GEOLOGY-ENGINEERING

Man-Made Fuels Needed Now

It will take a long time to find and extract all the crude oil from underground deposits, therefore synthetic liquid fuels are essential to supplement this supply.

By A. C. MONAHAN

➤ "SHALL I filler-up, mister, with this new synthetic gasoline? Understand it's made just right from coal, shale or natural gas."

It's a guess as to how soon the fellow at the filling station will be saying that. Or how soon you will be running your old or new car on gasoline, either oil-born or synthetic, mixed with ethyl alcohol—the kind that can be drunk.

The day when this will be possible is not too far in the future. The oil industry is preparing for it, and plants are under construction or being planned.

Methods for making synthetic liquid fuels are well known. Present costs are important factors, however. Before these synthetic products can compete on a price basis with the products of the natural crude oil more economical manufacturing processes must be developed. Otherwise the use of man-made fuels will await the higher prices that may be expected as crude oil deposits become harder to find and more costly to work.

Plenty of Petroleum

There is plenty of petroleum in the crust of the earth to last for many generations, many geologists believe. The problem is how to find it and how to get it out. Much of it is in the underwater continental shelf that extends from coastline far out beneath the sea. Much is in icebound areas north of the Arctic Circle. Then perhaps there are hidden deposits a mile or two deeper than the present known reserves.

To get oil from any of these sources will cost a great deal of money. In fact to discover oil deposits within the continental United States is a costly procedure and growing more so as time goes by. Geologists can locate areas favorable to oil deposits, but there is only one sure way to actually find oil. That is by boring, and well-drilling is expensive.

An exploratory well in the oil industry is a wildcat. Companies drill on the advice of geologists but the geologists are often wrong. If no oil is struck the well bored is a dry hole. Over 87% of the 5,000 American wildcats drilled in 1947 turned out to be dry holes. Of some 20,000 wildcats drilled in the past five years, considerably over four-fifths were dry holes.

In efforts to find deeply-hidden oil, many wells over 10,000 feet deep have been drilled. One at Fort Cobb, Okla., was carried down to 17,600 feet, or over three and one-half miles. It was not productive. Oil is being produced from the Gulf coast of Louisiana and Texas from below 10,000 feet, and in a few cases from below 13,000 feet. These deep wells cost from $250,000 to $350,000 each. Their cost, and the cost of all exploratory wells and geological surveys in search of oil is all finally borne by the consumers of the petroleum products.

Will Take Many Years

It will take many years to get the oil in known deposits out of the ground. This means that synthetic liquid fuels may be needed to supplement crude oil production long before the underground reserves are exhausted. Taking oil from underground is not like pumping it from a tank. It is distributed in tiny spaces in what are called oil-bearing sands, usually sandstone and limestone. It takes time for the petroleum to seep to the area from which pumped.

Some American oil fields have been producing for 80 years or more, and will probably continue to produce for another 20 years. Their daily production has of course greatly decreased. Oil was taken from most old fields as rapidly as possible before conservation practices were established, but nature through her own physical laws prevented their rapid and complete exhaustion.

The greatest untapped source of crude oil in the world is probably the continental shelves which one petroleum geologist estimates contain 1,000,000,000,000 barrels of oil. These submerged areas extending from a few to a few hundred miles out from shorelines under the oceans, have a geological history favorable to oil formation. Their national ownership inside the three-mile limit is unquestioned.

Beyond this limit, they have long been open to anyone. Waters over continental shelves are fish-feeding grounds, and fishing fleets of all nations have used them without interference. Now the situation has changed. The United States claims the American continental shelf areas as under American jurisdiction for both fishing and mining activities. This claim is by Executive Order of Sept. 28, 1945. It interferes in no way with ordinary navigation.

Natural Gas

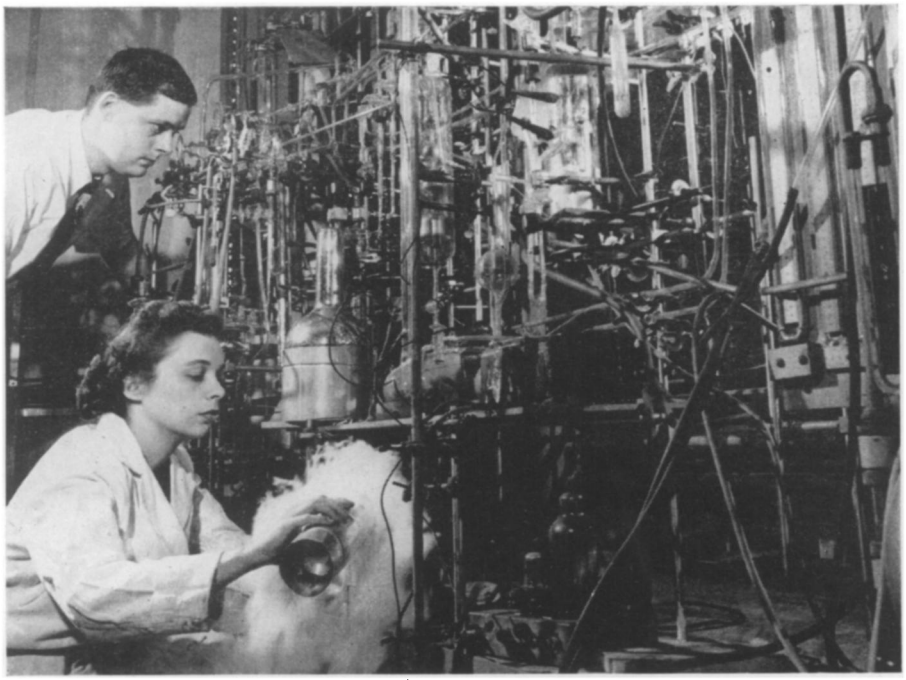
The first man-made gasoline and fuel oil to enter the American commercial market will probably be made from natural gas as a source material. Two giant plants, one in Texas and the other in Kansas, are now under construction for this purpose. The Texas plant will use gas much of which is now wasted, the Kansas plant will use a natural gas which has too low a heating value to use for ordinary gas heating or lighting.

