

Driving with methane

A system that uses both gasoline and natural gas can cut air pollution

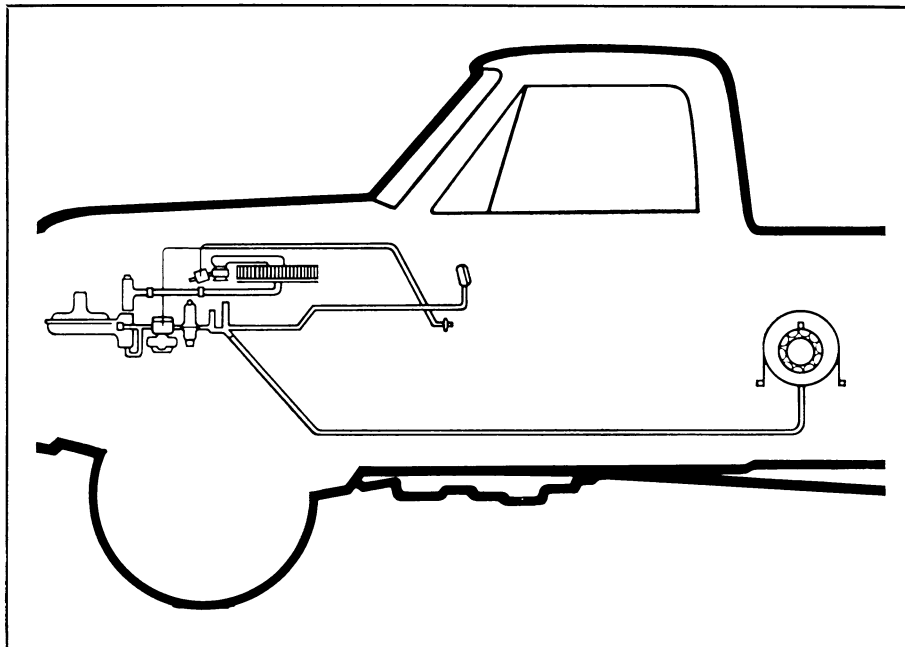
by Edward Gross

Various remedies have been tried to reduce auto-exhaust emissions, from catalytic mufflers, to pumps that provide air to burn pollutants in the exhaust parts of the engine, to carburetor and distributor design changes. Although significant reductions have been achieved, costs, parts wearing out, inadequate maintenance and increases in the auto population tend to offset any gains.

Abandonment of the internal combustion engine in favor of cars powered by steam (SN: 9/20, p. 247), electricity or chemical fuel cells has been proposed. But because of the heavy financial investment in the internal combustion engine, its high performance characteristics and the engineering problems still facing its challengers, replacement technologies face a long, uphill fight, with few betting on success.

A compromise system has been developed, one that handles the air pollution problem without the frontal assault on Detroit that scrapping internal combustion engines would represent. The Pacific Lighting Service Co., a natural gas utility firm based in Los Angeles, a year ago came up with the dual-fuel system (SN: 7/26, p. 84), whereby cars, trucks and buses have the option of operating on gasoline or on compressed natural gas: methane.

The company started by converting 30 of its own vehicles. It is now converting an additional 1,500, and the idea is beginning to catch on. The Federal Government's General Services Administration intends to have 1,000 of its 51,123 vehicles converted to the dual-fuel system by the end of this year (SN: 1/3, p. 12). And last month California's Governor Ronald Reagan



Pacific Lighting

The system carries natural gas from a pressurized tank into the engine.

announced that his state's fleet of 28,500 vehicles will eventually be converted to the system.

Converting to the system is a simple matter that any auto mechanic can do with a little instruction. Furthermore, the few moving parts in the system, and its adaptability, permit its continual use on successive vehicles. "It can be removed from one vehicle in less than an hour and placed on another in about four hours," estimates S. Smith Griswold, former associate director of the Federal Pollution Abatement Control Center, who left to join Natural Gas Vehicles, Inc., a subsidiary of Pacific Lighting located in Washington, D.C.

There are only three main parts to the system, functionally speaking: the cylinders of compressed methane, the regulator and the gas-air mixer.

