

Back-Stepping Reservoir of Tight Carbonate –A New Play of Exploration Target in Kuwait

**Prabir Kumar Nath¹, Sunil Kumar Singh¹, Khaled M. Al-Azmi¹, Afrah S. Al-Ajmi¹, Eman Al-Shehri¹,
Subratah Bhukta¹, and Abdulaziz A. Sajer¹**

¹Kuwait Oil Company, Ahamadi, Kuwait, Kuwait.

ABSTRACT

Minagish and Ratawi are the main carbonate reservoir in Kuwait. An integrated approach incorporating the regional understanding, core analysis wire line logs, mud log information, and conventional seismic and acoustic impedance of Minagish and Ratawi Limestone strongly suggest a robust conceptual model of inner-mid ramp environment. This study points toward the probability of a fair to good reservoir facies development beyond the main reservoir facies. The main reservoir facies of Minagish Formation is Oolite and grainstone deposited as inner ramp shoal facies under HST of sequence stratigraphic framework in the South and West Kuwait. In the northern part of Kuwait, significant thickness of packstone, wackstone and mudstone facies were deposited in mid to outer ramp environment, under transgressive system tract. These reservoir facies are considered to be a back-stepping reservoir which was developed due to sea level fluctuation described under 3rd to 4th order sequence stratigraphic framework. This back-stepping reservoir of Minagish Formation produced around 1100 BOPD from Khashman to the north of Main Burgan Field. Ratawi Limestone of Northern Kuwait was deposited in inner to mid ramp environment. Lithology are dominantly wackstone and packstone. The integrated analysis of Ratawi Limestone suggest presence of back-stepping reservoir in Northern Kuwait. The study culminated in to the discovery of Ratawi Limestone reservoir and proved the play concept of back-stepping reservoir. The zone produced 39 deg. API oil about @ 1000 BOPD with steady flow in Northern Kuwait. Petrophysical interpretations corresponding to the zone of interest of Ratawi Limestone suggest significant porosity development with good saturation. The back-stepping reservoir which is deposited under Transgressive System Tract is characterized by packstone facies with fair amount of porosity impregnated within wackstone and mudstone. The sequences are thin, limited in areal extent and display low impedance within the thick high impedance layer. The seismic data was subjected to the state of the art technology of seismic inversion and variance of seismic amplitude were successfully used to decipher the spatial distribution of these back-stepping carbonate reservoir of Minagish and Ratawi Limestone. Based on the above analysis and subsequent success, the back-stepping reservoir of Minagish and Ratawi Limestone is now active exploration phase to exploit tight carbonate reservoir in Kuwait.