AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

Baffles or Barriers – Stretching the recovery envelope by introducing stochastic heterogeneity to the analysis of deep-marine Palaeocene submarine fans in the Jotun Field, offshore Norway

Guargena, Claudia G., Enterprise Oil Norge Ltd., Stavanger, Norway; Wardell, Jon, Enterprise Oil PLC, Aberdeen, UK; Smith, Guy B., Enterprise Oil, Houston, TX.; Nilsen, Tor H., Consulting Geologist, San Carlos, CA; and Hegre, Thor M., Shore-Tec Services AS, Stavanger, Norway

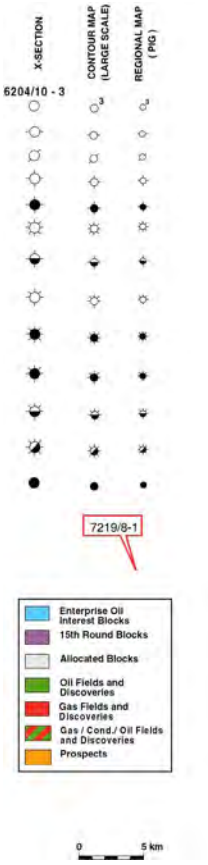
The Jotun Field, comprising both sand compaction 4-way-dip closures and stratigraphic pinchout traps, produces from the distal parts of the sand-rich submarine-fan system of the Palaeocene Heimdal Formation. Although a deterministic reservoir model of the Jotun Field adequately describes the in-place oil volumes, it does not represent the potential recoverable range, which is mostly dependent on the architecture of the shales present.

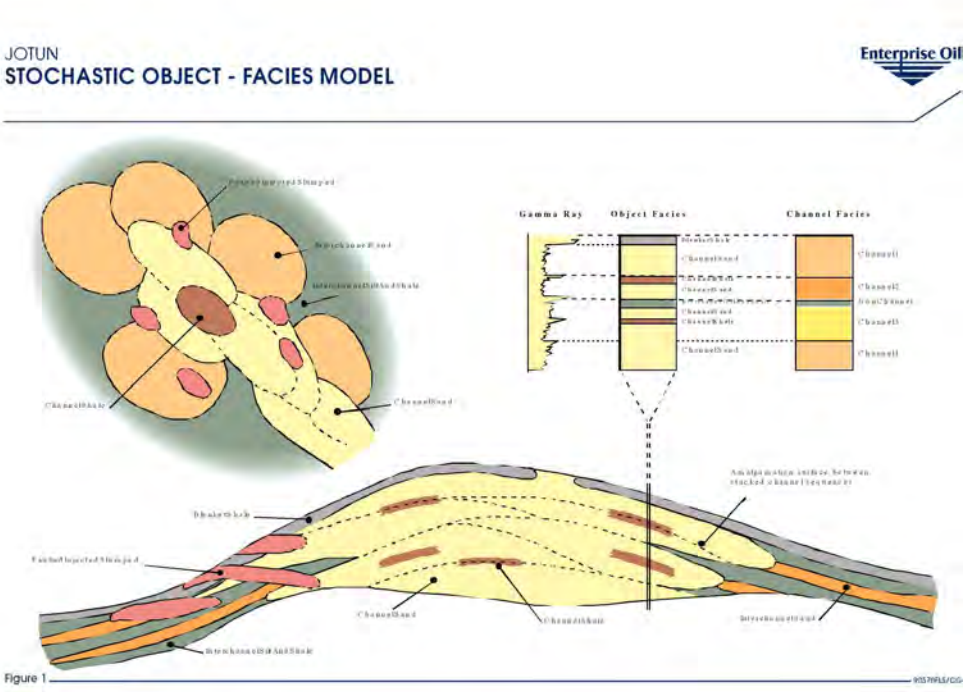
Reservoir heterogeneity was introduced by constructing a 3D object-based stochastic geological model within seismically derived zones. Depositional facies were distributed within each layer according to a geological model integrating seismically identified sand-rich fairways and core sedimentological facies within a sequence-stratigraphic framework. The model aims to represent sand lobes, mostly sandy debrites, with their genetically associated muddy facies, which infill basin-floor topography. Periodic mud blankets that punctuate sand deposition are later modified by sand injection and slumping (Figure 1). The model reflects both the seismic-scale depositional patterns and the core- scale heterogeneity.