The pressure cylinders, which range from 30-pound units containing 100 cubic feet of gas to 100-pound cylinders containing 300 cubic feet, can be put in or under the flatbed of a pick-up truck, in the trunk of a car or under, in or on a bus or truck. The function of the regulator is to reduce the pressure of the gas coming from the highly pressurized cylinder so it can feed into the gas-air mixer mounted on top of the carburetor. The mixer, the heart of the system, is the equivalent of a carburetor and air filter and replaces the ordinary air filter that sits on top of the engine.

Once the system is connected, all the driver need do is push a choke-like cable attached to the dashboard to switch from gasoline to natural gas. This can be done while the vehicle is in motion. The natural gas leaves the cylinder and travels via a fuel line to



Del Ankers

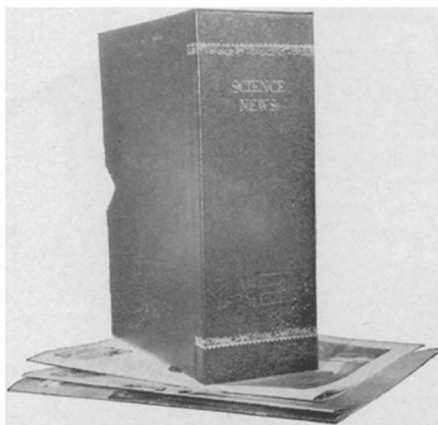
Refueling and range are problems.

the regulator in the engine. There it is reduced to the proper pressure and fed into the mixer where it is combined with air in the proper ratio for combustion and passed into the engine.

As for refueling costs, natural gas is cheaper than gasoline, says Edward Falck, president of Natural Gas Vehicles, Inc. "We figure the fuel savings on a taxi operating only 100 miles a day could pay for the cost of conversion in less than a year." He puts the cost of the entire system, including a tank, at about \$350.

Robert L. Kunzig, administrator of the GSA, agrees that the system is a money saver: "We estimate that the cost of converting the vehicles to the dual-fuel system can be recovered in 18 months through reduced operating and maintenance costs."

It is the number and size of the



science news

NOW, your journals can become an attractive permanent part of your professional library. These famous Jesse Jones volume files, especially designed to keep your copies orderly, readily accessible for future reference—guard against soiling, tearing, wear or misplacement of copies.

These durable files will support 150 lbs. Looks and feels like leather and is washable. The 23-carat gold lettering makes it a fit companion for the most costly binding.

Reasonably priced, too. Only \$3.50, 3 for \$10.00. Satisfaction unconditionally guaranteed or your money back.

JESSE JONES BOX CORP (Since 1843)
Department SN—Philadelphia, Pa. 19141

ENGINEERS

Looking for a top position? You can find the right one among leading firms advertising in the LOS ANGELES HERALD-EXAMINER'S NATION-WIDE ANNUAL MIDWINTER EDITION. Send for your FREE copy coming out January 4th. Leading firms throughout the country will be represented.

WRITE L.A. HERALD-EXAMINER
Classified Mail Division, Dept. 15
1111 So. Broadway, Los Angeles 54

SCIENCE EXPLORING FOR BOYS ages 11-15 at SPRUCE MOUNTAIN CAMP, Bryant Pond, Maine. Field, mountain, canoe trips, Ham radio, photography, plants, animals, astronomy, weather, geology, ecology. Mt. Katahdin outpost camp. Exciting concept of science recreation. Staff inquiries invited. Catalog: William T. Harty, 12 Highland St., West Medway, Mass. 02053.

Book Authors!

Join our successful authors in a complete and reliable publishing program on a subsidized basis; publicity, advertising, handsome books. Send for FREE report on your manuscript & copy of *How To Publish Your Book*.

