Conquering a New Frontier

The area offshore Brazil has been an exciting new frontier for exploration and development during the past few years. To date, Petrobras has discovered eight deepwater fields in the area called the presalt cluster of the Santos basin. In the Tupi discovery, an extended well test will be performed in March 2009, and a commercial pilot project will begin at the end of 2010. This activity is part of a company goal to achieve a significant production rate in the presalt cluster, to be added to the current domestic oil-production target of 2.8 million bbl/d [450,000 m³/d] by 2015. We believe this to be a significant increase over the currently forecasted capital expenditure of US $112 billion for the next five years, and we foresee a positive impact on future proven reserves.

Following our corporate vision led us to look beyond the well-known reserves that were above the salt in this offshore region. Our exploration in the Santos basin took us into waters deeper than 2,100 m [6,900 ft], targeting carbonates that are beneath 2,000 m [6,600 ft] of salt (for related concerns in the Gulf of Mexico, see “Meeting the Subsalt Challenge,” page 32).

The successes to date in this presalt province have resulted from application of existing technologies by Petrobras, its partners and suppliers. In particular, we relied on proprietary seismic interpretation software and high-definition nuclear magnetic resonance (NMR) tools. In these exploratory wells, the NMR tools provided vital identification of portions of the reservoir rock with sufficient porosity to indicate good production potential. However, we must address specific challenges to guarantee optimum production from these presalt carbonate formations.

Better characterization and imaging of the formation are necessary to map reservoir continuity and recognize its heterogeneity. Facies from seismic interpretation, internal pore distribution and connectivity are all keys to ensure the best well geometry to increase production, improve field drainage and minimize the number of floating platforms. In addition, we need to address technological gaps for achieving well deviation in the salt, for optimizing hydraulic or acid fracturing of horizontal carbonate wells and for understanding the wettability of the carbonates so we can inject water or gas, or both, effectively.

With long pipelines and low reservoir temperature, wax and hydrate tend to precipitate, creating flow-assurance problems that must be addressed. Further, the production environment is conducive to scaling of carbonates and sulfates. The company envisions an increased need for workovers that may lead to the use of light intervention vessels, and even of dry completion facilities that bring a positive collateral effect by reducing demand for floating drilling rigs.

The carbon dioxide [CO₂] produced from these formations ranges from 8% to more than 30%, and Petrobras and its partners will not vent it. Hence, we have a plan for green separation and reinjection of the gas in saline aquifers or for enhanced oil recovery. The CO₂ also presents a corrosion challenge to equipment and tools, particularly those that will reside for long periods in the wells.

Because the Tupi cluster is about 300 km [186 mi] from shore, the logistics for mobilization of personnel and equipment will require innovative planning that might include offshore bases for tasks such as maintenance and helicopter fueling. Petrobras is also looking at nontraditional uses of natural gas produced offshore. Feasibility of floating liquefied-natural-gas facilities is under study, as is consideration of using the gas at an offshore hub to produce electrical power for a series of production platforms.

The outstanding experience acquired from Campos basin production development through the partnership between Petrobras and traditional service and equipment suppliers will again be crucial for successful development of the Santos basin presalt cluster—technical cooperation agreements are under discussion to accelerate the necessary technological achievements.

These challenges may appear to be daunting, but the Tupi field pilot project predictions show a significant economic return for Petrobras and its partners, even when based on application of traditional technologies. However, Petrobras has always considered introduction of new technology to be a key business driver. The company will continue to develop and apply technologies, in cooperation with research institutions, universities, service companies and partners, to ensure that the presalt riches can be extracted safely and economically, even with fluctuating hydrocarbon prices.

José Formigli
E&P Pre-salt Executive Manager
Petrobras

José Formigli was recently appointed to a newly created Executive Manager post in Petrobras domestic E&P, called E&P-PRESAL. This position is specifically dedicated to evaluation and production development of presalt discoveries, encompassing the cluster of recent strikes in Santos basin, offshore Brazil. Since joining Petrobras in 1983, he has worked in several activities related to well completion and subsea engineering, starting as an offshore company man and later managing those activities. José was production manager of Campos basin, Marlim field asset manager, E&P services executive manager and E&P production-engineering executive manager. He received degrees in civil and petroleum engineering from the Instituto Militar de Engenharia and Petrobras University, respectively, and an MBA degree in advanced business management from the COPPEAD Graduate School of Business of the Universidade Federal do Rio de Janeiro.