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## **Revised Big Bore Well Design Recovers Original Bayu-Undan Production Targets**

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### **Abstract**

The Bayu-Undan gas recycling project is located north of Australia, in the East Timor Sea and is designed to produce 1,100 MMscf/D of wet gas, strip out 110,000 B/D of condensate/LPG, initially reinject 950 MMscf/D of lean gas, and later export up to 700 MMscf/D of lean gas to a LNG plant in Darwin. The initial development called for 16 North Sea-style, 7 in. monobore wells (11 producers and 5 gas injectors).

By May of 2003, it became apparent that the original well design would not achieve the 1.1 Bcf/D production target because of well construction problems. Three wells on the remotely located wellhead platform were abandoned because of wellbore instability. Without the production contribution from these wells, the first year's production target would not be met. To meet the production targets, a complete well redesign was undertaken. First, the tubing was upsized from 7 in. to 9-5/8 in. Then semi-openhole completions with pre-drilled liners and openhole packers were selected instead of the conventional cased and perforated design to reduce installation time. Finally, oil based drill-in fluid was selected to provide lubricity, temperature stability, and low liftoff pressure of the filter cake for rapid cleanup.

Utilizing the Big Bore design, the production capacity of +1.1 Bcf/D and injection capacity of 1.1 Bcf/D was achieved in June of 2004, ahead of schedule. The well count was also reduced from 16 to 12 wells (8 producers and 4 gas injectors.) Two producers had capacities in excess of 300 MMscf/D, and three gas injectors had injection capacities in excess of 350 MMscf/D. The increased production resulted in 19 MMstb of condensate/LPGs produced in the first year, some 7-8 MMstb more than would otherwise have been the case.

### **Introduction**

The Bayu-Undan Field is a retrograde gas-condensate field with a raw Gas-Initially-In-Place (GIIP) of 8-9 Tcf including 700 MMstb propane plus (C3+). The field is located in the Timor Sea and straddles the Joint Petroleum Development Area, JPDA. The Production Sharing Contracts, PSCs, 03-12 and 03-13 in the Timor Gap area are administered jointly by the countries of East Timor and Australia as seen in Figure 1. The Bayu-Undan gas recycling project was originally planned to be developed from two platforms, with eight - 7 in. monobore wells and eight - 7-5/8 in. monobore wells, consisting of 11 producers and five gas injectors. The planned well depths ranged from 4000 m (11,972 ft) to 6341 m (20,798 ft). This design would require well rates up to 220 MMscf/D, to meet the design premise of producing 1100 MMscf/D while re-injecting 950 MMscf/D of lean gas by July 2004. By 2006, when the LNG plant and pipeline were available, 475 MMscf/D would be transported to the LNG plant in Darwin and the remaining 475 MMscf/D of lean gas reinjected into the formation.<sup>1</sup>

The Bayu-Undan formation structure is a broad east-west trending horst with a number of culminations set up by internal east-west and north-south trending faults as seen in Figure 2. The predominant hydrocarbon-bearing section of the Bayu-Undan Field occurs in the upper part of the Early to Middle Jurassic Plover Formation and throughout the Later Jurassic Elang Formation. In addition, a thin interval belonging to the Frigate and the Flamingo Formations forms a minor part of the pay zone, along the margins of the field. One distinct feature is a common gas-water-contact (GWC) interpreted across the field at 3109 mSS TVD (10,198 ft). Figure 3 presents a generalized stratigraphic column and reservoir characterization for Bayu-Undan.