Volume one • Issue three August 1992

AFDC UPDATE

News of the Alternative Fuels Data Center

Alcohol-Powered Heavy-Duty Engines Meet With Emissions Success

Detroit Diesel Corporation (DDC), which in 1991 received the first U.S. Environmental Protection Agency (EPA) emission certification for its 100% methanol-fueled 6V-92TA turbocharged and aftercooled urban bus engine, has submitted data showing similar positive emissions results when the engine runs on E95 (95% ethanol-5% unleaded gasoline denaturant). The U.S. Department of Energy (DOE) through the National Renewable Energy Laboratory (NREL) helped support the certification project.

DDC's development of an alcohol-fuel engine began more than 10 years ago in conjunction with General Motors and others, such as DOE. DDC developed technology to autoignite the alcohol (like a diesel engine) rather than using spark or glow-plug ignition. Electronically controlled fuel injection and bypass blowers were incorporated in the design, allowing for both fuel efficiency and low emissions.

EPA engine emission certification has already been granted for use with M100 (100% methanol) and

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Detroit Diesel Corporation 6V-92TA Engine Emission Comparison (Emissions, g/bhp-hr)

TABLE 1

FUEL	NOx	OMHCE	CO	PM
1991 M100*	2.35	0.41	4.75	0.06
1992 M100*	1.70	0.10	2.05	0.03
1991 M85*	3.03	0.76	11.97	0.06
1992 M85*	4.05	0.23	1.60	0.03
1992 E95*	4.15	0.73	1.71	0.04

*With converter

U.S. EPA Heavy-Duty Engine Emissions Standards (g/bhp-hr measured during the EPA transient test)

TABLE 2

Model Year	NOx	HC	CO	PM
1991	5.0	1.3	15.5	0.25
1993 (Urban Bus)	5.0	1.3	15.5	0.10
1994	5.0	1.3	15.5	0.10
1994 (Urban Bus)	5.0	1.3	15.5	0.05*
1998	4.0	1.3	15.5	0.10
1998 (Urban Bus)	4.0	1.3	15.5	0.05*

*For urban buses, EPA can relax PM standard to 0.07 if 0.05 is not achievable.

Alcohol-Powered Heavy-Duty Engines *(continued from page 1)*

M85 (85% methanol-15% unleaded gasoline). Data for 1992 engine emissions using ethanol and methanol fuels have been submitted to EPA for certification. These data are provided in Table 1. Table 2 shows EPA's emission standards for comparison. Although there are no current emissions regulations for ethanol, DDC expects to receive special recognition from EPA and the California Air Resources Board.

Demonstration programs of DDC 6V-92TA alcohol engines to date include:

- Ethanol transit buses are participating in a demonstration in Regina, Saskatchewan. With more than one year of service, these buses are showing average fuel economy of 3.4 diesel equivalent miles per gallon. The transit system in Peoria, Illinois, is about to put 14 ethanol buses into operation under a Federal Transit Administration program.

- Other transit bus demonstrations involving nine methanol-fueled production engines have accumulated nearly 300,000 miles and have been "generally running well."

- An ethanol-powered truck owned and operated by Coors Brewery has accumulated 20,000 miles moving trailers around the brewery. A larger ethanol truck demonstration program with partial DOE funding is under way using the DDC 6V-92TA 300-hp ethanol engines in Volvo-GM Heavy-Truck Corporation tractors owned and operated by Archer Daniels Midland (ADM), the largest ethanol producer in the United States. The four ethanol trucks will run along side a similar diesel control unit for comparison between Decatur, Illinois and another ADM location in line-haul operation.

- Methanol truck demonstrations are also under way in California. An order was recently received for 303 DDC 6V-92TA production engines using 100% methanol for use in transit buses in Southern California. ❑

AFDC to Provide Unique Refueling Site Map Service

Are you a fleet manager who needs to know the details on where your vehicles can fill up on natural gas, methanol, ethanol, or LPG? Do you need to know how far it is between fueling sites? Would it be helpful to have all of this information plotted on a map?

The Alternative Fuels Data Center (AFDC) is beginning a new service that will allow AFDC users and National Alternative Fuels Hotline callers to obtain maps of fueling site locations. The MapInfo program at the AFDC will allow a data center user or hotline caller to obtain a map of any area, city, county, highway, state, or the entire United States—showing the relative locations of alternative-fuel refueling stations. For an example, see Figure 1.