Reservoir simulations, with a drainage strategy of horizontal wells at top reservoir, show that for sensitivities in sand body size, shale dimensions, spatial continuity of poroperm properties, and interlayer communication, the recovery factor can vary by as much as 10% while maintaining the total sand volume.

An uncertainty in the geological model is the pervasiveness of faulting, sand injection and slumping which disrupt shale continuity and greatly increase vertical communication. If such features are not common, significant volumes of oil will be trapped below laterally continuous shale barriers. This is illustrated by Figure 2 where the modelled facies realisation is overlain by the associated vertical communication parameter MULTZ. As modelled blanket shales are punctured by slumps and faults.

Drilling has confirmed the sand-distribution model in parts of the field and dynamic data acquisition should establish the presence of barriers.






X-SECTION
CONTOUR MAP (LARGE SCALE)
REGIONAL MAP (PIG)
6204/10 - 3
7219/8-1
0
5 km

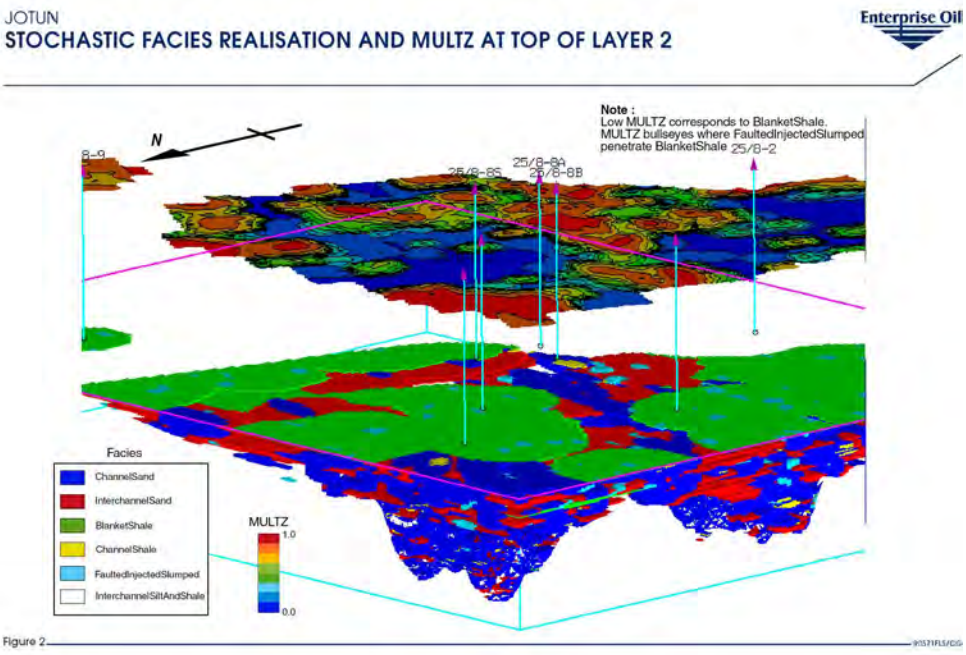

JOTUN
STOCHASTIC FACIES REALISATION AND MULTZ AT TOP OF LAYER 2
Enterprise Oil
Note :
Low MULTZ corresponds to BlanketShale.
MULTZ bullseyes where FaultedInjectedSlumped penetrate BlanketShale
N
8-9
25/8-8S
25/8-8A
25/8-8B
25/8-2
Facies
ChannelSand
InterchannelSand
BlanketShale
ChannelShale
FaultedInjectedSlumped
InterchannelSiltAndShale
MULTZ
1.0
0.0

Figure 2