Quarterly Technical Progress Report
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10th Quarter of the Project

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Increased Oil Production And Reserves From Improved Completion Techniques In The Bluebell Field, Uinta Basin, Utah

Contract DE-FC22-92BC14953

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INCREASED OIL PRODUCTION AND RESERVES FROM IMPROVED COMPLETION TECHNIQUES IN THE BLUEBELL FIELD, UINTA BASIN, UTAH

Contract No. DE-FC22-92BC14953

Utah Geological Survey (UGS)
Salt Lake City, Utah

Date of Report: May 13, 1996

Award Date: September 30, 1993

Anticipated Completion: September 30, 1998

Government Award: $228,653
(current year)

Principal Investigator:
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Reporting Period: January 1 - March 31, 1996

Objectives

The objective of this project is to increase oil production and reserves in the Uinta Basin by demonstrating improved completion techniques. Low productivity of Uinta Basin wells is caused by gross production intervals of several thousand feet that contain perforated thief zones, water-bearing zones, and unperforated oil-bearing intervals. Geologic and engineering characterization and computer simulation of the Green River and Wasatch Formations in the Bluebell field will determine reservoir heterogeneities related to fractures and depositional trends. This will be followed by drilling and recompletion of several wells to demonstrate improved completion techniques based on the reservoir characterization. Transfer of the project results will be an ongoing component of the project.

DISCLAIMER

SUMMARY OF TECHNICAL PROGRESS

Comprehensive Fractured Reservoir Model

Data (net pay thickness, porosity, and water saturation) of more than 100 individual beds in the lower Green River and Wasatch Formations were used to generate geostatistical realizations (numerical-representation) of the reservoir properties. The data set was derived from the Michelle Ute and Malnar Pike demonstration wells and 22 other wells in a 20 square-mile (52 km^2) area. Beds were studied independently of each other. Principles of sequential Gaussian simulations (SGS) were used to generate geostatistical realizations of the beds. The steps involved in generating the realizations were:

(1) the data were transformed to normally distributed data,
(2) a two-dimensional horizontal variogram was calculated from the transformed data,
(3) a model was obtained for the variogram,
(4) the parameters of the variogram model were used in the SGS algorithm to generate thickness, porosity, and water saturation distributions, and
(5) the output of the SGS algorithm was converted back to follow the original data distributions.

Figures 1, 2, and 3, show one realization of thickness, porosity, and water saturation respectively, in zone 5 (beds 24 through 41, lower Wasatch) in the 20 square-mile (52 km^2) area. Realizations will be generated for all of the beds in the lower Wasatch Formation (beds 13 through 41). The realizations for all the beds will be combined to generate a reservoir image, which will be used in the reservoir numerical-simulation flow model.

Regulatory Issues

The UGS Director and Energy Section Chief were invited to meet with county commissioners from every oil producing county in the state, representatives from the State Tax Commission, and Utah Association of Counties to discuss State tax incentives for enhanced-oil-recovery (EOR) and horizontal-drilling projects in Utah. The UGS explained technical aspects of such activities using the DOE sponsored Bluebell and Monument Butte fields (both Class I), and Paradox basin (Class II) as examples of the economical potential of EOR and horizontal-drilling.

UGS personnel also met with the Utah Department of Natural Resources Executive Director and representatives of the Utah Office of Energy and Resource Planning to establish the Departments' position on a state legislative bill that provides tax incentives for EOR and horizontal-drilling projects.

The UGS is preparing a white paper in cooperation with the Utah Office of Energy and Resource Planning outlining a state strategic initiative to increase oil production in Utah. The strategy will focus on expanding government/industry partnerships similar to those established in the Bluebell and Paradox projects, and modifying tax philosophies and regulatory processes to take into account varying reservoir conditions.

Technology Transfer

Two masters theses have been completed under the direction of Dr. Thomas Morris of the Department of Geology, Brigham Young University, Provo, Utah. They are:

Garner, Ann, 1996, *Outcrop study of the lower Green River Formation for the purpose of reservoir characterization and hydrocarbon enhancement in the Altamont-Bluebell field, Uinta Basin, Utah:* 192 p.

Wegner, MaryBeth, 1996, *Core analysis and description as an aid to hydrocarbon production enhancement - lower Green River and Wasatch Formations, Bluebell field, Uinta Basin, Utah:* 233 p.