AFDC users can access this service if they are connected via Internet and have XWindows software. Those individuals who don't have this capability may request map print-outs through AFDC or the National Alternative Fuels Hotline at 1-800-423-1DOE. Maps can be printed at the AFDC in color for easy reading.

All of the nongraphic refueling-site information, including addresses, contact names, and public availability, may be accessed using a normal search with AFDCTerm communications software provided free of charge by the AFDC to interested parties.

The AFDC has recently added LPG sites to its refueling information data base. Unique information has been added for CNG refueling sites including information on each site's compressor types, connection types, and operating hours. ❑

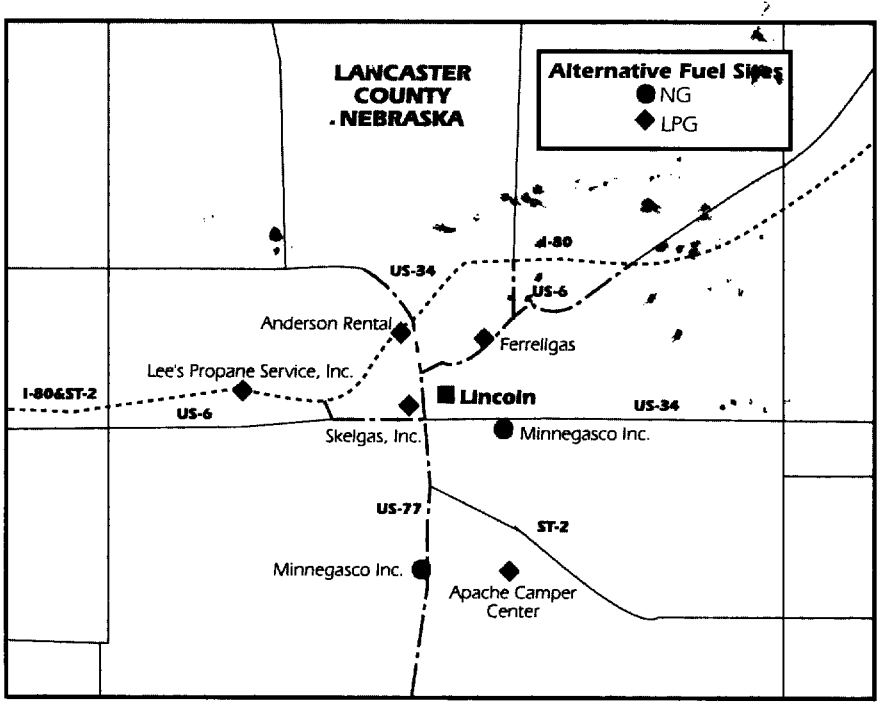

Figure 1. Natural Gas and Propane Refueling Locations in Lancaster County, Nebraska.

Alternative Fuels "Hotline" Installed By DOE

New Service Complements AFDC

The Department of Energy (DOE) has begun a service to answer questions from industry and the public through its newly established National Alternative Fuels Hotline. By calling a toll-free number, 1-800-423-1DOE, callers will be provided with the answer to questions or referred to a proper source.

DOE's Assistant Secretary for Conservation and Renewable Energy, J. Michael Davis, said, "Establishing this hotline reflects DOE's increasing commitment to research and development on alternative fuels and to fulfill the public's desire to know more about their availability and performance."

Davis said that callers also will have access to information from the National Renewable Energy Laboratory's (NREL) AFDC. The AFDC contains data on government fleet vehicles and demonstration projects across the country, as well as more than 3,000 alternative-fuel refueling stations across the United States.

The "800" number is available to all callers outside the Washington, D.C. area; local callers may call (202) 554-5047 to reach the hotline. The hotline will be available to callers between 10 a.m. and 6 p.m. ET on weekdays except federal holidays. ❑

AFDC to Switch to Windows Application Software

For increased ease of operation and enhanced graphic capabilities, the Alternative Fuels Data Center (AFDC) will switch to MS Windows application software beginning November 1, 1992. That means data center users will need to have installed their own Windows software and accompanying "mouse" to call up data.

Using current software, AFDC users have limited capability to see data displayed as graphs. With the switch to Windows software, users will be able to call up such information on vehicle mileage, fuel economy, vehicle performance, and maintenance as graphs rather than tables. Another advantage is that users will require less time online to perform searches.

In addition to graphic capabilities, the Windows system with its icon format is user friendly. Windows is widely available at retail computer stores for about $150 including the mouse.

