Brazil's deepwater: A financial as well as a technical challenge

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When Petrobras first broke through the two-kilometre salt layer under Brazil's Santos basin in 2006, few in the industry guessed the enormity of the find. The wildcat well, called Paraty, was almost stratigraphic in nature, designed to find the easiest passage through the salt rather than looking for the juiciest structures.

For years, a handful of Petrobras geologists had worked on somewhat unorthodox theories suggesting the presence of a potentially huge hydrocarbon system beneath salt deposits left behind when the South American and African continents began drifting apart more than 100m years ago. Their theories trickled down the ranks, generating rumours about a "new Campos basin" at deeper horizons, but not even Petrobras saw the pre-salt as the primary target on these ultra deepwater Santos basin blocks acquired in Brazil's early bid rounds.

What Petrobras found in 2006 was an unfamiliar microbialite carbonate reservoir of light oil and gas, with carbon dioxide and sulphur dioxide showing up in unwelcome quantities. The three partners on the Paraty well – Brazil's Petrobras, Britain's BG Group, and Portuguese Gulbenkian Foundation offshoot Partex Oil & Gas – were cautious about the potential of their find. They had endured a difficult 672-day drilling operation, with another 200 days for open-hole and cased-hole tests and the Paraty well cost over US$200m.

The immense logistical and technological challenges for drilling or producing in the pre-salt environment were immediately clear. The targeted structures were located in water depths of around 2,220 metres, about 300 kilometres off the Brazilian coast and deep-buried beneath the salt layer. The Paraty well was drilled to 7,628 metres below the seabed. The most daunting challenge was posed by the reservoir itself. "There was a fundamental question mark about whether we could produce from this carbonate microbialite reservoir. It departed from all of our previous experience, which was mainly with sandstones," recalls Ricardo Beltrão, general manager for production with the research and development arm of Petrobras.

Armed with information from the Paraty well, Petrobras went on to make some of the biggest discoveries for decades, including giants such as Lula, Guara and Franco. Estimates now point to at least 50bn barrels of recoverable oil and gas in the Santos basin pre-salt province. A strategy aimed at gathering information from these fields has put those early conceptual fears to rest. Extended well tests in the Santos and Campos basin showed that the pre-salt reservoirs can produce at prolific rates using systems that have been tried and tested in the Campos basin, including subsea completion and flexible risers and drilling optimisation. "An initial period of research under our Prosal programme and results out in the field showed that we were being cautious. The pre-salt fields are much more productive than we had imagined," Beltrão reflects.

This is just the beginning of the pre-salt challenge, however, as there is immense scope for applying new technology and concepts to reduce costs and increase safety. Petrobras CEO José Sergio Gabrielli says improvements in drilling efficiency have helped push the break-even point down to an international crude price of US$35-US$40, compared with US$40-US$45 previously. Drilling through the salt is no longer the daunting challenge it was, and drill-string optimisation is starting to ease the difficulties of drilling into the hard carbonate rock. Petrobras expects to drill 1,000 pre-salt wells by 2020, when it will have 65 deepwater rigs at work, and activity is not likely to diminish before 2030.

The very scale of the pre-salt operation offers the chance for efficiency gains. Petrobras is working out how to use a mix of higher-end rigs, tophole rigs and specially-equipped intervention vessels to reduce drilling costs on each well, for instance. The company's 'Proinv' drilling efficiency programme has already trimmed the costs of pre-salt wells to an average US$120m, down from US$180m two years ago, says Petrobras general manager for well engineering Luiz Felipe Bezerra. The company believes this sum can be trimmed back to US$80m. Such claims are impressive, but the pre-salt partners are still in the early stages of surmounting the difficulties.

These challenges can be divided into three main categories: the technological, the financial and the physical, which includes limitations on logistical or industrial capacity in Brazil. Extended well tests and pilot production system may have overcome the most fundamental technological challenge of getting these reservoirs to produce, but there is still tremendous scope for reducing production costs through the development and application of new technologies.

Ground-breaking projects are already taking shape, such as the tethered subsea buoys that will decouple risers from the huge loads to which they are subjected at these water depths, or the offshore gas-to-liquids project that promises to eliminate flaring on extended well tests. Petrobras is spending about US$1bn per year on research and development, and other operators are beginning to follow suit by virtue of a provision that earmarks one per cent of their royalties for this objective.

