

The Ongoing Journey of Incorporating Reservoir Properties from Seismic at Agbami Field, OML 127 & 128, Deepwater Nigeria

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Agbami field was discovered in 1998 in ~4800 ft of water depth, offshore Nigeria. The anticlinal structure is comprised of 4 stacked turbidite reservoirs containing ~2.1 billion barrels in place of ~45 - 49 degree API oil with ~1000 scf /stb GOR. First oil was achieved on July 28, 2008. Agbami's development will recover ~1 billion barrels by crestal gas injection, peripheral water injection and mid-flank oil production. As of mid June 2010, the field has produced ~126 MMBO with ~112 BCF gas injected and ~39 MMBW injected.

Agbami has had imaging, noise and low resolution issues since the first dip-oriented 3D seismic survey shot in 1996. A new higher fold strike-oriented survey was acquired in 2004 to improve the quality of the data. In 2006, pre-stack depth migration using tilted transverse isotropy (TTI), was completed by ETC in Houston. Better imaging and frequency bandwidth was achieved, but the raw migration was not of sufficient quality to get reservoir properties from seismic. Post-migration data conditioning of the dataset was performed in-house in Lekki to better address noise and to preserve AVO response in 2008.

A fresh interpretation of faults and horizons was undertaken on the 15 Hz dominant frequency reconditioned seismic datasets. These datasets exhibit direct hydrocarbon indicators for the 14MY and 16MY reservoirs that correlate with the MDT interpreted oil water contacts. This interpretation provides the basis of Agbami's latest earth model, Model 5A. Several seismic attribute extractions were analyzed to determine which to use for sand population in the Model 5A. Ultimately, the Vsh prediction extractions, along with net-to-gross and facies proportion assumptions, were used to generate the soft data to guide MPS simulations for 5 of 8 sub-reservoirs used in the static design of experiments. Unfortunately, the reservoir properties from seismic for the other 3 sub-reservoirs were hampered by various problems including, too low frequency for a particular reservoir thickness to get a reliable response, lingering multiple energy, and interference from shallow reservoirs.

In spring 2010, a new seismic survey using 4C ocean bottom nodes technology was acquired to get higher frequency data and shear information to provide higher fidelity reservoir properties from seismic from all Agbami sub-reservoirs. This survey will also serve as the baseline for 4D seismic over Agbami.