

Agricultural Irrigation Pumps

Central Wisconsin

Key Project Information

Equipment:	Stationary Agricultural Irrigation Pumps
Project:	Engine Repower
No. of Engines:	29
Project Year:	2012
Funding Agency:	US EPA- National Clean Diesel Funding Assistance Program

Leonardo Academy, through a grant provided by the Environmental Protection Agency's (EPA) National Clean Diesel Funding Assistance Program, facilitated efforts to reduce emissions among seventeen central Wisconsin cranberry farmers. The project helped offset the cost of repowering 29 diesel irrigation pumps to achieve better fuel efficiency and help improve air quality.

Wisconsin is an industry leader in cranberry farming, and is ranked as the number one cranberry producer in the nation for the 16th consecutive year. Wisconsin cranberry growers understand that sustainable farming must be practiced in order for the cranberry industry to remain a strong part of Wisconsin's heritage and economy. Today it is estimated that there are between 9,000 and 11,000 stationary diesel agricultural engines operating throughout central Wisconsin. Like many older diesel engines, Wisconsin's in-use stationary diesel agricultural engines emit particulate matter (PM) and nitrogen oxides (NOx) that have the potential to cause adverse health effects to operators and people in neighboring communities.

Engine repowers completed by:

- Twin Lake Cranberry
- Elm Lake Cranberry Co.
- Perry Creek Cranberry Corporation
- Owen Rock Cranberries
- Cranberry Creek Cranberries
- Dandy Creek Cranberries
- JDH Cranberries
- Wisconsin River Cranberry
- Lester Cranberry
- Whittlesey Cranberry
- Fanning Cranberry
- Jackson Crawford Creek
- Adam 73
- Juneau Mather
- Juneau Yellow River
- Portage Evergreen
- Wood Oakridge



Estimated Project Benefits:

- **CO₂ Reduced** - 1630 tons
- **NO_x Reduced** - 200 tons
- **PM Reduced** - 37 tons
- **Diesel Savings** - 147,500 gal
- **Fuel Cost Savings** - \$663,750

Construction Equipment

Wisconsin

Michels Corporation

Key Project Information

Equipment: Crusher

Project: Engine Repower

Location: Brownsville, WI

Number of Engines: One

Project Year: 2012

Funding Agency: US EPA – National Clean Diesel
Funding Assistance Program



TERRA Corporation

Key Project Information

Equipment: Excavator

Project: Engine Repower

Location: Madison, WI

Number of Engines: Two

Project Year: 2012

Funding Agency: US EPA – National Clean Diesel
Funding Assistance Program

The construction sector is a significant contributor to the two primary pollutants in diesel exhaust that affect human health: nitrogen oxide (NO_x) and particulate matter (PM), creating 32 percent of all mobile source NO_x emissions and 37 percent of PM emissions. While stringent new emissions standards have significantly reduced emissions from new non-road equipment starting in 2008, much of the equipment in the current non-road diesel fleets will continue to operate for many years to come. Leonardo Academy, through a grant provided by the Environmental Protection Agency's (EPA) National Clean Diesel Funding Assistance Program, coordinated efforts to reduce emissions among two Wisconsin construction companies.

Michels Corporation and Terra Corporation were awarded funds to help offset the cost of repowering two unregulated engines to Tier 3 emission standards. The repowered engines aged between twelve and twenty-five years old, will assist the construction companies in achieving better fuel efficiency and help improve air quality by producing fewer emissions.

