

## Risking Oil and Gas Quality and Producibility in Deepwater Reservoirs

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With increasing emphasis on exploration, development and production in deepwater, accurate and early prediction of hydrocarbon quality, value and producibility becomes evermore critical to economic success. High costs of deepwater drilling, testing and field development make accurate pre-drill prediction and post-drill evaluation of hydrocarbon quality essential for prospect ranking, well placement, development planning and facilities design.

Pre-drill prediction of hydrocarbon quality must consider source facies, maturity and reservoir alteration processes (e.g., biodegradation, phase-separation, gravity-segregation). Biodegradation is a key control on hydrocarbon quality in cool deepwater reservoirs due to increased activity of petroleum-degrading bacteria at temperatures less than 80°C. Biodegradation reduces quality and producibility of oil and gas resources (increases viscosity, acidity, sulfur, residua; reduces API gravity, recovery efficiency and gas wetness) and complicates production and refining (e.g., emulsions and salts require additional treatment, acids cause refinery corrosion). In some deepwater basins, reservoirs have experienced multiple episodes of charge and biodegradation, making it critical to evaluate both paleo- and present-day conditions.

Post-drill evaluation of hydrocarbon quality must also consider fluid variability due to gradients and testing procedures. Gradients caused by density, biodegradation or phase solubility can cause significant variations through a hydrocarbon column and relative positions of fluid tests should be considered when modeling resource quality. In addition, deepwater fluid tests are often small and/or contaminated by drilling or completion fluids, requiring correction of measured properties for various contaminants.

Viable oil and gas quality risking models must leverage non-optimal samples and integrate wide-ranging process variables to address bottom-line concerns across the Upstream and Downstream.

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