New opportunities for mature oil and gas exploration and production

Olzhas Begimbetov
Director of Resource Base Development Department
KMG Engineering LLP

Assylzhan Dauletov
Deputy General Director for Exploration
KMG Engineering LLP
• Giant terrigenous field in Western Kazakhstan;
• Discovered in 1961;
• First development stage started in 1965;
• Initial recoverable reserves all together ≈4 Bbbl;
• More than 9000 wells;
• Main reserves are located in Mid-Lw. Jurassic intervals, deposited in fluvial-deltaic environment challenging development plan with high reservoir heterogeneity.
• New high quality and resolution 3D seismic data improved the understanding of reservoir heterogeneity thus upgrading more realistic geological model.

• Field development plan is going to be reconsidered thus improving its production efficiency and recoverable factor.

• Additional increase in reserves was obtained as well as new lithological traps were discovered.
SPECTRAL DECOMPOSITION
THIN LAYER VELOCITY MODEL

- Simple method to build relatively detailed thin layered velocity model.
- Application of Classification and Estimation module

Layered Grid (Time)
Velocity Well Data (VSP)
Seismic PSTM Data
Trend Modeling (Classification & Estimation)
Make Seismic cube (interpolate)

Vertical mean trend curve
Resampled seismic attribute
Weighted multivariable regression
Detailed thin layered velocity model was used in creating time logs for all wells that showed good correlation. Very useful and simple way to tie massive amount of wells. More than 9000 wells in this case. Some corrections may be applied – two/three iterations to reduce uncertainties.
PROPERTY MODELING USING LOGS AND SEISMIC DATA

- Trend Modeling for Vsh (Classification and Estimation) – AI as seismic trend with vertical mean trend from logs
- Vsh Property modeling – Trend Model used as co-kriging
- Porosity property modeling – Vsh property as co-kriging
- Saturation property modeling – estimated using J functions
- Cut-offs for NTG (separated complex intervals from standard)
- Depth conversion using thin layered model, local model corrections to well tops
HC RESERVES OF ONE PRODUCTION HORIZON

PREVIOUS
HC RESERVES OF ONE PRODUCTION HORIZON

NEW
HC RESERVES OF ONE PRODUCTION HORIZON

- Oil production
- Water production
- Water injection
ADDITIONAL LAYERS – COMMERCIAL HC FLOW AFTER FRACKING

Restudy of more than 9000 wells using Techlog

- High WC intervals (red) after long time production and water flooding;
- Perforation with fracking (black) of low reservoir quality intervals that previously weren’t included in reserves – showed very good HC flow.

+300 Mbbl recoverable reserves increase
ADDITIONAL RESERVES

Seismic neural net analysis
NUMEROUS LITHOLOGICAL TRAPS BELOW MAIN HORIZONS
• High resolution 3D seismic data with application of Schlumberger modern methodologies and algorithms in Petrel and Techlog allowed to restudy a massive dataset with more than 9000 wells in a relatively short period of time to better understand reservoir uncertainties and heterogeneities;
• This work resulted in reserves growth up to 300 Mbbl (end of 2021);
• Numerous additional prospects discovered;
• New reservoir development plan is under consideration based on the achieved geological studies;
• Such an old mature field still has a good potential for exploration and improved production.

ACKNOWLEDGMENT

• Would like to express special thanks to the whole geoscience team of JSC NC KazMunayGas, operator JSC OzenMunayGas and KMG Engineering technical team (head office and Aktau branch), who took direct participation in this work.