Estimated Project Benefits:

- **CO₂ Reduced** – 2,050 tons
- **NO_x Reduced** – 125 tons
- **PM Reduced** – 14 tons
- **Diesel Savings** – 184,800 gal
- **Fuel Cost Savings** – \$831,600

National Clean Diesel Funding Assistance Program

EPA Regions 6 and 7

United Parcel Service

Key Project Information

Equipment: Delivery Trucks

Project: New trucks equipped with selective catalytic reduction systems

Location: Louisiana, Texas and Missouri

Number of Trucks: 30

Project Year: 2012

Funding Agency: US EPA- National Clean Diesel



Coca-Cola Refreshments

Key Project Information

Equipment: Delivery Trucks

Project: New electric-hybrid trucks

Location: Houston, Texas

Number of Trucks: 10

Project Year: 2012

Funding Agency: US EPA- National Clean Diesel Funding Assistance Program

Leonardo Academy facilitated a \$900,000 award for United Parcel Service (UPS) and Coca-Cola Refreshments (CCR) from the Environmental Protection Agency to help reduce emissions from delivery trucks. Reducing emissions from diesel engines is currently one of the most important air quality challenges facing the country. Even with EPA's more stringent heavy-duty highway and non-road engine standards set to take effect over the next decade, millions of diesel engines already in use will continue to emit large amounts of nitrogen oxides, particulate matter and air toxics, which contribute to serious public health problems.

With its commitment to conserving fuel and decreasing emissions, UPS initiated early retirement of thirty 1997-1999 Class 8 delivery trucks that provided service in and around nonattainment or moderate nonattainment areas in Louisiana, Texas and Missouri with new trucks that meet EPA 2010 engine emission standards and are equipped with selective catalytic reduction systems. Additionally for this project, CCR volunteered the early retirement and replacement of ten Class 8 delivery trucks that service Houston, Texas with 2012 hybrid-electric trucks. From past experience CCR hybrids use 30 percent less fuel and produce about 30 percent fewer emissions than standard tractors. All technologies acquired are verified by the EPA to maximize fuel economy and reduce emissions.

Estimated Project Benefits:

- **CO₂ Reduced-** 5,128 tons
- **NO_x Reduced-** 1,289 tons
- **PM Reduced-** 61.31 tons
- **Diesel Savings-** 462,000 gal
- **Fuel Cost Savings-** \$2,079,000

Washington Island & Madeline Island Ferry Lines

Wisconsin

Washington Island Ferry Line

Key Project Information

Vessel: MV Robert Nobel

Project: Engine Repower

Location: Washington Island, Wisconsin

Number of Engines: Two

Project Year: 2012

Funding Agency: US EPA – National Clean Diesel Funding Assistance Program



Madeline Island Ferry Line

Key Project Information

Vessel: MV Bayfield

Project: Engine Repower

Location: Madeline Island, Wisconsin

Number of Engines: Two

Project Year: 2012

Funding Agency: US EPA – National Clean Diesel Funding Assistance Program

The inhalation of diesel emissions can trigger adverse health problems, including chest pain, coughing, throat irritation and congestion and can worsen bronchitis, emphysema and asthma. Emissions from older marine vessels can contribute to air pollution by producing particulate matter (PM) and nitrogen oxides (NOx) that can be harmful to not only the ferry operator and passengers, but also to the surrounding communities and environment. Leonardo Academy, through a grant provided by the Environmental Protection Agency's (EPA) National Clean Diesel Funding Assistance Program, facilitated efforts to reduce emissions from two Wisconsin ferry operators.

Estimated Project Benefits:

- **CO₂ Reduced** - 2130 tons
- **NO_x Reduced** - 110 tons
- **PM Reduced** - 1.75 tons
- **Diesel Savings** - 192,000 gal
- **Fuel Cost Savings** - \$864,000

Washington Island Ferry Line (WIFL) and Madeline Island Ferry Line (MIFL) were awarded funds to help offset the cost of repowering the engines on WIFL's MV Robert Noble and MIFL's MV Bayfield. Operating approximately 280 days per year, these ferries serve as the primary provider of transportation to and from the islands for passengers, vehicles, and freight. These repower projects will assist the ferry lines in achieving better fuel efficiency and help improve air quality by producing fewer emissions.

