Exploitation Strategy for BCS Sands in Sobhasan Complex, Mehsana, Gujarat, India

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BCS(Below Coal Sand) sands in Sobhasan Complex field in Mehsana-Ahmedabad Tectonic block of Cambay Basin, are thin, low resistivity sandstone reservoir developed between Sobhasan and Mandhali member of Kadi Formation of Lower Eocene age. Development of these reservoirs has gained importance in recent times as the days of easy oil are at its last leg and most of our big fields are matured and at declining stage of production. Increasing oil prices have further made the development of such reservoirs techno-economically viable and attractive.

BCS sands overly the Lower Tongue of Cambay Shale and are overlain by the Bottom Coal of Sobhasan Member. They are developed throughout the field. Sand geometry and log motifs reveal the presence of tidal flat environment at the time of deposition of these layers. Towards the southern part of the field, thickness of these layers increases with an improvement in sand facies and favourable entrapment conditions.

Block of well MW#16 is located in the South Western part of the field. It is bound by two sub-parallel north-south trending west hading and two northeast-southwest trending south hading faults. Gas-oil/shale contact (GOC/GSC) has been observed in the block as well as in nearby blocks in BCS pays. GOC in this block is at -1597 m MSL. Since no oil-water contact is observed in this block, lowest known oil i.e. 1636.5 m MSL based on well data of MW#16 has been taken as the limit. Well logs indicate good continuity of the sand along the East-West and North-South direction. Block has permeability, porosity, oil saturation and oil iso-pay of the order of 15-50 md, 13-24%, 40-67% and 2-10 m respectively.

BCS sands were put into production through exploratory well MW#16 in December, 2004 which started producing @45 m^3/d. Block has produced at a peak oil rate of 60 m^3/d from 4 wells in 2008-09. Well production performance indicates the energy support from the gas cap. Wells produce at a sustained rate of 15-20 m^3/d with negligible water cut. Pressure drop of about 30 Kg/cm^2 is observed after a production of 7-8%.

Reservoir Model has been created in PETREL software with grid size of 39X75X3 in X, Y and Z directions and cell size of 50m X 50m cell. Porosity and water saturation maps have been generated based on well values.

Reservoir simulation on ECLIPSE 100 simulator considering the reservoir as saturated, brings forth the fact that limited gas cap support is not sufficient for optimal exploitation of this reservoir. Additional energy support in terms of water injection is essential for effective exploitation of these pay zones. Current paper deals with the details of the reservoir simulation study carried out in block of well MW#16 and the development strategy formed on the basis of the study. After a very good history match of pressures, seven prediction variants have been studied considering different scenarios of development from Business As Usual to infill producer locations, conversion to water injectors, new water injectors etc. Variant VI which considers three new in-fill locations, two oil producers and one water injector and conversion of an existing well to water injector is found to be most suitable for the block. Recovery in this variant increases to 33.1% from 19.72% in base variant.