The UGS has established a home-page on the internet. The address is http://utstdpwww.state.ut.us/~ugs/. The site includes a page describing the UGS/DOE cooperative studies (Bluebell, Paradox, and Ferron), and a separate Bluebell page. The Bluebell page contains: (1) a description of the project, (2) a list of participants and their postal addresses and phone numbers, (3) each of the Quarterly Technical Reports, (4) a description of planned field demonstration, (5) a portion of the First and Second Annual Technical Reports with information on where to get complete copies of each report, (6) a reference list of all publications that are a direct result of the project, and (7) an extensive selected reference list for the Uinta Basin and lacustrine deposits worldwide.

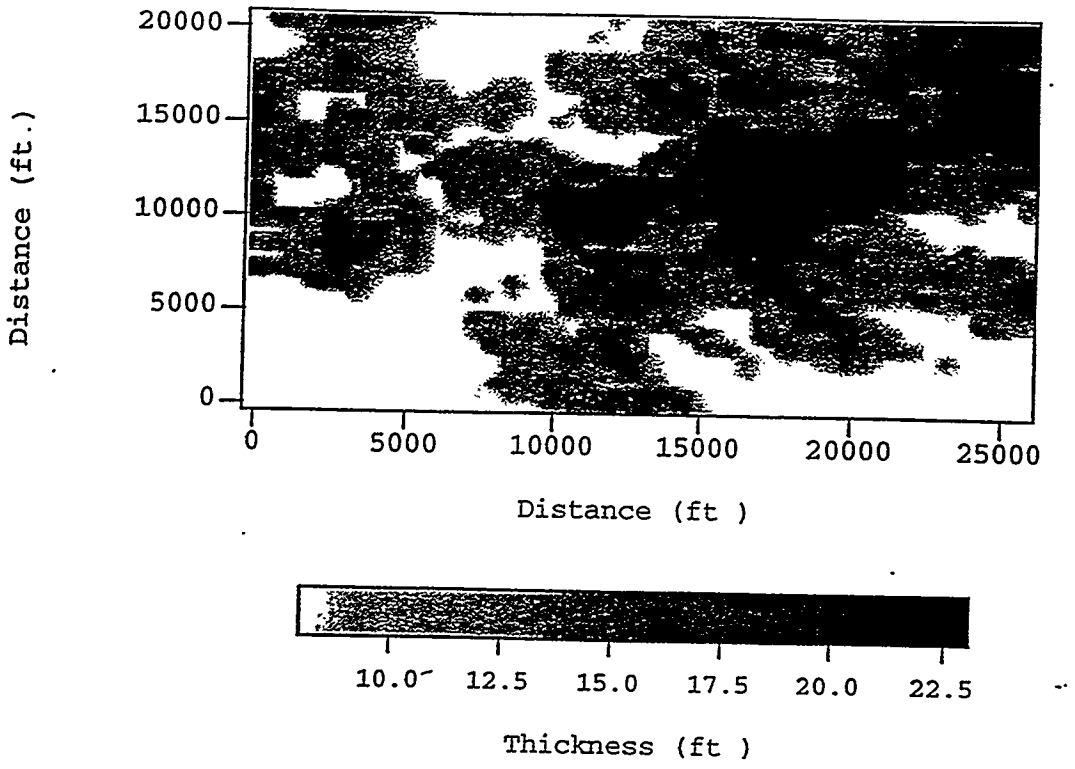

Figure 1. Thickness distribution in zone 5.