National Energy Strategy Update

Senate Amendments Offer Tax Deductions for Vehicles and Storage and Dispensing Equipment

July 30, 1992, the full Senate approved National Energy Strategy (NES) legislation that could expand the use of alternative transportation fuels.

If adopted by a House-Senate Conference Committee, this measure would provide a tax deduction for a portion of the cost of certain motor vehicles propelled by clean-burning motor fuels, and a tax deduction of up to $75,000 per location of the cost of certain property used in the storage or dispensing of clean-burning fuels into a vehicle's fuel tank. The provision also would allow for an income tax credit of 15% of the cost of electric vehicles.

Clean-burning fuels are defined as natural gas, liquefied natural gas, liquefied petroleum gas, hydrogen, electricity "and any other fuel if at least 85% of the fuel is methanol, ethanol, any other alcohol, ether, or combination of the foregoing."

Clean-fuel vehicles are defined as those that have been produced by an original equipment manufacturer designed to be operated on clean-burning fuel. Conversion equipment installed on vehicles also would be eligible.

The tax deduction allowed for a dedicated or flexible-fuel vehicle is limited to no more than $1,200 or the actual incremental cost of the installation, if greater. Caps on this are $50,000 for trucks or vans of 26,000 lb or more and buses with a minimum capacity of 20 passengers, $5,000 for trucks or vans from 10,000 to 26,000 lb, and $2,000 for all other motor vehicles.

The tax credit would apply to vehicles and storage and dispensing equipment after June 30, 1993 and before January 1, 2005, and would be gradually phased out starting in 2002.

The NES will be debated over the coming weeks before it is sent to the President for signature. ***AFDC Update*** will keep readers aware of the outcome and implications. ❑

New Emission Data Bases Added to AFDC

As a new service, the Alternative Fuels Data Center (AFDC) has added information on emissions to its data base for vehicles converted to run on dual fuels—compressed natural gas (CNG) and gasoline. Data has also been added on flexible-fuel and control vehicles placed in the Alternative Motor Fuels Act (AMFA) fleet.

The dual-fuel vehicles are being monitored by the National Institute for Petroleum and Energy Research (NIPER) under contract to the U.S. Department of Energy (DOE). Twelve dual-fuel light-duty and medium-duty vehicles in the Tinker Air Force Base fleet in Oklahoma were selected for extensive monitoring, including emissions, fuel economy, drivability, safety, oil analyses, and investigation of any vehicle failures related to the fuel systems.

Emissions and drivability tests were completed on all 12 vehicles before their conversion to dual-fuel operation. In addition, six of the vehicles have been tested after conversion. The emissions tests followed the protocol specified in the EPA Federal Test Procedure, and the drivability followed the Coordinating Research Council cold start/warm-up procedure.

Emissions results of the dual-fuel vehicles show reductions of nonmethane hydrocarbons (NMHC) and carbon monoxide (CO) but marked increases in nitrogen oxides (NO_x). This is not uncommon for CNG-converted vehicles, according to NIPER. It is a result of incomplete combustion of the fuel, rendering the catalyst unable to reduce NO_x enough to meet current clean-air standards. Results for each vehicle before and after conversion are included in the AFDC data base.

Drivability results on the CNG-gasoline vehicles showed little difference before and after conversion of the vehicles.

The AMFA fleet information being added to the AFDC includes results of chassis dynamometer tests on flexible-fuel vehicles (FFV) and control vehicles, as well as speciated information on aldehyde and unburned alcohol emissions.

Initially, results are being entered for several Chevrolet Lumina and Ford Taurus cars. Some of each make are FFVs running on M85, FFVs running on gasoline, and stock vehicles running on gasoline. The FFV M85 testing was completed on both M85 and indolene. Participating AMFA vehicles are tested at 4,000, 10,000, and 20,000 miles.

Coming soon to the AFDC are the results of emission tests on heavy-duty vehicles in New York, Illinois and California. Engine dynamometer data generated by Southwest Research Institute also will be added on the Cummins L10 CNG-powered engine. ❑

Alcohol-Fuel Vehicles Are Favored by Federal Fleets

Federal agencies are indicating the desire to run vehicles on alcohol fuels rather than on gaseous fuels. Under Executive Order 12759, Section 11, all federal agencies are required to develop a 5-year operating plan with guidance from the U.S. Department of Energy and General Services Administration for the acquisition of alternative fuel vehicles (AFVs). These plans are designed to serve as a tool for projecting volume and types of AFVs that will be driven by U.S. agencies' fleet operators in the future.

