air quality test before and after modifications. Manufacturers list is available at http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm.
- The exhaust should be extracted from building by tailpipe exhaust extraction system.
- Install in-duct Electronic or Nano filters to remove particulate matter entering building.
- Keeping doors to living areas closed and sealed. Maintain living and office areas at positive pressure with respect to the garage and keeping a record of health symptoms and nuisance complaints.

Funding

- Contact EPA at (202) 564-5305, US Fire Administration at 866-274-0960 and inquire for funding for truck exhaust retrofitting.
- Ask union officials, local business and organizations for funding.
- Distribute brochure regarding diesel effects on children in the neighborhood, and ask residents to contact alderman or local officials to provide funding.
- Contact union officials, OSHA, US Fire Administration and ask to place diesel particulate matter on OSHA's "Toxic and Hazardous Substances" list.

- Contact union officials and US Fire Administration to set the limit of DPM concentration in firehouses. Support your demand by Mine Safety and Health Administration limiting DPM in mines.

TABLE OF AUTHORITIES

Culbert v. City of Jersey City, 175 N.J. 286, 291, (2003)
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59 FR 15968-001, OSHA's proposed Indoor Air Quality regulation
66 FR 5706-01, Exposure limits to DPM in mines (MSHA)
ANSI/ASHRAE 62-2001 addendum 62aa
Childhood Asthma Hospitalization and Residential Exposure to State Route Traffic, Lin, full text available at http://www.sciencedirect.com/
Demonstration of Advanced Emission Control Technologies Enabling Diesel-Powered Heavy-Duty Engines to Achieve Low Emission Levels (MECA), June 1999
FACT SHEET: Release of the Health Assessment Document for Diesel Engine Exhaust, September 2002
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