Known reserves of natural gas have increased more rapidly than reserves of oil. Some state that there is enough to make quantities of gasoline from it for 25 years without endangering the supply needed for future years for heating and lighting. Others claim a much larger supply. One oil man recently stated that in Texas alone over 1,500,000,000 cubic feet of gas are being blown into the air every day. Its only present use is to assist in the production of oil.

The cost of gasoline from natural gas is relatively low. The products can be put on the market at prices competitive with those from natural petroleum. The investment in plant and equipment, however, is high.

The supply of shale containing oil, usually called oil shale, is very great. The largest deposit is in a Colorado area that extends well into Utah. But it is found also in California, Indiana and Kentucky. A U. S. Bureau of Mines pilot plant, now producing many barrels of oil a day, is located at Rifle, Colo., not far from the Utah line. There is enough oil shale in America to yield an estimated 95,000,000,000 barrels of oil if all could be extracted.

From work already done, it appears that oil from oil shales can be extracted even now at prices comparable to those for the average cost of production from wells. However, the product has different



SYNTHETIC FUELS—Radioactive atoms are used by Gulf Oil scientists in probing the still mysterious reaction by which gasoline is produced from coal.

characteristics and is better for production of diesel and other fuel oils than it is for gasoline and aviation fuel at the present time. New methods of refining may change this situation later.

Coal may be rapidly losing its right to be called the king of fuels, but it gives promise of being the father of fuels in the form of liquids. Coal for years has been the chief source of mechanical energy, but it took second place to oil and natural gas in 1946. Even for locomotives, coal is becoming secondary; over 90% of the locomotives now under construction are diesels, and one new diesel appears on the tracks every week to ten days.

Two Methods

There are two methods of producing synthetic liquid fuels from coal; the hydrogenation method and the Fischer-Tropsch process. Both have been used in Germany for several decades. Both are experimentally used in America, and developments already made are improvements on the German processes. The product is at least equal in quality to that being made from well oil, but the cost is still relatively high.

Laboratory work on the synthesis from coal is being done by the U. S. Bureau of Mines and by at least two coal and oil company combinations. The Bureau of Mines is building a large-scale demonstration plant at Louisiana, Mo., and a commercial plant is under construction near Pittsburgh.

Blending one gallon of ethyl alcohol with nine gallons of low-grade gasoline will make ten gallons of premium grade anti-knock motor fuel, Dr. G. E. Hilbert, of the U. S. Department of Agriculture, recently said. He is director of the department's regional laboratory at Peoria, Ill., where work is being done to develop liquid fuels from vegetable matter, particularly farm wastes. The advantage of a mixture of alcohol in gasoline for motor fuel has long been known but used relatively little because of the cost of the alcohol.

The process of making alcohol from grains for beverages and other purposes is well known and highly developed. Ordinarily there is not enough surplus grain to make alcohol from it for automobiles. But there are great quantities of corncobs and other farm wastes from which ethyl alcohol can now be successfully made.

The cost is still too high, however, to use the alcohol as a motor fuel, but the outlook for a cheaper process is promising. One factor in cost is the transportation of the farm wastes to the alcohol-making factory. They are bulky to ship. Then to make a profitable business, uses for byproducts must be developed. Some could be used for making wallboard and plastics, or even briquetted for household heating. Corncobs, for example, yield such valuable byproducts as xylose, butanol, acetone and furfural. Among many uses for the last is in the making of nylon.

Despite the fact that the per capita consumption of petroleum products has risen from 367 to 608 gallons during the past nine years, that there are now a million more passenger cars on the road than in 1941, and that about 4,500,000 families are using liquefied petroleum gases for fuel, there is actually little danger that America will be without liquid fuels for centuries to come.

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ENTOMOLOGY

World's Food Crisis Made Worse by Insect Pests

➤ WORLD food shortages are being made worse by insect pests, which make hungry humanity eat at second table. With the world's population increasing at its present rate, our present tolerance of these thievings and spoilages must end, declared Dr. Fred C. Bishopp, assistant chief of the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture.

Dr. Bishopp spoke as guest of Watson Davis, director of Science Service, on Adventures in Science, heard over the Columbia network.

Much of the insect loss that used to be regarded as inevitable can now be prevented, thanks to DDT and some of the other new insecticides, Dr. Bishopp stated. Notable instances of successes already achieved which he cited are reductions in the hundred-million-dollar losses to the meat and dairy industries caused by tormenting flies, elimination of tick-borne cattle fever in the South, increase in the potato yield in Maine from 253 bushels per acre to 358, and the virtual elimination of houseflies from many cities and large areas in the country as well.

Although cotton is commonly thought of as a textile crop it is an important food crop as well, Dr. Bishopp pointed out, because of the oil from its seed and the seed meal that is fed to livestock. Cotton-attacking insects in one year cut the seed yield by 613,000 tons, worth $44,000,000. This would have provided enough refined oil to make 200,000,000 pounds of margarine, meeting the minimum needs of 8,000,000 people. Cotton insects alone, therefore, are worth the