IOCL Identifies Improvement in Gas Recovery Using Dynamic Modeling in Mamuniyat Reservoir

Multiple disciplines and workflows were integrated using Petrel RE and ECLIPSE simulator to identify the optimal development scenario, Libya.

**CHALLENGE**
Evaluate the potential of hydraulic fracturing in a tight gas reservoir during the field development planning stage, using limited reservoir and hydraulic fracturing data.

**SOLUTION**
Use Petrel* Reservoir Engineering (RE) and ECLIPSE* industry-reference reservoir simulator to create a dynamic model and quantify the impact of hydraulic fracturing on well stimulation.

**RESULTS**
- Integrated data from multiple disciplines and workflows within the robust Petrel* E&P software platform.
- Improved net asset value through predicted natural gas recovery.
- Saved time required for data entry and manipulation.

"The advanced functionality of hydraulic fracturing modeling in Petrel RE and ECLIPSE simulator improved understanding and confidence in field development planning, which helped us to evaluate the potential of fracturing on tight gas reservoirs."

Santanu Samanta
Senior Manager
Indian Oil Corporation, Limited

Assess the potential of hydraulic fracturing

Indian Oil Corporation, Limited (IOCL) wanted to evaluate the potential of hydraulic fracturing the tight gas fields of the Mamuniyat reservoir and quantify the financial impact. Optimizing production from this low-permeability reservoir required preparing multiple field development plans involving both vertical and horizontal wells, with history-matching of drillstem test (DST) data to increase recovery. However, the limited amount of hydraulic fracturing data available made developing predictive scenarios particularly challenging. The high-degree of reservoir heterogeneity also contributed to the complexity of modeling.

Tight gas reservoirs make interpretation of reservoir data and flow behavior more complicated. This can lead to large uncertainties in reserves calculations, jeopardizing the sanctioning of the project. Once quantified, production of these tight reservoirs usually involves stimulation, which poses technical and economic challenges. Carefully laid field development plans and evaluation of several contingency scenarios is the first step in meeting a tight reservoir challenge. Accurate measurements minimize uncertainties, enabling the best possible reserves estimates and tailoring of the completion procedure.

IOCL optimized the location of new wells using predictive scenarios generated by Petrel RE and ECLIPSE simulator.
CASE STUDY: Petrel RE and ECLIPSE simulator improve tight gas recovery in Libya

Simulate and rank development scenarios—from geology to completions to production
Schlumberger recommended IOCL use Petrel RE and ECLIPSE simulator to create a dynamic reservoir model and quantify potential improvement in gas recovery including the impact of hydraulic fracture well stimulation. Petrel RE provides an extensive tool set to incorporate different analyses, from analytical production simulation to complex completion operating controls to case management for hundreds of uncertainty simulations.

Petrel RE also provides a seamless link to the ECLIPSE simulator, which translates the reservoir model to the physical and dynamic simulation world. Meanwhile, operational economics are evaluated and reevaluated to ensure that capital is well spent by linking the development decisions in the reservoir model to the implications this has on capital expenditure across various fiscal models.

Determined optimal field development strategy
Using the reservoir modeling and economic analysis tools of Petrel RE and ECLIPSE simulator, IOCL effectively ranked and selected the optimal development scenario, resulting in an increase in predicted natural gas recovery. This integrated solution effectively connected workflows and disciplines, enabling IOCL to efficiently

- achieve seamless integration between disciplines—from the geomodel to the reservoir model
- generate multisegment well and vertical flow performance tables
- incorporate DST and hydraulic fracturing data across multiple wells, dates, and strategies
- connect field measurements and geoscience models with upscaling, sector modeling, and local grid refinements
- manage multiple simulation runs across history-matching and predictions.