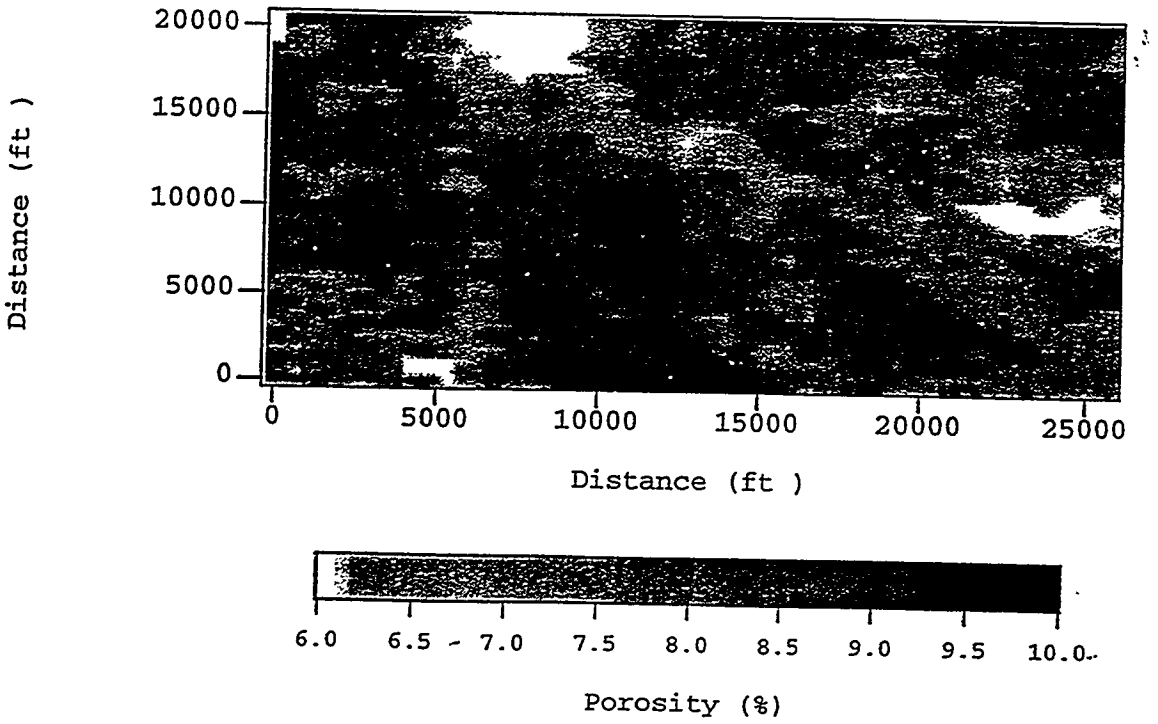

Figure 2. Porosity distribution in zone 5.

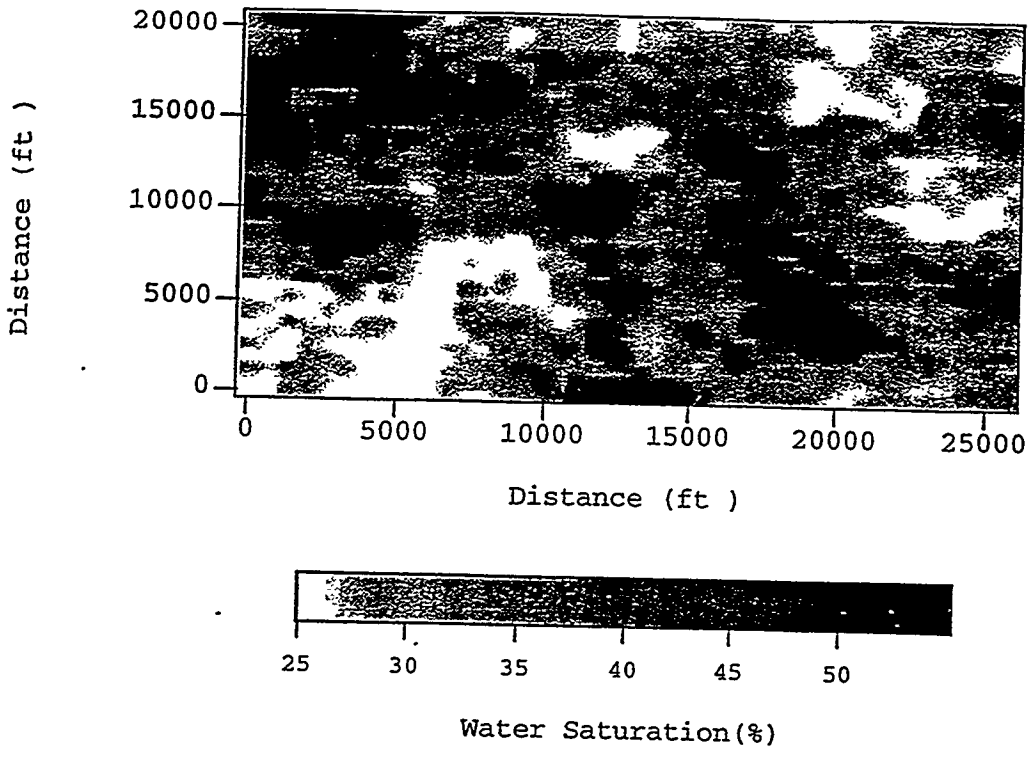

Figure 3. Water saturation distribution in zone 5.