

A LOOK AT THE OIL POSSIBILITIES OF CUBA*by*DOLLIE RADLER HALL¹

Since the discovery of oil in sedimentary rocks at Jatibonico, Camaquey Province, Republic of Cuba, early in 1954, there has been an intensive interest by major oil companies and independents to determine if Cuba will be an important oil province.

There are many factors to be taken into consideration. All agree that Cuba is in a very strategic location should major oil fields be found. It has a domestic market now importing some 60,000 barrels per day; it could dominate the eastern market of the United States and could take its place in the markets of the world.

Cuba's land area is roughly the size of the State of Pennsylvania, (28 million acres). Its shelf area which is considered very important in the search for oil covers another fifteen million acres.

Sugar, tobacco, bananas, rum and rice are the sources of income, with sugar dominating the economy. For many months of the year there is a serious unemployment problem. Cuba has no natural fuel. Charcoal from the mangrove swamps is used for cooking. Much liquified petroleum is used in the larger cities. Bagasse, the sugar cane pulp is used for fuel in the sugar mills. A natural fuel is needed to attract industry to stabilize their economy and raise their standard of living.

The population of 6 million people is rather evenly divided, 117 per square mile, compared to 47 in the United States. Havana, the largest city has a population of one million. The Island is 750 miles long, average width 50 miles; 26 seaports equipped for international trade; a central highway which is paved, numerous feeder roads; telephone and telegraph throughout the island; a railroad to important cities and sugar centrals.

The people are friendly and happy and are excellent workers. They have a great deal of respect for the United States and pattern many of their public buildings, work projects and many ways of doing business after the United States. Their peso has an equal value with the American dollar. Spanish is the language but many speak English.

Active oil and gas seeps have been known since earliest time in every province. Oil was first discovered at Bacuranao in Havana Province in 1864, Motembo 1881, and Jarahuca 1943, both in Las Villas Province, and Jatibonico in Camaguey Province in 1954. All fields until the discovery at Jatibonico produced from fractures in serpentine, with gravities of 20° to 32° at Bacuranao, naphtha 52° to 62° gravity at Motembo and 42° gravity at Jarahuca. Jatibonico produces 14° gravity oil from a calcareous sandstone in the Upper Cretaceous. Possible extensions to Bacuranao were discovered in 1955 by Ted Jones, on the coast to the north and Cruz Verde by Clarence Moore et al, to the south of the old field. This is a four well pool producing

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150 barrels per day. Depth of production in all fields ranges from 200 to 1800 feet.

A very useable geologic map is available from the Geological Commission of Cuba, compiled under the direction of Dr. Jorge Brodermann, published in 1946.

Cuba is divided into four structural areas separated by three large sedimentary basins. The structural axis is slightly north and parallels the geographical axis. The oldest rocks are basement complex on which succeeding geological formations are laid down. Various igneous rocks have been intruded at several different periods into the older rocks as well as into the later deposits of Jurassic and Cretaceous. Serpentine and altered serpentine are found in every province. Most asphalt deposits as well as oil and gas seepages occur in areas of serpentine. There is often found well within the serpentine areas lenses of limestone impregnated with oil or oil residue. These limestones appear to be of Jurassic or Cretaceous age and were probably brought up with the intrusions. Evidence points to serpentine of various ages and there are cases where the serpentines have been intruded by various igneous rocks.

The oldest known sediments are of Jurassic age. A thick massive limestone cut by a fine network of calcite veins quite soluble and very cavernous forms the axis of the backbone of the mountains in Pinar del Rio Province. Under proper conditions this formation could form an excellent reservoir for oil. Asphalt has been found in this formation. Formations of Cretaceous age have an extensive development on the island. The *Aptychus* limestone of lower Cretaceous age is believed by many to be an important source rock and under certain conditions an important reservoir bed.

The Upper Cretaceous contains black shales that could serve as source rocks as well as cap rocks. Other formations are made up of limestones and sandstones. Some sandstones reach a thickness of 300 feet.

The Paleocene is made up of evenly bedded micaceous sand that could make a good reservoir rock.

Tertiary rocks are found throughout the island and are well represented in the basins. Marls, sands, conglomerates, massive limestones and coral reefs are all potential reservoir rocks.

The Quaternary consists of coral limestone and other coastal deposits on marine terraces; recent alluviums in river valleys, tidal flats and coral reefs which are still developing.

The Jurassic has a known measured thickness of 2500 feet, the Cretaceous 20,000 feet and Tertiary 15,000 feet. Surface beds in the Tertiary contain sections of coral reefs, porous limestones and sandstones. If proper conditions of these are found beneath some of the large surface structures that have been mapped, they should yield major oil fields.

The Jurassic and Cretaceous beds have been subjected to intense deformation and have extremely complicated structures. The Tertiary rocks have overlapped these highly folded and faulted rocks and are folded into more simple structures.