Green Bay Metro

Green Bay, Wisconsin

Key Project Information

Equipment: Transit Bus

Project: Diesel Particulate Filter Installation

Number of Buses: 4

Project Year: 2010

Funding Agency: US EPA – National Clean Diesel Funding Assistance Program



The inhalation of diesel emissions can trigger adverse health problems, including chest pain, coughing, throat irritation and congestion and can worsen bronchitis, emphysema and asthma. Through a grant provided by the US EPA's National Clean Diesel Funding Assistance Program, Leonardo Academy partnered with Green Bay Metro to reduce emissions from four transit buses. Green Bay Metro operates 13 full service bus routes throughout the Green Bay Metropolitan Area. Fixed route transit and paratransit services are provided to the cities of Green Bay and De Pere, villages of Allouez, Ashwaubenon, and Bellevue, and the Oneida Nation. Cumulatively, the public transit fleet of 37 buses has annual ridership of approximately 1.7 million, and this number is projected to increase over the next year as people seek more affordable modes of transportation during the economic downturn.

Green Bay Metro installed diesel particulate filters (DPF) on four of their buses that have been in service for more than 7 years. A diesel particulate filter is a device that acts similarly to the catalytic convertor of your car. It traps particulate matter contained in diesel exhaust and prevents it from distribution into the air. The particulate matter is later burned off during the regeneration process. The ThermoCat DPF was selected because of the long duty cycles and typically lower exhaust temperatures in Northern Wisconsin – this technology successfully addresses both of these issues. The material in the catalyst also allows the particulate filter to regenerate at lower temperatures without operator intervention.

Estimate Project Benefits:

- **CO₂ Reduced-** 1,370 tons
- **NO_x Reduced-** 41 tons
- **PM Reduced-** 1.5 tons
- **Diesel Savings-** 52,000 gal
- **Fuel Cost Savings-** \$234,000



National Clean Diesel Campaign

Ohio Diesel Emission Reduction Program

United Postal Service

Key Project Information

Equipment: Delivery Trucks
Project: New trucks equipped with Selective Catalytic Reduction (SCR) systems
Number of Trucks: 20
Project Year: 2012
Funding Agency: Ohio EPA- Diesel Emission Reduction Grant Program



The Ohio EPA Diesel Emission Reduction Grant (DERG) program is intended to reduce Ohioans' exposure to diesel exhaust emissions and to help improve air quality in counties and areas of the state that do not meet national standards. In 2012, the agency awarded approximately \$10 million for clean diesel projects to both public sector and private sector fleets. Eligible projects included: replacement of diesel vehicles or equipment with new vehicles or equipment that meet higher emission standards; removing the diesel engine from a piece of equipment and replacing it with a new, rebuilt or remanufactured engine that meets higher emission standards; adding verified emission reduction technologies such as diesel oxidation catalysts and diesel particulate filters to existing vehicles and equipment; and adding verified, anti-idle technologies such as auxiliary power units and direct-fired heaters to existing diesel vehicles and equipment.

Ohio EPA awarded United Parcel Service (UPS) funds for the early retirement and replacement of twenty 1997-1998 Class 8 short-haul delivery trucks. These delivery trucks operate along the Interstate 71 highway, from Cleveland to Columbus to Cincinnati, traveling over 100,000 miles a year. The new delivery trucks are equipped with Selective Catalytic Reduction (SCR) systems. SCR technology is one of the most cost-effective and fuel-efficient technologies available to help reduce emissions. SCR can reduce NOx emissions up to 90 percent while simultaneously reducing HC and CO emissions by 50-90 percent, and PM emissions by 30-50 percent.

UPS operates a US ground fleet of over 60,000 vehicles and has set a new automotive goal to improve the miles per gallon (MPG) performance of its entire U.S. package delivery fleet by 20 percent by 2020. Fuel efficiency levels will be improved through improved alternative fuel and vehicle technology, effective vehicle maintenance procedures, fuel conservation efforts, sophisticated routing technology and operational initiatives such as minimizing engine idling.

