CASE HISTORY (2013):
Hydrocarbon Detection–Volcanic reservoirs, W.Junggar Basin, China

Introduction

- Primary reservoirs are Carboniferous volcanic rocks, charged from Permian lacustrine source rocks.
- 2012 3D seismic survey identified 5 traps, with a total coverage of 98.6 km^2. Two exploration wells (A6 and A10) gained commercial discoveries.
- Volcanic lithology changes quickly, the faults of block structures are complicated. The spatial distribution of oil and water is not clear and difficult to predict.

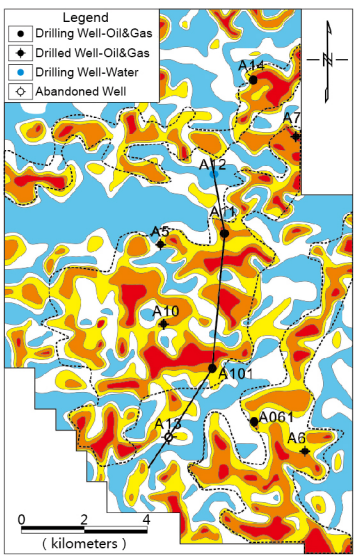
Survey Objectives

- Apply geomicrobial hydrocarbon detection method to identify hydrocarbon accumulation zones.
- Analyze hydrocarbon potential for drilling.
- Apply geochemical hydrocarbon detection method to analyze the reservoir fluid fill properties.

Survey Results

1 Geomicrobial hydrocarbon detection results accurately predicted the drilling results of 6 wells.

- Geomicrobial hydrocarbon detection results identified 3 hydrocarbon accumulation zones, which matched well with the drilling results of 4 known wells (A5, A6, A7 and A10).
- Accurately predicted the drilling results of 6 wells during survey (A101, A11, A12, A13, A14, A061). Well A12 ,proposed by NOC, was located on a volcanic 'buried hill', and seismic data and geological evaluation suggested it was a favorable target. However, Microbial Values (MV's) ,which became available only after spudding, were low and background and predicted the possibility of hydrocrbons to be low. Well A12 was waterbearing which matched with the geomicrobial hydrocarbon detection results.
- It was recommended to conduct MGCE on other selected prospects to analyze their hydrocarbon potential to avoid drilling more dry holes.

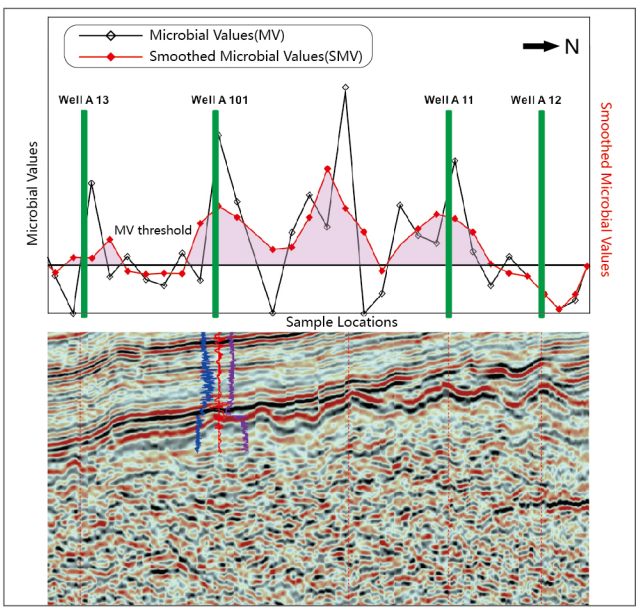


Blue color represents microbial background
White-yellow-orange-red represent low, medium, high to super high microbiological anomalies

▲ Microbial Anomaly Distribution Map and well locations

Well ID	Testing Result	The Degree of Agreement
A11	38.34t/d oil and 2.058×10^{4}m^3/d gas	High
A12	Water well	High
A13	Oil and gas show	High
A14	11.43t/d oil	High
A101	18.51t/d oil and 0.486×10^{4}m^3/d gas	High
A061	12.82t/d oil and 0.546×10^{4}m^3/d gas	High

