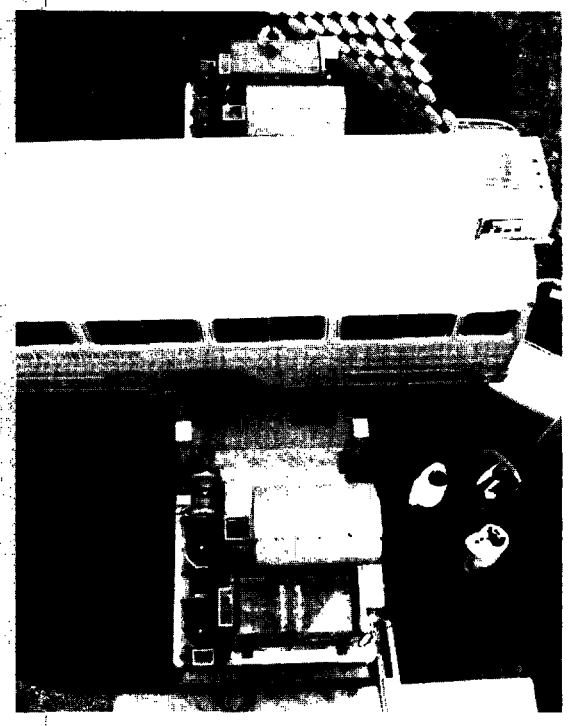
Alternative FUELS IN TRUCKING

Vol. 1 Number 2 Spring 1992

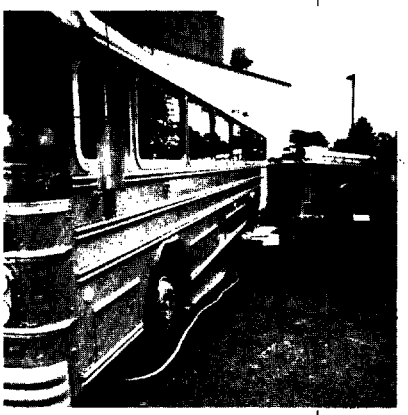
IT'S A FIRST!!!

The Mechanical and Aerospace Engineering Department at West Virginia University has designed and constructed a Transportable Engine Emissions Testing Laboratory for monitoring engine performance and emissions testing for heavy duty vehicles operating on conventional and alternative fuels. This is the world's first completely transportable dynamometer, and is a joint project between West Virginia University and the U.S. Department of Energy, Office of Transportation Technologies.

"This is a simple, but thorough, testing procedure." - WVU Press Release



Aerial view clearly shows power absorbers, fly-wheels, and dynamometer drive train.



A vehicle is backed onto the test bed and the outer hub of the drive axle on each side is connected to the power absorber through a drive train. The instrument trailer is located behind the bus.

The dynamometer will:

- Perform transient and steady state chassis tests on vehicles where they are housed, greatly reducing transportation costs and loss of service.
- Provide performance data for medium and heavy duty vehicles.
- Provide emissions screening for CO, CO^2, NOx, CH4, CH3, OH, HCHO and particulate matter.
- Simulate road load, wind drag, and vehicle inertia using a range of driving cycles.
- Incorporate effects of gear shifting by providing the driver with visual prompts via computer monitor in the cab.
- Provide a detailed hard copy record to verify the run and provide emissions data.

For more information contact Drs. Donald Lyons or Reda Bata, Mechanical and Aerospace Engineering Department, West Virginia University, Morgantown, WV 26506, TEL: 304-293-3111.

Project Profile

CUMMINS NATURAL GAS DEMONSTRATION PROJECT

by A.C. Chu

In the project's initial field and market seed testing, nearly 210 L10 engines have been built. Over 125 engines and compressed natural gas (CNG) storage ranks were installed in city buses during the last two years. Original equipment manufacturers include Ontario Bus Industries (OBI) or Bus Industries of America (BIA), the Flxible Corp.; Gillig Corp.; and Crane Carrier.