Estimated Project Benefits:

- **CO₂ Reduced** - 6340 tons
- **NO_x Reduced** - 806 tons
- **PM Reduced** - 35 tons
- **Diesel Savings** - 7,500,000 gal
- **Fuel Cost Savings** - \$33,750,000

Schneider National

Green Bay, WI

Key Project Information

Equipment: Long Haul Trucks

Project: Trailer Side-Skirts, Low-Rolling Resistant Tires, and Idle Reduction Technologies

Number of Engines: 107

Project Year: 2010

Funding Agency: US EPA – National Clean Diesel Funding Assistance Program



Leonardo Academy joined forces with Schneider National to reduce emissions from 107 tractors and trailers operated by the Green Bay, Wisconsin-based carrier through a grant provided by the US EPA's National Clean Diesel Funding Assistance Program. Older diesel engines can generate significant amounts of environmental pollutants, such as fine particles and primary greenhouse gases including nitrous oxides and carbon dioxide. The grant facilitated clean diesel projects that improved air quality throughout the Upper Midwest and particularly in high population density areas where Schneider National operates hubs.

Emission reduction strategies for this project include trailer side-skirts, low-rolling resistant tires, and idle reduction technologies. These strategies also reduce fuel usage and maintenance cost, which in turn will help with job creation for Schneider National.

Schneider has long held a leadership role in increasing the industry's commitment to environmental sustainability. The company is active at the state, national and international level through participation in key environmental sustainability-focused initiatives, associations and task forces.

Leonardo Academy and Schneider National are members of the EPA's SmartWay Transport Partnership, a voluntary collaboration between the EPA, the freight industry and interested parties to increase energy efficiency while striving to reduce greenhouse gases and air pollution within the transportation sector. Schneider National has been recognized by the EPA with the SmartWay Award of Excellence every year since the award's inception in 2005.

Estimated Project Benefits:

- **CO₂ Reduced-** 17,900 tons
- **NO_x Reduced-** 150 tons
- **PM Reduced-** 4.2 tons
- **Diesel Savings-** 2,006,250 gal
- **Fuel Cost Savings-** \$9,028,125



School Bus Idle Reduction

Wisconsin

Key Project Information

Equipment: School Bus
Project: Idle Reduction – Direct Fired Heaters
Number of Buses: 47
Project Year: 2010
Funding Agency: US EPA – National Clean Diesel Funding Assistance Program



Every day tens of thousands of school children across Wisconsin ride on school buses that utilize diesel fuel, exposing them to hazardous pollutants and increasing their potential to suffer from adverse health effects. Leonardo Academy, through a grant provided by the Environmental Protection Agency's (EPA) National Clean Diesel Funding Assistance Program, facilitated efforts to reduce diesel emissions among several Wisconsin school bus fleets – particularly those operating within nonattainment or poorer air quality areas of the state.

Select school buses operated by the Oconto Falls School District, Oconomowoc Transport and Riteway Bus have been installed with direct fired heaters that reduce school bus idling and thus emissions to students in the idling zone. Between 300 to 600 hours of idling by the impacted units will be eliminated per year. The direct fired heaters will also preheat school bus engines to eliminate cold starts, extend engine life, reduce fuel consumption and tailpipe emissions, and provide in-duty supplemental heat.

Estimate Project Benefits:

- **CO₂ Reduced** – 1370 tons
- **NO_x Reduced** – 41 tons
- **PM Reduced** – 1.5 tons
- **Diesel Savings** – 400,000 gal
- **Fuel Cost Savings** – \$1,800,000

Children are especially sensitive to air pollution given that their respiratory systems are still developing and they are breathing at a faster rate. Oconomowoc Transport and Riteway Bus operate largely in Waukesha and Milwaukee counties, both of which have been designated by the EPA to be in nonattainment for PM_{2.5} and 8-hour ozone. Leonardo Academy anticipates that the implementation of the proposed strategies will assist the counties in progressing towards the attainment standard.



National Clean Diesel Campaign

Total Transportation Services, Inc.

