



OTC 20087

SS Early Testing—Jabuti Extended Well Test

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This paper was prepared for presentation at the 2009 Offshore Technology Conference held in Houston, Texas, USA, 4–7 May 2009.

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Abstract

Planning the development of a new reservoir play in a deepwater environment is always a challenge. In 2005, Petrobras discovered a deeper fractured carbonate reservoir in Marlim Leste Field, Campos Basin. This play has never been put on stream in Brazilian deep waters. Two development alternatives were considered: to tie back a small number of the carbonate reservoir wells to the P-53 Production Unit, which was built to produce a shallower Oligocene reservoir, or to consider a dedicated FPSO to exploit this carbonate reservoir, allowing the use of a larger number of wells.

Three different intervals were tested in the first appraisal well. Due to the expected heterogeneity of such kind of reservoir, the data was not enough. Several geologic scenarios were created, based on static and DST data. The next step was to perform a Value of Information study to justify an extended well test (EWT). Meanwhile, the second appraisal well was drilled and cored. In the beginning of 2008, a 4-month EWT was performed with a dynamic positioning FPSO in order to monitor the reservoir behavior before the final investment decision and prior to the drilling of the development wells. The EWT results were essential to define the most probable geologic scenario, to support the decision of using a 100 mbpd capacity dedicated FPSO for the production of the structure and to optimize the development plan.

Introduction

The deepwater naturally fractured carbonate accumulation named Jabuti was discovered by the Well A in 2005 (Figure 1). The development of such a reservoir presents a great challenge in any place in the world. In a deepwater environment, the technical and logistic restrictions involved make it even more complex and costly. The two following appraisal wells, Well B and Well C, were located in structural and stratigraphic positions considered to be good for acquiring exploratory information as well as for later use for production. The reservoir thickness varies from 250 m to 400 m along the structure and the average depth of the top is about 4100 m. It is saturated by a 28 API oil and the oil-water contact is located at 4500 m. The water depth ranges between 1000 m and 1500 m.

Although three tests were performed and a reasonable amount of logs and rock data were acquired, great uncertainties about the performance of the reservoir remained. Aiming to anticipate oil production, it was verified that more dynamic data would be necessary. Performing an EWT was considered to be a good alternative for reducing risks of the Jabuti reservoir.

Petrobras EWT History

The company has a track record of using EWTs in offshore fields, aiming technology development and information acquisition to reduce geologic and technical risks. The company has been using different ways to implement and operate an EWT, depending on the main uncertainties as well as the logistic close to the accumulation being tested. When the key information is related to the subsea fluid flow or when there is a nearby production facility with spare production capacity, the EWT can consist of the tie-back of a subsea well to that facility – e.g. Marlim Sul⁽¹⁾, Albacora Leste and Marlim Leste (Module I) fields. When the knowledge of the main reservoir parameters is the key driver for the EWT, it can be carried through the positioning of a dynamic positioning (DP) FPSO right above the well of interest, e.g. Roncador⁽²⁾, Jubarte⁽³⁾ and Golfinho⁽⁴⁾ fields. In this case, the test is generally shorter because there is a great demand for this kind of facility. Recently the company started using the Value of the Information (VoI) methodology⁽⁵⁾ as one of the main elements for ranking where to perform an EWT. In this case, the increase in the expected net present value (NPV) provided by the new data is compared to the cost of the EWT. In the present case, the VoI was positive and, as the greatest objective was to collect reservoir data, a DP-FPSO was used.