The Maule Field: An Economic Small Field Development

J. Pyle*, K. Koster, G. Barker and P. Rose
Introduction

- Eocene penetrations with logs, no sand
- Brimmond sands present

Map showing locations of Maule, Forties, Bravo, Alpha, Charlie, Delta, Brimmond, and Maule reservoirs with indications of sand occurrences.
Wet Sands Clearly Visible – NEAR STACK

Wet sands have a class I AVO character

Discovery Well (14m TVD net pay)

Forties Field

2005 Near Stack Data

Dike

Wet Sand

A

A'

+ve Amplitude
-ve Amplitude

+ve Amplitude
Offset/Angle

Wet Sand

Pay Sand

1

2p

2

Pay Sand
Pay Sands Have Class II AVO Response – FAR STACK

2005 Far Stack RAI Data

Discovery Well (14m TVD net pay)

Forties Field

Continuation of discordant bedding on far stack highlighting the oil leg of the Maule field above a notional OWC of -1970m TVDss

Possible OWC -1960m

A

A’

+ve Amplitude

-ve Amplitude

Dike

Offset/Angle

Wet Sand

Pay Sand

1

2

2p
Maule Discovery Overview

Very distinct ramp and flat geometry on near stack data indicating the presence of injectites at Maule

Possible OWC -1960m

Wet Sand

Pay Sand

+ve Amplitude

-ve Amplitude

Discovery Well (14m TVD net pay)
Diagnostic Signs for Eocene Sand Injection

Steeply dipping seismic character’s (in places penetrated by wells)

‘Jacked up’ structures above injected sand

Sand at base Oligocene - only penetration of this ‘age’ sand in the area. Well crosses a fault at this depth.

Steep dips from density image data
Pre-Drill Depth Map

- Anticipated STOIIP of c. 6MMBO mean case
- Recoverable reserves of 2.9MMBO
The structure to the south of Maule is very flat and therefore sensitive to depth uncertainty in the OWC. The southerly edge is defined by a low amplitude response on far stack RAI volumes. This is interpreted to be due to a lack of sand along this margin.
- 84m MD Net Pay
- Apparent low NTG in anticipated sand
- Dips overall consistent with seismic geometry, but with sharp entrance and exits from main sands
- Azimuthal Density tool dip geometries indicate we were intersecting the roof of an undulating sand – main sand body was beneath us – consistent with TVD’s in pilot
A55w Production Wellbore

- 114m net pay MD
- 2 discrete higher net intervals
- Dips overall consistent with seismic geometry, with repeat of sharp exits from main sands
- Distance to bed (DTB) validates A55x azimuthal density dips
Pre-Drill Concepts Confirmed; Finer Details Emerge

Rugose tops, high dips especially on entry and exit

Nearby injected lobe at a lower elevation (as seen in discovery) - creates sharp dip boundary at horizontal heel

Seismic Top Reservoir

OWC -1960m?

Oil Sand Indicator Seismic (Far Stack RAI)

A55 (Pilot) 10.1m TVD
2010 4D Snapshot Records Sweep Pattern

-ve  Amp  +ve

2000 Far-Far Stack Quadrature

Blue = soft Far stack soft pick 4D hardening pick

A55w

Well Curtain Section

2000 Increase in Sw

-ve +ve

Amp

Red = hardening (interpreted as water displacing oil)

Data is excellent quality with a low signal/noise and good 4D response

Seismic boat shot lines over Maule 4-6 weeks after production commenced

00-10 Full Stack Difference (4D Volume)

Far stack soft pick 4D hardening pick

Far stack soft pick

4D hardening pick

NW SE

80m
4D Signal Early in Field Life

2010 Far Stack Depth Map

2000-2010 4D Hardening

+ve Amplitude
-ve Amplitude
Maule Field Project Timeline & Production History

Initial production just 9 months after TD of the discovery well

- Current production steady at c.1000bopd
- 0.62MMBO Cumulative Production

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Summary

Economic development made possible by:

- Nearby facilities
- Small field allowance
- Flexible, low cost drilling operations
- Sense of urgency both at Apache and DECC (capitalising on 4D survey data for future development wells)

The future for Maule:

- 2nd producer location identified (aided by 4D data) & planned for Q4 2011
- Potential for further infill location(s) in thinner ‘wings’
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