There are also facies belts in the older rocks, the farthest north being the dolomite-anhydrite series along the north coast of Las Villas and Camaquey Provinces. Conditions found here are similar to southern Florida. A well drilled by Shell, Cayo Coco #1, in the northern keys found good oil shows in a porous dolomite but tested salt water. This area is due to be tested in the near future by major oil companies. Many geologists believe salt domes will be found in this belt.

South of the dolomite-anhydrite belt is found a highly deformed belt of marine thin bedded limestones and cherts. This highly contorted belt has abundant oil seeps and is believed to be the source of the oil in the serpentine fields.

Another highly deformed belt consists of massive limestones and shales of Cretaceous age in the northern part of Pinar del Rio Province. This belt also contains many oil seeps and a few shallow tests drilled had good shows of live oil.

A fourth belt consists of highly deformed limestones and Cretaceous volcanics. They have their greatest extent in the southern half of Cuba. There are many volcanic flows and tuffs in this section. Some geologists believe that these are the reservoir rocks of the Jatibonico field, with the cap rock the Tertiary shale and that the source of the oil is from Tertiary beds down dip.

The fifth belt for the older rocks consists of the serpentine which is found cropping out in all the previous belts except the dolomite-anhydrite.

Until recently the Tertiary sediments were considered to be a very thin cover over older rocks and of little importance as a producing horizon.

In 1946, Standard of New Jersey in their Banos #1, in Pinar del Rio Province, drilled to a total depth of 8600 feet in Paleocene. They had a section of at least 8000 feet of Tertiary and recorded some shows of oil. In 1955, Trans-Cuba Oil Company drilled to a total depth of 10,128 feet in Tertiary near Sancti Spiritus, Las Villas Province. More than 15,000 feet of Tertiary has been mapped on the surface in Oriente Province. Seismograph reflections in offshore areas indicate that there may be as much as 20,000 feet of Tertiary.

It is believed that the three basins may well develop some large oil fields in gently folded structures or stratigraphic traps.

The stratigraphy and structure offer problems and ideas as to where to prospect. Fortunately for Cuba it is found that companies differ in their ideas as to the better areas in which to prospect.

Approximately Thirty Million Dollars is committed to be spent during the next five years by majors and independents in the search for oil in Cuba.

Majors represented are Stanolind - 11 million acres; Standard of California - 750,000 acres; Atlantic - 1½ million acres; Shell - 750,000 acres; Standard of New Jersey - 750,000 acres; independents represented are Cuban Venezuelan Oil Voting Trust and Trans-Cuba Oil Company - 3 million acres (This in addition to their holdings under Sulgraves, Stanolind, and Cuban American); Sulgraves 160,000 acres; Reiter Foster-Americuba - 200,000 acres; Siboney-Caribbean - 5 million acres; Kewanee - 200,000 acres; Benedum and

Trees-Russell Cobb, Jr., — 750,000 acres; White Eagle International — 4 million acres; Ted Jones — 50,000 acres; Consolidated Astoria Mines Limited — 30,000; Union Petrolera Aurrera-Jarahueca — 112,500 acres; Cuban Colombian — 860,000; Cuban American — 1 million acres; Cuban Canadian — 5 million acres. The Dos Estrellas concession of 29,000 acres on which the Jatibonico field is located is owned jointly by Union Petrolera-Aurrera-Jarahueca $\frac{2}{3}$ ths, Kerr-McGee $\frac{1}{3}$ th and Cuban Canadian $\frac{1}{2}$.

Approximately 22 wells have been completed at Jatibonico with depths ranging from 1,100 feet to 1,600 feet, with initial production of 50 to 500 barrels per day. The field is currently running 1,500 barrels per day.

The article on developments in Cuba by Ruth Sheldon Knowles published in *World Petroleum*, October, 1955, gives information concerning exploration planned in Cuba.

Summarizing

Cuba has evidence of oil and gas in active seepages and in fields already discovered; a stratigraphic section of at least 20,000 feet of Cretaceous, 2,500 feet of Jurassic, and 15,000 feet of Tertiary. Sediments that can be seen and measured or examined in tests drilled show rocks of good source material and excellent reservoir conditions. There is evidence of reef accumulation as well as possible accumulation around salt domes.

There have been numerous periods of structural movement; creating complex structures and many unconformities. Accumulation of oil should be found in structures as well as in stratigraphic traps.

Exploration now going on should determine if Cuba is to take its place among large oil provinces of the world. All factors point to its being a good place to prospect for oil since it has the stratigraphic section that has yielded the greatest percentage of world reserves.

PENNSYLVANIAN AND PRE-PENNSYLVANIAN RELATIONSHIPS IN THE ARDMORE BASIN

by

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EDITOR'S NOTE: Mr. Becker has reported that his paper has never been put in printed form and that he is unable to make an abstract for us. We have been informed that an abstract of a paper on this subject presented at Oklahoma City may be in existence but we have not seen it.

1. Walter Duncan Oil Company.