CARLTON PRESS Dept. XNA
84 Fifth Ave., New York, 10011

FREE



CHEMICALS—RAW MATERIALS

Small Laboratory Quantities

Most Any Item Can Be Supplied

In \$1.00 Packages

Order Now Or Write For Information

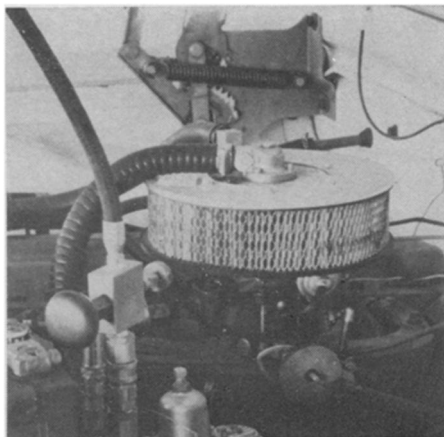
Cash With Order—We Pay Postage

SPECTRO-CHEM INC.

1354 Ellison

Louisville, Ky. 40204

. . . dual fuel



Del Ankers

Heart of the system: the air-mixer.

cylinders that determine the mileage range, along with the size of the vehicle, its type of engine and the load it carries. A 250-cubic-foot cylinder, for example, will give the average six-cylinder sedan a range of about 50 miles. The maximum range using two 300-cubic-foot cylinders is 120 miles. Liquefied natural gas would be an even better fuel because it could increase this range to more than 700 miles, but it is much more expensive.

Because of its limited mileage, the system is not meant to be operated on natural gas when on the open road, where auto emissions are not such a problem. At speeds from 40 to 70 miles an hour nearly complete gasoline combustion occurs and there are hardly any pollutants. It is the stop-and-go of city traffic, where incomplete combustion produces polluting nitrogen oxides, hydrocarbons and carbon monoxide, that the system is designed for. Refueling will also limit its use.

It is not being aimed initially at the private auto owner, but rather at the fleet owners of taxis, buses and trucks. Such fleet owners would be the only ones with central refueling plants necessary for making the system work.

Although the initial marketing target is fleet owners, Griswold thinks the dual-fuel system eventually will reach the private auto owners: "As the popular demand increases, service station operators will install compression facilities for the American motorist," he predicts, adding that the demand is necessary to justify the cost of installation.

Reine J. Corbeil, Pacific Lighting's project manager, cites certain operational advantages in having the system, advantages such as quick starting in cold weather, since the fuel already is a gas, no vapor lock in hot weather and low maintenance costs because of cleaner fuel.

In addition, there is no venting of

pollutants from the fuel; evaporation of gasoline from the carburetor is a significant pollution contributor in standard engines. There is also no safety problem. Should a leak occur, natural gas, being lighter than air, would rise and dissipate, whereas gasoline can collect in a puddle. Especially important is the fact that the ratio of gas to air in which combustion can occur is confined to a narrow range.

There is a debit side, Corbeil admits. "Space will be taken up by tankage," he says, "because we have chosen not to modify the engine in any way. There is also some slight power loss at the higher speeds."

But what of the prime reason for the system's existence: reduction of air pollutants? How well does it do that job?

Boasts Corbeil, "We are able to accomplish a 90-percent reduction in emission of gaseous contaminants."

Comparison test results by the California Air Resources Board on a 1968 car equipped with an exhaust control device and the dual-fuel system showed that, when operating on gasoline, the car emitted 28.8 grams of carbon monoxide per mile. When burning natural gas, the amount was reduced to 2.1 grams per mile. In the case of hydrocarbons, the corresponding figures were 2.56 grams per mile down to .3 gram per mile. And for oxides of nitrogen, they dropped from 3.8 grams to .5 gram. The differences were even greater when the dual-fuel system was compared to an earlier model car with no control device.

"We ran most of the approval tests for the natural gas system at this laboratory," says John Chipman, supervising engineer for the California Air Resources Board, "and we found that natural gas simply produces less pollutants. The pollutants it does emit are less reactive as far as smog formation is concerned; their composition is significantly different."

Of course, for the present, the solution to the auto-exhaust problem resides with the auto industry itself. It will have to clean up the internal combustion engine or go to more unconventional power sources, and heads of both Ford and General Motors have announced intentions, at least, of working on cleaner internal combustion engines.

In the meantime, however, the dual-fuel system is an effective way to reduce air pollution. Says Kunzig, "If the system is successful—and we have every evidence that it will be—GSA can make a considerable contribution toward reduction of the air pollution that plagues our metropolitan areas." □