

## **DHULIAN OILFIELD : A CASE HISTORY**

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The Dhulian oilfield is located in the central part of the Potwar Plateau, about 90 km south-west of Islamabad. A.W.Wynne first mapped the surface structure in 1877 as a broad east-west trending, doubly plunging anticline. In 1918, the Attock Oil Company Limited started exploration on the surface structure. First commercial production was obtained in 1937 from the fractured shelf carbonates of Eocene Chorgali-Sakesar formations. First oil discovery in Pakistan from Paleocene reservoir was made during 1951 in Dhulian. In 1960 Pakistan's first Jurassic oil-bearing reservoir was also discovered in the Dhulian-39 well. A total of 49 wells were drilled till 1966. The average well depth in the field is about 8,500 feet, but Dhulian 43, the deepest well, was drilled to a depth of 12,428 feet into Infra-Cambrian; the Permian and Cambrian objectives were water bearing.

In 1993 POL acquired seismic data which revealed that in the subsurface the Dhulian structure is a broad asymmetric compressional fold with faulted compartments. It is salt cored, with a wrench-induced major thrust to the north separating it from the Kaur pop-up structure. The trapping mechanism for the Tertiary reservoirs is a four-way dip closure, whereas the Jurassic oil is trapped by a combination of structure and reservoir pinchout. The Kuldana Formation (red clay) forms the top seal for the Eocene reservoir, whereas the Nammal and Datta variegated shales are the cap rocks for the Paleocene and Jurassic respectively. The Eocene marine carbonates and shales and the black marine shales of the Paleocene Patala Formation are believed to be the source rocks for the oil in Dhulian. The Paleocene and Jurassic reservoirs appear to be in pressure communication. However, many wells, including Dhulian-46, produced oil from deeper Jurassic sand, while shallower Paleocene limestone in the same well produced only water, implying non-communication. Dhulian has an active water drive in the Eocene reservoir, whereas the principal drive mechanism in the Paleocene and Jurassic reservoirs is solution gas and partial water drive.

The Dhulian field has produced a total of approximately 41 mmbbls of oil and 199 bcf of solution gas. The 500 feet thick Eocene shelf carbonates has produced 7.7 mmbbls of 28°-32° API oil with initial maximum reservoir pressure of 5960 psi. The main oil production of 21 mmbbls was obtained from the 450 feet thick Paleocene shelf carbonate and 12 mmbbls of oil has been produced from the 70 feet thick basal Jurassic Datta sandstone. The Paleocene and Jurassic reservoirs gradually watered out and the flow ceased completely in 1983. Prior to the initiation of an enhanced hydrocarbon recovery project in late 1997, daily production from the Eocene was only about 18 b / d oil and 256 b / d water. After the recent completion of the Dhulian-17 and -39 workovers, oil and gas production from the field has increased significantly