

Currently hundreds of different seismic attributes that are generated from 3-D seismic data are used to identify the highest productive areas and how to develop them. Micro-seismic mapping has made completion more efficient and safe. While the geophysics involved in unconventional resource development may not be the first thought in the board room, their data has become an accepted early development tool of successful oil and gas companies.

THE EARLY EXPLORATION HISTORY OF THE PEARL RIVER MOUTH BASIN IN THE SOUTH CHINA SEA

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Pearl River Mouth Basin (PRMB) is located in the northern part of the South China Sea, south of Hong Kong and the Guangdong Province, China. It is a Cenozoic depositional basin. The oil search was initiated in the middle of 1970s by the Chinese. With preliminary geophysical surveys and one Jack-up drilling rig, the Ministry of Geology (MOG) had defined the basin geology and drilled 7 exploration wells, of which the Zhu 5 well obtained a commercial flow, symbolizing the oil discovery in the basin.

Due to lack of capital, technology, and offshore operational experience, China decided to open the basin to the foreign investors through a bidding process in early 1980s. This was a brand new approach, and in order to implement this strategy in February 1982, the Ministry of Petroleum Industry (MPI) set up a company, *China National Offshore Oil Corporation (CNOOC)* in charge of the foreign cooperation which represented the Chinese authority dealing with all the activities related to bidding and operation details.

On the first round of offshore bids, the PRMB had attracted 24 oil companies from 11 countries, which signed 13 lease blocks with *CNOOC* under the terms of that the oil company carried out all exploration costs to earn up to 49% of the development working interest in first 15 years of production. Unfortunately, many large prospects came out dry and only 5 small-size oil fields were found from 3 lease blocks. By the combination of drilling results and oil price collapse, the foreign investors started to walk away from the consequent bidding rounds. However, by 1990, the foreign oil companies had 7 oilfield discoveries and decided to develop the fields jointly with the Chinese partner. When these fields were on stream in the middle of 1990s, the PRMB oil production was greatly

boosted and the basin became the most important offshore oil province in China.

Looking back the exploration conducted in the PRMB, the foreign oil companies not only brought the investment and technology to China, but also taught the Chinese how to operate and manage offshore oil business. In China, the foreign cooperation is definitely on a fast track to catch up with the developed countries. The evolution of *CNOOC* as an oil company is a good example, and the early exploration in the PRMB tells the story.

CALIFORNIA AVIATION AND AEROSPACE PETROLEUM BEGINNINGS

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In the first dozen years of the twentieth century, gasoline used in autos, boats, and planes was similar. Fuel chemistry advanced competitively after 1910 when fliers in experimental contraptions gathered at America's first International Air Meet in Los Angeles. Investors then held races aimed at sharpening engine power and fuel range. Performance specifics discussed among hydrocarbon crafters such as M. J. Trumble propelled fellow designers to improve fuels. They tapped shale, secured more geology and altered chemical refining to jimmy the mechanics of high octane mixes. By 1924, Trumble patented a solid fuel near California's Olinda oilfield. He and partners anchored plans for Green River carbons. Royal Dutch geologists traveled West in the 1850's, and by 1910, they were dug in around Olinda's Carbon Canyon. Newhall teams exploited white petroleum in Elsmere Canyon. Aviation fuel (known as *av fuel*) geology rocked out West.

Progress in aviation fuels was driven by competing chemists finding different flashpoints and other features designed to boost performance. Today's av and jet fuels contain thousands of elements for atmospheric adaptation and engine needs. One team durably committed to av fuel and jet fuel since the beginning was Shell. Their earliest roots in California were planted with partners including Captain John Barneson and M. J. Trumble who capitalized *General Petroleum* in 1912. The guts of *GP's Trumble Refinery* in Vernon were moved to Torrance in 1927 as GP became a subsidiary of Standard's Socony, and then Mobil Socony; later Mobil Oil, and then Exxon Mobil. Major Jimmy Doolittle from the U.S. Army Air Corps headed the av fuels division at Shell in the 1930's. *GP's* Tor-