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Methane: A Motor Fuel

When oil becomes scarce and even more costly, other fuels will replace it in motor vehicles. Already a start has been made with ethyl alcohol and there has been talk of employing methanol as a motor fuel. But little attention has been focused on methane. This lack will be partly met by a book entitled *Methane: Fuel for the Future*.*

The earth's crust contains large amounts of methane. The gas can also be obtained from biomass and from synthesis gas derived from coal. In the United States, a million-mile pipeline network exists for distribution of the gas. Methane is already being used in about 400,000 vehicles around the world, including 250,000 in Italy and 20,000 to 30,000 in the United States. Users have found that engine wear is reduced: lubricating oil is not diluted as it is when gasoline is used. Exhaust gases are relatively nonpolluting. Start-up of motors is not affected by cold weather. An engine designed especially for methane has an energy efficiency greater than that of ordinary automobiles. Conventional cars and trucks can be modified at a cost of \$1500 to burn either methane or liquid fuels. When they burn methane, such engines are about 10 percent less efficient and, for the same piston displacement, generates 25 percent less power than with gasoline.

A major consideration in the use of methane is the need to employ high pressures—typically 160 to 200 atmospheres—to store the gas in the vehicle. Steel vessels used for this purpose add about 10 percent to the weight of the vehicle. Light tanks made of composite materials are under development. Riding around in a vehicle with tanks at 200 atmospheres might seem hazardous; however, the vessels are built to withstand about three times that pressure and are tested at pressures considerably above those in standard use. Such vessels would withstand a crash far better than a conventional gasoline tank. To obtain the high pressures for filling the methane tanks, compressors are employed. At present, these are too costly for individual home use. Thus, the principal present use of methane-fueled vehicles is in fleet operations, where a single compressor and accompanying storage tanks can serve many cars or trucks. A substantial number of natural gas distribution companies maintain such fleets. One Kansas City company has 700 vehicles that operate with natural gas.

Of all the alternatives to gasoline from petroleum, methane is the one source that could displace much of it relatively rapidly. For example, shale oil in quantity is decades away, as are liquid fuels from coal. But methane is available and conversion of cars to use it is not difficult. At the moment, proved reserves of natural gas are limited, but the National Petroleum Council and the American Gas Association are confident that much more will be found and tapped. They point to methane in the Devonian shales of the Appalachian Basin, to methane associated with coal, and to natural gas in western tight gas sands. In addition, many other horizons have not been explored. Once successful wells are drilled, processing equipment can be quickly installed and the production channeled into the pipeline network. Thus, the nation has an answer to a prolonged attenuation of oil imports.

As long as liquid fuels are readily available, motorists will probably pay a premium price for them. Operators of large fleets will make their decisions on the basis of relative costs. The cost of gasoline per unit of energy is now about twice that of methane, and if present prices continue, fleet operators making heavy use of vehicles could afford to make the investments necessary to convert to methane. In the United States, there is uncertainty about the effects of deregulation on the price of natural gas. In the short term, it may rise. However, potential future supplies of methane have an energy content considerably greater than that of petroleum, and ultimately the contrast in price of the two fuels must increase. Hence, it is likely that in the long term methane will have an increasing role as a motor fuel.

—PHILIP H. ABELSON

*P. McGeer and E. Durbin, Eds., *Methane: Fuel for the Future* (Plenum, New York, 1982).