Approximately, 110 city buses are in field service in Toronto, Hamilton, Mississauga, Pittsburgh, New York, Los Angeles, San Diego, Orange County, Tacoma, Columbus, Dallas, Fort Worth, Cleveland, New Jersey, St. Louis, and Miami. Crane Carrier garbage trucks are in service in the City of New York. Utility companies supporting these field tests include SoCal, Brooklyn Union Gas Co., Consolidated Natural Gas Co., and Columbia Gas System.

As of March 1992, field test vehicles have cumulatively logged over 1.5 million miles, with the highest mileage bus in Toronto at 90,000 miles. Fuel economy for these buses has not been significantly different from existing bus fleets in similar route operation. When compared with L10 diesel buses, the fuel economy of natural gas buses is about 20 percent lower. However, this deteriorates when excessive idle and light load duty cycles are encountered. The oil consumption is equal or better than diesel power plants.

A number of engines are also undergoing additional performance, emissions, and durability tests. Emissions from lab engines have been demonstrated to be below 3gm NOx, 0.05 gm particulates, and below 0.5 gm Non-Methane hydrocarbons, which exceed the design requirements. A 1000-hour test is in progress, to evaluate emissions deterioration factors. The engine system reliability is now predictable and improving along Cummins traditional diesel engine experience. Cummins plans to begin production of fully warranted engines for city buses in July 1992.

Editor's Note: The author is Executive Director for Engines and Aftertreatment Systems at Cummins Engine Co., Inc.

LEARNING FROM EXPERIENCE

By Jim McNamara

Many fleets will save themselves a lot of pain if they take the time to check out alternative fuels now and learn from the experiences of the companies already using them.

"There are a lot of things behind the scenes you need to investigate. Do your research first, go slow and make sure you have all your facts together," said Sid Gooch, senior fleet manager for Federal Express Corp., Memphis, Tenn.

FedEx runs 800 propane-powered light-duty vans in Canada, a methanol-powered class 8 tractor and a fleet of compressed natural gas-powered vans in Southern California.

The propane fleet enjoys a considerable fuel cost advantage over comparable gasoline vehicles, Mr. Gooch said, since propane costs 15 cents per liter in Canada vs. 55 cents per liter for gasoline.

Whatever type of fuel is used, there are a number of points to consider, he said. First, check all building codes since difference fuels may require different ventilation, plumbing or wiring standards.

If a fleet decides to convert vehicles to alternative fuels, it is preferable to have the vehicle manufacturer do the conver-

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Joy Miller, Editor

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The aim of **Alternative Fuels in Trucking** is to keep fleet owners and opertors, equipment suppliers, goverment officials and other interested parties informed of important developments which impact the use of alterntive fuels in heavy-duty trucks. Suggestions and comments are welcome.

sion and to have it covered by a factory warranty the way any other engine would be. If the conversion is done by a vendor, get references on the company first. If a conversion company goes out of business, the fleet may have no warranty coverage and may not be able to get spare parts, which is why Mr. Gooch also recommended maintaining a parts inventory.

Vehicle mileage can vary according to the quality of the fuel, particularly CNG, and by the pressure delivered by the refueling station. Both factors need to be considered ahead of time, he said.

The Houston Metropolitan Transit Authority has some experience with alternative fuels and is slated to get a whole lot more, since Texas law forbids the purchase of new diesel buses by public agencies, said James Patrick. Texas also has passed laws to encourage the use of natural gas, one of the state's biggest resources.

Regardless of the coming change, "alternative fuels shouldn't scare anyone," he said.

The acceptable alternative fuel should have a variety of operational characteristics equivalent to diesel, he said. The criteria include an acceptable level of safety, vehicle range, weight, fueling time, retrofit ability, reliability of supply and domestic availability, performance, dependability, similar maintenance requirements, reduced emissions and similar economics.

— continued on page 4

DID YOU KNOW?