Houston, Texas

Key Project Information

Equipment: Drayage Trucks

Project: New Hydrogen Fuel Cell Trucks

Number of Trucks: 40

Project Year: 2012

Funding Agency: U.S. Department of Energy – National Energy Technology Laboratory and the Office of Energy Efficiency and Renewable Energy



Houston is home to some of the worst air quality in the nation. Stakeholders banded together to support the introduction of a zero-emission technology into market to haul freight at the Port of Houston. Made possible by a grant awarded by the U.S. DOE, this project is a two-year demonstration of hydrogen fuel cell vehicles in real world conditions at the Port of Houston. The project will help Total Transportation Services, Inc. (TTSI) and other operators evaluate the true viability of introducing Class 8 hydrogen fuel cell electric hybrid trucks into its Alternative Fuel Vehicle (AFV) fleet. The initial expectation is that the new hydrogen fuel cell trucks will enable TTSI to eliminate harmful greenhouse gases and cut operating and maintenance costs while delivering performance and meeting the environmental, economic and social needs of the communities they serve. Should this demonstration project at the Port of Houston ultimately achieve the expected benefits of the zero-emission Hydrogen fuel cell trucks, TTSI will be incorporating these vehicles into their national operations as soon as practical. Long-term benefits of demonstration of this technology include reduction of pollutant emissions from port drayage operations, one of the largest sources of emissions at any port.

Estimate Project Benefits:

- **CO₂ Reduced** – 65,340 tons
- **NO_x Reduced** – 22,845 tons
- **PM Reduced** – 420 tons
- **Diesel Savings** – 6,000,000 gal
- **Fuel Cost Savings** – \$27,000,000

The vehicles proposed for this project are the Vision Industries Corporation (Vision) TYRANO™. With over 80 percent of the truck components manufactured and assembled in the United States, the TYRANO™ is a heavy-duty vehicle weighing 19,000 pounds that runs on a hydrogen fuel cell plus plug-in hybrid electric batteries. A hydrogen fuel cell-powered truck has an electric motor powered by Lithium-ion batteries. The batteries are constantly charged by a fuel cell that converts hydrogen gas into electricity. The batteries can also benefit from the use of regenerative braking to incrementally add charge.

Clean Transportation Triangle

UPS Liquefied Natural Gas Fueling Stations

Key Project Information

Equipment: Liquefied Natural Gas Fueling Stations

Project: Refueling Infrastructure

Number of Stations: Two

Locations: Houston and San Antonio, TX

Project Year: 2012

Funding Agency: TCEQ – Texas Emissions Reduction Plan, Clean Transportation Triangle



The Clean Transportation Triangle program was established by the Texas Commission on Environmental Quality (TCEQ) in 2011 to create natural gas fueling stations along interstate highways between the Houston, San Antonio, and Dallas/Fort Worth areas. The program's goal is to build the foundation for a self-sustaining market for natural gas vehicles in Texas. The new stations will ensure that natural gas vehicles have access to fuel.

United Parcel Services (UPS) was awarded a grant by the Clean Transportation Triangle Program to help fund the building of two liquefied natural gas (LNG) fueling stations. There will be one station built in Houston, Texas and one built in San Antonio, Texas. LNG is one of several alternative fuels that UPS has incorporated into its fleets over the last several years. Natural gas is abundant and is composed primarily of methane (more than 90%) and other hydrocarbon gases, such as ethane, propane, butane, and pentane. LNG vehicle fuel provides an excellent means to reduce emissions of nitrogen oxides (NOx), particulate matter (PM), sulfur oxides (SOx), and greenhouse gas (GHG) emissions. A typical LNG truck will have 90 percent fewer nitrogen oxide and particulate matter emissions than a diesel truck, 100 percent fewer sulfur oxide emissions, and 30 percent fewer greenhouse gas emissions. Due to the clean burning nature of natural gas, LNG-powered, heavy-duty vehicles can achieve low emission rates without excessive and expensive emission control equipment as is required for diesel engines.

Additional advantages of LNG vehicle fuel include:

- Favorable economics over diesel and other transportation fuels;
- A 100 percent displacement of petroleum fuels using an abundant, domestic and low-carbon fuel; and,
- The ability to produce renewable fuels from landfill gas, waste water, dairies, and other sources.