In the medium term Petrobras is aiming for a new era of highly-automated production and compact processing modules that allow production units to be "re-configured" during the life span of the fields. The company is also pursuing ground-breaking subsea processing projects, looking for ways of reducing the manning levels on offshore platforms and maximising output on the limited space available on production platforms. Subsea separation and compression technologies could eventually extend to the carbon dioxide that accounts for about 11 per cent of the gas in the pre-salt fields.

The financial challenge

The second great challenge Brazil faces in putting the pre-salt fields into production is a financial one.The pressures on Petrobras were in evidence in 2010 when the company carried out a US$70 bn re-financing operation on global stock markets. Only about US$43 bn of this sum was cash. The rest was payment-in-kind when the Brazilian government transferred production rights for up to 5 bn barrels of pre-salt oil on unlicensed acreage.

This oil-for-shares mechanism left minority shareholders wary of another refinancing operation and fed perceptions that government objectives, such as increasing the federal stake to its current level of around 48 per cent of total capital, might be diverting Petrobras from its production targets. It also increased the capital expenditure commitments on Petrobras, imposing a tight production schedule and rigid local content requirements. The re-financing operation triggered a negative adjustment that has practically wiped out the increase in market capital for the time being. Petrobras has since overcome a budgetary impasse to approve a US$225bn five-year capital expenditure plan that slightly boosts upstream spending but included a market-pleasing US$14bn divestiture plan.

Petrobras CEO Jose Sergio Gabrielli insists that the stock price will bounce back over the long-term. Many analysts agree with him, enthralled by uncommonly attractive long-term fundamentals, especially burgeoning reserves and proven record as a top-notch deepwater operator. Gabrielli points out that debt requirements, estimated at between US$67bn and US$90bn through 2015, are easily fundable. This is based on oil price scenarios of US$95 to US$80 per barrel. Shorter term concerns are being eased by an exploration project called Varredura detecting more than 2bn barrels of pre-salt oil beneath existing Campos basin production infrastructure. These discoveries require investments to extend the life of older platforms. Combined with updated topside and subsea processing facilities they imply faster and more economic routes to higher production than the greenfield Santos basin discoveries.

More pressing financing concerns relate to a supply chain where the great majority of companies are small privately run outfits. "Petrobras currently has 5,500 registered suppliers, 60 per cent of which have a turnover of less than US$5m. This is not the ideal foundation for a US$224bn capex plan," says John Michael Streithorst, head of private equity at Banco Modal. A study carried out by Brazilian national oil industries association (ONIP) and Booz & Co, concluded that the domestic supply chain will receive investments of US$400bn through 2020. This raises deeper concerns about possible bottlenecking or overheating.

This pressure has become more intense as Petrobras is asked to move swiftly to high levels of local content on a huge domestic rig-building programme. Hydrocarbons regulator ANP is beginning to enforce local content rules under oil and gas concessions more vigorously, affecting Petrobras but also the estimated US$33bn that international oil companies will invest in the Brazilian oil sector over the next five years. Brazilian authorities are working hard to meet the challenges. Flexible and cheaper new lines of credit are being made available to suppliers through the National Development Bank (BNDES) and an innovative online financing mechanism offered by five leading banks. A host of new private equity funds have been springing up in Brazil to help fill the gap. Brazil is already seeing a big expansion in supply chain investments, including new shipyards such as Estaleiro Atlantico Sul and Estaleiro Rio Grande.

Teething problems are not hard to detect, with delays affecting the construction of these yards and, as a consequence, the first wave of contracts. A chorus of complaints can be heard industry wide about skills shortages and predatory hiring of technically-qualified professionals. Brazilian officials and optimistic industrialists insist that a combination of Petrobras's contracting zeal, heavy investments in automated production and government coordinated training programmes will ensure that Brazil will build up toward the kind of productivity that will underpin long term survival. The extremely negative reaction to the Petrobras re-financing seems to have run its course and investors are harking back to the fundamentals that drew them so strongly to Petrobras three years ago. ■