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FEASIBILITY OF OPTIMIZING RECOVERY AND RESERVES FROM A MATURE AND GEOLOGICAL COMPLEX MULTIPLE TURBIDITE OFFSHORE CALIFORNIA RESERVOIR THROUGH THE DRILLING AND COMPLETION OF A TRILATERAL HORIZONTAL WELL

Quarterly Technical Progress Report
April 1, 1998-June 30, 1998

By
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Pacific Operators Offshore, Inc.
Santa Barbara, California

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Feasibility of Optimizing Recovery and Reserves from a Mature and Geological Complex Multiple Turbidite Offshore California Reservoir Through the Drilling and Completion of a Trilateral Horizontal Well

By
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Objectives

The main objective of this project is to devise an effective redevelopment strategy to combat producibility problems related to the Repetto turbidite sequences of the Carpinteria Field. The lack of adequate reservoir characterization, high-water cut production, and scaling problems have in the past contributed to the field's low productivity.

To improve productivity and enhance recoverable reserves, the following specific goals are proposed:

- Develop an integrated database of all existing data from work done by the former ownership group.
- Expand reservoir drainage and reduce sand problems through horizontal well drilling and completion.
- Operate and validate reservoirs' conceptual model by incorporating new data from the proposed trilateral well.
- Transfer methodologies employed in geologic modeling and drilling multilateral wells to other operators with similar reservoirs.

Summary of Technical Progress

This progress report represents the second report in Budget Period II, which is the actual field development work in the subject Class III project. The second quarter was primarily dedicated to the actual deployment of the drilling rig and ancillary equipment and the initiation of actual sidetracking operations to drill the 4 horizontal and 2 vertical redrills in the Carpinteria field.

Introduction

During Budget Period I a reservoir study incorporating the latest reservoir description technology was completed. The aim of this study was to provide a basis to redevelop the field using modern drilling and completion technology. The initial focus was the application of a trilateral horizontal well

to increase economic recovery from the field. A workover program was initiated in December 1996 (which was not a part of the Class III project) to evaluate the model's initial conclusions and provide data for the continuing study, in addition to improving production rates.

The reservoir study was refined to the point that drilling locations were been chosen and actual field redevelopment could begin. The trilateral concept was discarded due to the geologic complexity and active water encroachment in the field, complicating the ability to isolate productive sands from excessive water. An alternative approach utilizing the multiple shut-in producers for redrilling single horizontal lateral wells was chosen instead. The main driver for this decision was the ability to exploit more drilling locations for the cost of a single grass roots well. Six locations were chosen: two vertical wells to determine current saturations and states of depletion in multiple sands within two fault blocks; followed by four horizontal redrills to exploit the opportunities identified in the vertical wells. The vertical wells will also be completed as producers, with favorable structural position and minimal incremental costs of completion. This report summarizes the activities that occurred in the 2nd quarter of 1998 which primarily consisted of actual field development work. During this reporting period, the first vertical well, A48WB02 was drilled.

Pre-spud Meeting

A project kick off meeting was held on April 17, 1998 with all the Vendors of the drilling program. A total of 40 attended the meeting. During that meeting, we discussed general drilling plans for the 6 well program, safety and environmental issues, communication issues, an overview of the well plans, etc. This meeting provided a chance for all the vendors and Pacific Operators to familiarize themselves with the entire drilling team.

Drilling Activity

From March 25, 1998 through April 18, 1998, the completions of the six redrill candidates were abandoned with the existing platform well servicing rig.

On April 19, the drilling rig was delivered to the pier at Port Hueneme and loaded for transport to Platform Hogan. The rig and ancillary equipment was moved to the platform in multiple boat trips. On April 22, a contract drilling crew was mobilized to the platform to assist with the rig up of the drilling equipment. The derrick on the existing platform rig was lowered and the rig was disassembled and transported in multiple loads to the onshore facility.

The drilling rig and subbase were assembled on the platform rig skid. The mud tanks and conditioning equipment were assembled on the platform. The galley was unloaded and made operational. The drawworks were installed on the rig. The drilling string was unloaded on the platform.

The new derrick was raised to half-mast, and guy lines were hung from the derrick. The derrick man board was installed and the new catline was installed. Production equipment (hydraulic tong system, production table, spider and automated slips, etc) were installed. Drilling line was strung and the blocks were hung. The derrick was raised to full height, and the accumulator was hung on the rig skid. The mud pump package and mud cleaning equipment was installed. Welding continued on the

rig assembly.