That the first discoveries of natural gas seeps were made in Iran between 6000 and 2000 B.C.? These gas seeps, probably first ignited by lightning, provided the fuel for the "eternal fires" of the fire-worshipping religion of the ancient Persians.

The first natural gas well was drilled in China in 211 BC, with bamboo poles.

The world's largest gas field is Urengoy, in West Siberia. It has more than 20 separate reservoirs and it's initial reserves have been estimated at 8,067,000,000,000 cubic meters.

- Source, Encyclopedia Britannica, 1990

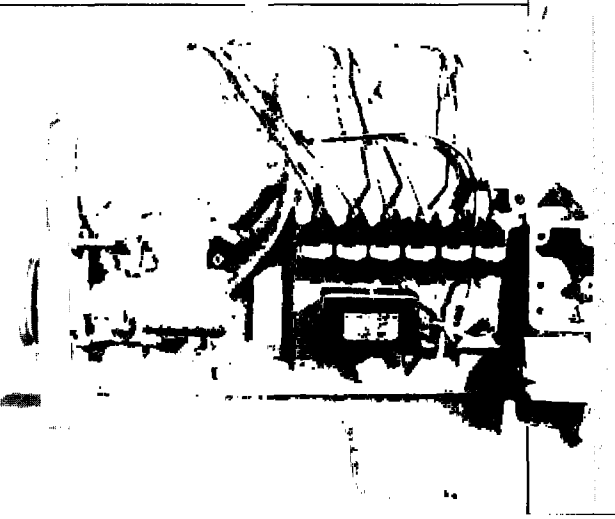
Engine Profile

CUMMINS L10 NATURAL GAS

The basic engine is the same as he L10 diesel: a 6-cylinder, inline heavy-duty engine. However, the diesel injection system is replaced by a natural gas system with carburetor, governor and spark ignition. The 10.5 to 1 compression ratio is lower than the diesel. The Holset turbocharger is waste-gated, providing the optimum air-to-fuel ratio over the entire operating range.

The lean-burn technology of the L10 will meet urban bus NOx and particulate standards. With a catalytic converter for hydrocarbon control, the natural gas L10 will meet the most stringent diesel emission standards.

Beginning with a 240hp model, L10 natural gas engines will be expanded over time to provide a range of horsepower and models.



Engine Model	Hp	Operating Range	Peak Torque @1100 rpm
L10 240NG	240	1100-2100 rpm	750 lb-ft

Table courtesy of Cummins Engine Co.

EXPERIENCE— *from page 3*

Based on an analysis of the different types of natural gas-derived fuels, Houston Transit chose liquefied natural gas.

"It's not quite as good as diesel, but it's better than CNG," said Mr. Patrick.

LNG will of course require new fueling infrastructure, redesigned engines and vehicles and new maintenance procedures, he said. One problem that has been cropping up is unreliability of fueling nozzles, which have a tendency to break when dealing with the -260 F liquid.

LNG has been getting road-tested elsewhere, as well.

Roadway Express, Akron, Ohio, is currently running the only operating LNG truck fleet in the world, said William Demastus, vice president of maintenance.

Roadway has seven LNG-powered tractors being converted or already in local pickup and delivery operation in its Copley, Ohio terminal.

Mr. Demastus said that while there is no nationwide infrastructure in place for LNG, it is a viable option that can be made to work. Roadway has invested $410.000 in the project so far, no counting salaries. Its cosponsors on the project have contributed more than $600,000 for the terminal's LNG fueling station.

"We had a total buy-in from all participants and personnel," he said, and the project is a "textbook case" on how to run a fleet experiment.

The project has had its share of unexpected breakdowns, involving both vehicles and fueling station, he said. Nevertheless, Roadway is extending the test through 1992.

"By then we will be doing business as usual with LNG," Mr. Demastus said.

Editor's Note: The author is a reporter with Transport Topics, a weekly newspaper which covers the trucking industry.

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