Based on preliminary 5-year plan results, the number of alcohol-fuel vehicles is expected to increase by more than 300% from 1993 to 1997. Vehicles using compressed natural gas (CNG) are predicted to increase by approximately 30%. For comparison see Figure 2. These fuel preferences

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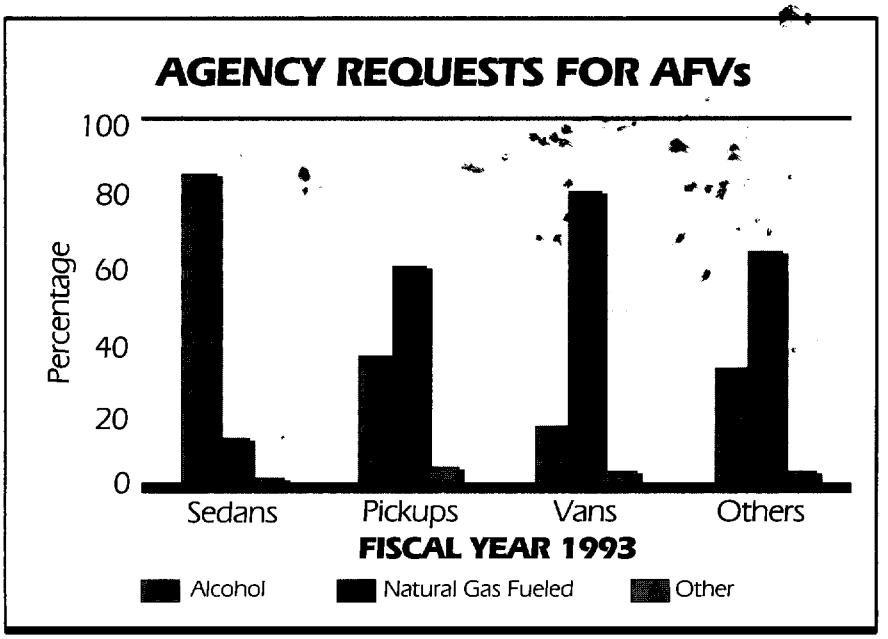

Figure 2.

Alcohol-Fuel Vehicles Are Favored *(continued from page 4)*

may change as more AFV types become available.

Of the vehicles chosen, light-duty trucks and compact cars were preferred, comprising over 70% of the total requests.

For more information about the executive order, contact Mr. David Rodgers, U.S. Department of Energy, Office of Alternative Fuels, 1000 Independence Ave., Washington, DC 20585. ❑

DOE Provides Significant Funding for Alternative-Fuel Federal Express Fleet

AFDC to Contain Data Gathered in 2-Year Project

The U.S. Department of Energy (DOE) is providing significant funding to a recently launched study to be conducted on 113 1992-model-year alternative-fuel Federal Express dedicated-fuel delivery vans. The composition of the demonstration fleet is shown in Table 3. The vans, which will be operated in Southern California, will run on M85, compressed natural gas, electricity, propane, and reformulated gasoline.

Throughout the demonstration program, data will be collected on emissions, safety, performance, reliability, maintenance, and durability. The data will be sent to the National Renewable Energy Laboratory's Alternative Fuel Data Center. An economic assessment of the use of each fuel will be performed from a fleet operator's perspective.

Emissions will be measured by the California Air Resources Board. Tailpipe emissions will be measured on selected vehicles at 6,000, 20,000 and 40,000 kilometers. Evaporative emissions will be measured at 20,000 kilometers.

Battelle Memorial Institute of Columbus, Ohio is the technical contractor for the project. ❑

Composition of Federal Express Demonstration Fleet Vehicles

TABLE 3

Fuel	Chevrolet G30	Chrysler B350	Ford E250	Other	Total Vehicles
Compressed Natural Gas	7	7	7	0	21
Propane	7	0	13	0	20
Methanol (M-85)	0	0	20	0	20
Reformulated Gasoline	7	7	7	0	21
Electric	–	–	–	4	4
Control	9	6	12	0	27
Total Vehicles	**30**	**20**	**59**	**4**	**113**

Alternative-Fuel Data Collectors Installed on New York Packer Trucks

The AFDC will soon be receiving data from vehicles equipped with data loggers, shoe-box sized devices that pinpoint reasons for performance problems in vehicles.