On May 6 - 9, the new rig was broken in on several production jobs (A-26, A-18 and A-23). The final rig mobilization was completed which included installation of the BOP system and the milling operations drill string was picked up to spud A-14 on May 19.

Section milling was completed on Wells A-14, A-43, A-22, A-48 and A-49.

Drilling operations during June, 1998 consisted of cutting the window on A-49 (90 hrs), attempting a window on A-44 (26 hrs) and redrilling A-48 (583.5 hrs). Well A-48 required two sidetracks. The first sidetrack was unsuccessful due to a lost drilling assembly in the hole. The first sidetrack was started on 6/6/98 and drilled to a total depth of 3754'. When the bit was pulled, the cones were missing on the bit and the decision was made to place a cement plug on top of the junk in the hole and kick off and continue drilling operations. After setting the plug and running back in the hole to kick off the plug the bottom hole assembly became stuck in the hole. The top of the fish was at 3272'. An attempt was made to recover the fish which consisted of a downhole mud motor, 2 monel collars and 5 drill collars. Fishing operations were initiated with wash pipe on 6/18/98. The washpipe became stuck at 2891'. A back off was performed and the well was cemented back to 2536'. A second sidetrack (A48WB02) was started on 6/23/98. By 6/30/98, the well had reached the total depth of 4153' and under-reaming operations were under way. The well was completed and put on production in early July, 1998.

Geological Activity

Forward Modeling for Horizontal Wells

The horizontal wells will be drilled incorporating both measurement while drilling (MWD) and logging while drilling (LWD) technology. The LWD vendor, Anadrill, will be providing a forward model of the horizontal section of the well. The forward modeling preliminary meetings included a meeting with the sales staff, the managers/modeling expert, and the on-site Geo-Steering coordinator from Houston. They were provided with ASCII files of digital data of well logs on all the wells in close proximity to the preliminary proposal for horizontal holes. Additional digital data from the pilot holes will be used along with a proposed well path to create an anticipated image of the resistivity values to be expected from the MWD tools. The MWD tool to be used is the Anadrill ARC-5 tool which provides a Gamma Ray and one Resistivity log in real time, but records multiple resistivity curves which will be available any time the tool is retrieved from the well bore.

Well Site Work

On well A-48, since a "Mud Logger" was not being used, a collection of cuttings returns or samples was collected and described. Its primary use has been in comparing cuttings description with Electrical logs in order to better understand reservoir conditions and capabilities on completion.

Summary of Log Evaluation for Well A-48WB02

The "E" sands in this well appear to have been somewhat depleted by the production from the original hole. None of the water saturations with the exception of the "E-1" at 2715 ft., and a thin layer at 2740 ft. are sufficiently low to allow to allow water free oil production, particularly since the oil is

of low gravity and high viscosity. Further the "E" sands have a high percentage of very fine to silt sized sand which tends to move with water. This in essence precludes any manageable production.

The "F-1" sand, which is the major productive interval in the field appears to be flooded or depleted in much of the best and most permeable portion of the sand. The sand actually consists of multiple layers which act independently, and hence deplete at different rates. This group of sands were not included in the completion for this well since they would probably have produced mostly water. There are five layers with less than 60% water saturation that total less than 50 ft. Selectively perforated these five layers could probably produce oil with a high water cut until the saturation exceeds 70% or so. Coning, or capillary pressure effects would create an increasing water cut on the well with time.

For future re-completions, three perforation intervals may be added in the F-1 sand. These intervals have a slightly higher shale or clay content, and therefore have not been flushed or depleted as much as the high permeability center layers.

The "F-2" sand from 3261 to 3288 ft. still has some recoverable oil. Perforations here could add some high water cut production. It would probably be wise to eliminate the bottom 10 ft. of the interval to avoid coning from just below the oil/water contact at 3288 ft.

The "F-3" sand was considered to be capable of clean production and therefore was perforated to demonstrate the viability of these layers as support for a horizontal or near horizontal well.

The "F-4" sand group had some oil saturation at the top and a good layer at the bottom. The lower layer had been considered as part of the completion, but was not perforated due to the proximity to water and quality of cement. It should be strongly considered as a zone that could be added to the perforations at a later date.

The remaining "F" sands are considered wet, and should be avoided.

Only a portion of the "G" sands were drilled at this location. Of those penetrated, only the "G-2" had sufficient remaining oil to produce. There is 10 ft at the top of the "G-3A" which might be added although the sand sits directly on depleted oil sand. It may have remaining oil only because of poor permeability.