CASE STUDY

Seismic Reservoir Characterization: Highly Detailed Subsurface Facies Model

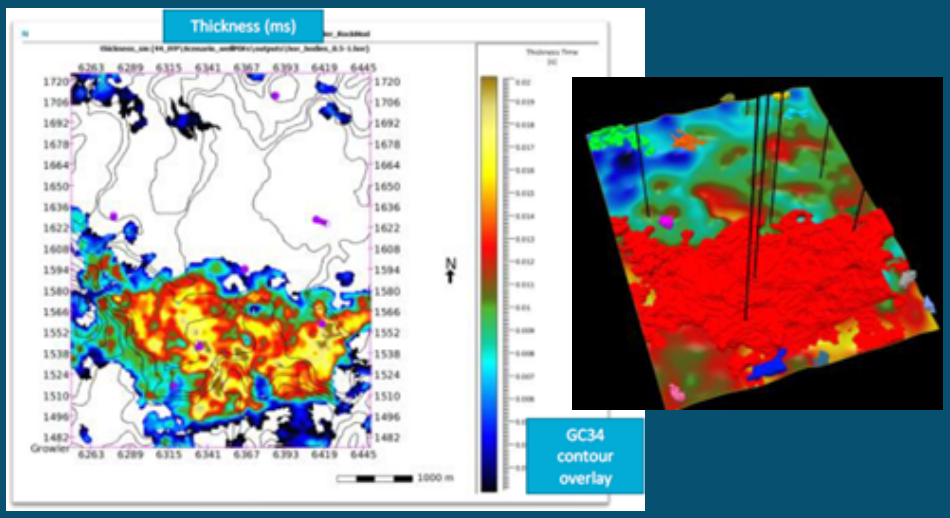
OVERVIEW

The Growler field, South Australia, is an onshore oil field of Jurassic age. The main producing area under the current study is a low relief four-way dip closed structure consisting of a channel reservoir of 15-20m thickness that has been mapped from the 3D seismic amplitudes and confirmed by drilled wells. The interpretation of seismic data has revealed relatively lower quality oil reservoir in the form of minor sandstone channels and crevasse-splay deposits.

CHALLENGES

- Substantial overlap in the reservoir facies in the elastic domain
- Inherent uncertainty associated with AVO response due to poor quality of land seismic data requiring optimal preconditioning of the seismic data.
- Occurrence of carbonaceous shale that gave rise to false AVO anomaly

Point bar sand delineation using geobody capturing of reservoir probability volume from seismic inversion with cutoff of 50%



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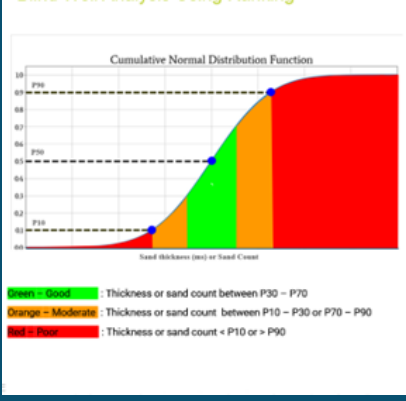
CASE STUDY

Blind well analysis using quantitative approach via ranking. Note that the blind wells sand thickness/count are well predicted within the P10 and P90 range.



Vertical Wells	Reservoir Sand Thickness (ms) at the well	Sand Thickness (ms) Calculated from Ranking Process		
		P10	P50	P90
Growler_1	10	7	11	14
Growler_3	12	8	10	13
Growler_4	11	5	8	11
Growler_5	10	4	8	13
Growler_6	11	8	11	14
Growler_7	12	9	12	15
Growler_8	13	8	10	14
Growler_9	10	6	9	13
Growler_11	11	6	10	12
Horizontal Wells	**No of ResFlag Sample at the well**	**No of Sand Sample from Ranking Process**		
		P10	P50	P90
Growler_15	21	8	13	18
Growler_16	51	14	35	53
Growler_17	40	32	37	44
Growler_18	34	26	35	44
Growler_NE2	51	34	50	66

Advanced Geostatistical Seismic Reservoir Characterization in the Growler Field, A. Mannini et al. 2022 – APGCE 2022, Kuala Lumpur, Malaysia

SOLUTION

An integrated workflow comprising an iterative seismic petrophysics and rock physics modeling, preconditioning of seismic data to calibrate the seismic AVO response with well data. Simultaneous inversion and Bayesian litho-facies are estimated to understand the intricacies of the aforesaid challenges before applying geostatistical inversion to derive highly detailed subsurface models. The high-risk areas of encountering carbonaceous shale have been mapped through the probability of its occurrence.

RESULTS

- Successfully integrated well and seismic data to extract highly detailed reservoir model. The results' accuracy have been assessed quantitatively by blind well analysis (14 wells).
- Sand encountered in most of the blind wells were found to lie between P10 to P90 giving rise to high level of confidence to use these results for future field optimization & development.

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CONTACT US

info@geosoftware.com
geosoftware.com/services