For providing data to the public on a variety of fuels and vehicles, the AFDC depends on accurate unbiased information for comparing and analyzing performance, fuel economy, emissions, safety, and operating and maintenance costs of alternative-fuel vehicles versus conventional-fuel vehicles.

The data loggers are a vital step in this process. Without such devices, explanations for variations in vehicle operating cycles, gas mileage, and range would be difficult to interpret. Each logger is capable of recording 720 data points per minute and storing up to 390,000 points.

Data loggers are especially useful in determining why vehicle performance and engine durability vary. Understanding operating cycles is crucial when comparing the fuel economy, mileage, and maintenance of a large number of vehicles.

The National Renewable Energy Laboratory (NREL), under contract with the DOE, is coordinating efforts with the New York City Department of Sanitation, the New York State Energy Research and Development Administration, and the New York City Department of Environmental Protection to evaluate vehicle peformance on alternative fuels through the use of city garbage trucks equipped with data loggers. The Department of Sanitation owns nine vehicles with Cummins L-10 engines, six of which run on compressed natural gas. ❑

New E85 Variable-Fuel Vehicles Placed With Federal Fleets

The first new Chevrolet Lumina ethanol-fuel sedans are being delivered to federal fleets in Washington, D.C. and Illinois.

The U.S. Department of Energy (DOE) under the Alternative Motor Fuels Act (AMFA) program, has provided funds to cover the incremental costs of purchasing the Luminas, which are optimized to run on E85 (85% ethanol-15% unleaded gasoline).

The General Services Administration (GSA), which purchases the vehicles for federal fleets, will place 17 of the vehicles with the U.S. Department of Agriculture. The rest will be divided between DOE and GSA in the two locations.

Data collection activities will include weekly log sheets completed by each driver, maintenance/service repair records from the dealership and GSA, oil and fuel samples, and emissions analyses. The data will be contained in the Alternative Fuels Data Center.

The E85 vehicles are the first of their kind to run in the federal fleet. These initial vehicles will be modified production 1992 Chevrolet Lumina methanol variable-fuel vehicles, fully certified to all applicable U.S. emission and safety standards. General Motors (GM) will provide special training for dealers and fleet operators to ensure that the unique service needs of these vehicles and the different fuel characteristics are fully understood. GM has recommended E85 fuel specifications for use in its vehicles. ❑

Department of Energy Division Director of Biofuel Systems, Richard Moorer, drives flexible fueled Chevrolet Lumina.

Published by the Alternative Fuels Division of the National Renewable Energy Laboratory: 1617 Cole Boulevard • Golden, Co. 80401-3393.

AFDC Hotline Number: 1-800-423-1DOE

NREL is operated by the Midwest Research Institute for the U.S. Department of Energy.

Meetings and Conferences

August 1992

August 10-13

Society of Automotive Engineers, Future Transportation Technology Conference & Exposition, Westin South Coast Plaza Hotel, Costa Mesa, CA. For information and programs, call SAE at 412-772-7131, fax 412-776-2103, or write:
SAE
400 Commonwealth Drive
Warrendale, PA 15096

September 1992

September 21-22

Coordinating Research Council, Informal Workshop on Handling Methanol and Ethanol as Automotive Fuels, San Diego Hilton, San Diego, CA. For information and a program, call CRC at 404-396-3400, fax 404-396-3404, or write:
Mrs. Shirley Bradish
Workshop Secretary
CRC
219 Perimeter Center Parkway,
Suite 400
Atlanta, GA 30346

September 30-October 2

American Gas Association and Natural Gas Vehicle Coalition, 10th Annual Natural Gas Vehicles Conferences, Walt Disney World, Orlando, FL. For information, contact Regina Conley, 703-841-8440, fax 703-841-8406, or write:
AGA
Attn: Meeting Services
1515 Wilson Blvd.
Arlington, VA 22209

October 1992

October 15-16

European Fuel Oxygenates Association, Fifth EFOA Conference, Sheraton Hotel and Towers, Brussels, Belgium. For more information, contact EFOA at 32(0)2 676 72 11, or fax 32(0)2 676 73 01, or write:
EFOA, c/o CEFIC
Avenue E. Van Nieuwenhuyse,
4 - bte 2B-1160
Brussels, Belgium

October 19-22

Society of Automotive Engineers, International Fuels and Lubricants Meeting and Exposition, Fairmont Hotel, San Francisco, CA. For information, call SAE at 412-772-7131, fax 412-776-2103, or write (see address for SAE above)