▲ Oil test results



▲ Overlaying microbial anomaly line plot and N-S seismic section

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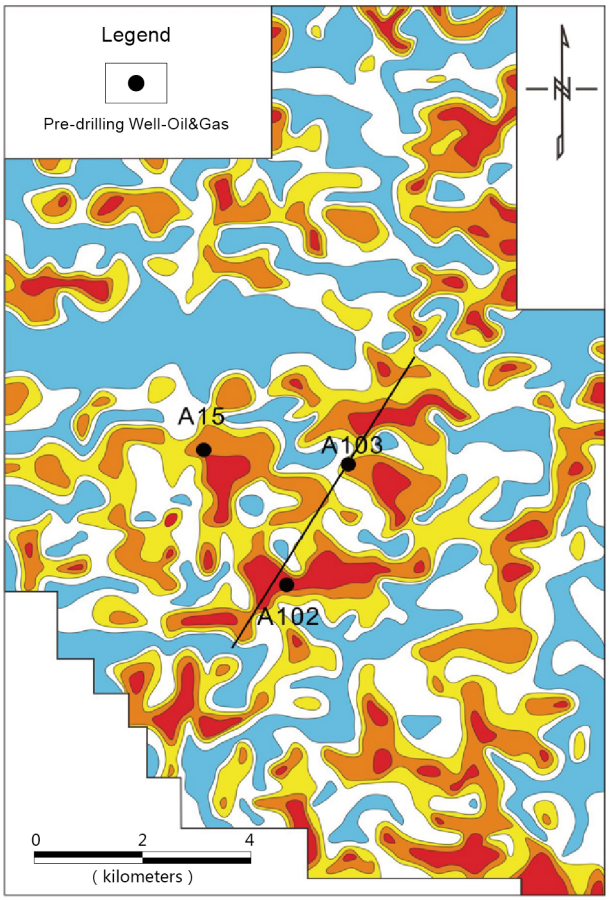
Survey Results

2 "4G" integrated research high-graded 3 favorable prospects resulting in commercial discoveries

- MGCE results were fully integrated with 3D seismic data analysis and geological evaluation for target optimization.
- On the basis of target optimization, 3 new well locations were proposed which all resulted in commercial discoveries.



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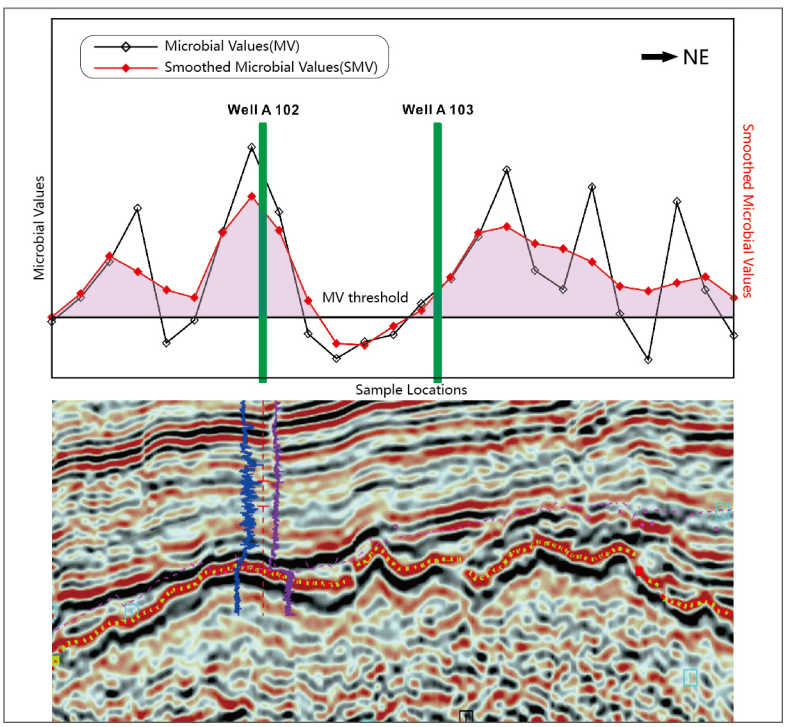
▲ Microbial Anomaly Distribution Map and wel locations

Well ID	Testing Result		The Degree of Agreement
A15	Oil well	1.97t/d oil and 0.930×10⁴m³/d gas	High
A102	Oil well	45.9t/d oil and 0.712×10⁴m³/d gas	High
A103	Oil well	46.3t/d oil and 0.755×10⁴m³/d gas	High

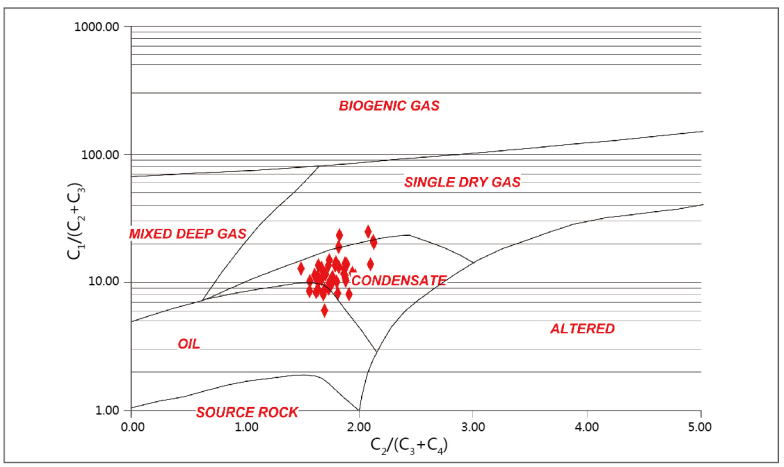
▲ Oil test results



▲ Overlaying microbial anomaly line plot and NE-SW seismic section (see map)

3 Geochemical hydrocarbon detection method accurately predicted reservoir fluid fill properties

- Geochemical hydrocarbon detection results indicated that the reservoir fluids in the study area are primarily of condensate with some oil. This understanding was later proved to be correct by drilling results.



▲ Hydrocarbon composite analysis and reservoir property evaluation plot