Foz do Amazonas Basin: Latest Exploration Enhances Prospectivity

New 2D seismic data is unlocking the hydrocarbon potential of the deepwater part of this underexplored north Brazilian basin.

With a record $1.4 billion bid total, Brazil’s 11th licensing round was a significant event for the region’s oil industry. High priority for many oil companies was the Foz do Amazonas Basin, offshore northern Brazil. A year before the exciting events of the 11th round, Spectrum acquired over 21,000 km of 2D seismic, gravity and magnetics data in this area, providing a regional grid and a suite of seismic data to evaluate the exploration potential of the basin. This evaluation continues into 2015 with the addition of new seismic analysis and collaborations with these remote sensing tools. The integration of seismic data with other tools and methodologies has greatly enhanced the understanding of this frontier area.

Brazilian oil companies are betting big on the Foz do Amazonas Basin, where Spectrum has acquired extensive 2D seismic, gravity, and magnetics data, providing a regional grid and a suite of seismic data to evaluate the basin’s exploration potential. This evaluation continues into 2015 with the addition of new seismic analysis and collaborations with remote sensing tools. The integration of seismic data with other tools and methodologies has greatly enhanced the understanding of this frontier area.
New Play Concepts

Exciting Opportunities and hydrocarbon potential.

volumes of 14 Bbo and 40 Tcf gas, demonstrating huge

shelf. The ANP 11th Round presentation quoted in-place

wells have been drilled in the Amazon Cone. Past

pinned, not being fully

with several disappointing appraisal

deposits as in French Guiana. This

targets have been slope channel

Mercury and Jupiter discoveries.

shales which have produced the Venus,

biomarkers are thought to represent

of Sierra Leone and Liberia. The

Amazonas area has recorded marine

pay in two turbidite fans. The Foz do

323,000 km2, with water depths ranging from 50m to

margin basins, covers an area of

Brazilian equatorial margin basins, covers an area of

283,000 km2, with water depths ranging from 50m to

and magnetics, has identified several exciting opportunities

of exploration leads in the Foz do Amazonas and will be

explained in further detail at the EAGE conference in

May, 2015.

by the 1 APS 0045B AP well. Cretaceous to Early Paleocene

sandstones, with secondary Tertiary sandstones, as proven

and south-east of the Amazon Cone are Upper Cretaceous

the Amazon Cone the main reservoir targets are the Upper

Pliocene sands, which are estimated to have high porosity

and are the main targets for exploration. To the north of

the Amazon Cone the main reservoir targets on strike to the

Petroleum Potential

In the shallow water shallower area of Foz do Amazonas, proven source rocks of both Aptian and Cretaceous-Turonian (Cauquena Formation) have already been identified. In wells 1 APS 0045B AP and 1 APS 0049 AP Aptian-Cretaceous Formation facies associated with hydrocarbon exploration, the oil-water contacts are typically at depths between 4000-4500 ft in the sandstones and 3000-3800 ft in the shales. The hydrocarbon potential of the plays that will be discussed is huge, and will be further explored in coming years.

Geological Overview

The development of the Foz do Amazonas Basin began in the Triassic through the opening of the Equatorial Atlantic. In the Early Cretaceous, a second period of extension was followed by the Aptian- Albian sea floor spreading, which resulted in the formation of the South Central Atlantic. The area was divided into the Parana and Amapa plates, the Tertiary carbonate platform and the Amazon Cone (Mello et al., 2004).

The Foz do Amazonas Basin was expressed as orthogonal and oblique extensional tectonics during the first 450 million years and several graben systems developed, which were late fill with oil and gas source. The upper Aptian Albian shallow marine sandstones were then deposited first and then transgressed by transgressive marine shales and sandstones during the Cenozoic-Turonian. It is thought that this area has a maximum thickness of approximately 670 m. These shallow oil source sands are comprised of continental to marine shales and sandstones of the Cacipóre fan.

The Amazon drainage system, which developed during the Tortonian, had profound influence on the shelfal area into the deeper basin. In certain areas these shelfal sands have been drilled in well 1 APS 0045B AP, and contain Aptian to Albian source rocks of both Aptian and Cenomanian- Turonian age. The AAPL has indicated that these sands are prolific in the distal, Late Cretaceous seal over the majority of the basin. The main reservoir targets on strike to the north-west and south-east of the Amazon Cone are Upper Cretaceous sandstones, with secondary Tertiary sandstones. The Faz dos Amapá and Cauquena formations contain hydrocarbon potential which may be fore-deep faulted turbidite systems and fans.

Seismic interpretation has indicated a potential regional Late Cretaceous seal over the majority of the basin. The chance for stratigraphic traps is likely to be on or near the shelf. There is a significant Tertiary syn-rift system which may have affected the area. These syn-rift sediments are likely to be the major seal which may contain deeper water turbidites and fans.

In wells 1 APS 0018 AP and 1 APS 0049 AP Aptian Codo Horizon sands were drilled and these are the main targets for exploration. The Upper Cretaceous shallow marine sandstones are located to the north of the basin and contain marine sands which had been sourced from the Amazon drainage system to the north of the basin and were filled with syn-rift sediments. The Cenomanian-Turonian carbonate platform and the Tertiary carbonate platform and the Amazon Cone (Mello et al., 2004).

Seismic interpretation of Foz do Amazonas shows a steep slope edge with an sand system, which may have periodically failed, restoring to marine transport and turbidity along the slope escarpments. These deep flows may be recognised on the seismic, particularly in the Tertiary and Cretaceous sections, as high acoustic impedance shadowed fans. Further features indicated are incised deepwater channels and canyons which sourced from the shelf area into the deeper basin. In certain areas these canyons are up to 100m deep. A number of lowstands are recognised in the Cenomanian-Turonian and Campanian to Maastrichtian, when sands may have been transported via the slope channel systems into the deeper water areas of the basin. The basin floor fans have the capacity to contain significant hydrocarbon volumes.

Leads De-Risked

To complement Spectrums seismic data, EMGS conducted a 4,400 km2 of 3D Controlled Source Electromagnetic (CSEM) survey with the primary aim of identifying the structural and stratigraphic trends that may be related to the source of the positive anomalies in the distal using seismic attributes. Seismic facies distribution, stacking, and reservoir quality. The results of the re-microsedimentology work provides an important exploration tool and the de-risking of exploration leads in the Foz do Amazonas and will be explained in further detail at the EAGE conference in Madrid, 2015.

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