DOE/MC/26026-95/C0482

Multistrata Exploration and Production Study

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Contract Number:

DE-AC21-89MC26026

Conference Title:

Natural Gas RD&D Contractor's Review Meeting

Conference Location:

Baton Rouge, Louisiana

Conference Dates:

April 4 - 6, 1995

Conference Sponsor:

Co-Hosted by Department of Energy (DOE)
Morgantown Energy Technology Center
Morgantown, West Virginia
and
Southern University and
Agricultural and Mechanical College
Baton Rouge, Louisiana

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Conf-950494--27

4A.1 Multistrata Exploration and Production Study

CONTRACT INFORMATION

Contract Number	DE-AC21-89MC26026
Contractor	The College of West Virginia P.O. Box AG Beckley, WV USA 25802-2830
Contract Project Manager	Linda K. Hawkins
Principal Investigators	Ronald G. Brunk John R. Maestas Pat Parsons
METC Project Manager	Charles W. Byrer
Period of Performance	October 1, 1989 to March 31, 1995

ABSTRACT

The objective of this project was to develop and verify a geotechnical/geostatistical approach to find natural gas resources and to verify the process by drilling, completing, testing, and producing wells located by the process.

BACKGROUND INFORMATION

Research conducted on the Eccles 7.5' quadrangle in Raleigh County, WV, in 1990, pinpointed several target areas. Immediate landowners, gas companies, and mineral rights owners were contacted to determine their willingness to assist the College in conducting the research. Extensive talks were held and as a result, agreements were drawn up between the College and the owners. Test Well 1 (TW1) was completed in May 1991 and Test Wells 2 and 3 (TW2, TW3) in November, 1991. The wells were shut in for one year thereafter, while the parties involved negotiated agreements. The wells were placed on line at the close of fiscal year 1992. The following section summarizes the activities conducted in fiscal years 1993 and 1994.

PROJECT DESCRIPTION

Activities for the Multistrata Project began in Fiscal Year 1993 with the placement of the three Test Wells into production full force. By turning all three wells in line October 1, 1992, gas began flowing as designed by the agreements negotiated in Fiscal Year 1992. All the parties involved began to see tangible results as the gas moved from the College's gathering lines into the systems of Ramco, Columbia, and Mountaineer Gas Companies.

The College of West Virginia began work as specified in the Field Test Plan for Phase II, Task 12. The TW1 and TW3 sites were successfully automated. The College coordinated the automation activities, which included selecting and installing electric motors and controls for each site. It also required electricians and Appalachian Power Company to set several poles, hang 5000 feet of line, and install two transformers.

Prior to running electricity to these sites, the pumps used to dewater the coal seams were operated on a manual basis. By running them 12 hours a day, three days per week, coal gas production increased an average 6 mcfd. Following automation, production from the coals increased another 4 mcfd on average. A number of pump rates and schedules were attempted in order to achieve maximum dewatering.

Water disposal has been addressed on a continuing basis, and permission has been granted from the State of West Virginia to apply water from the coal seams directly to the surface since the coal seam water has been analyzed and found to be potable. There are certain guidelines, of course, such as requirements to monitor the disposal, to avoid erosion, etc. Several meetings have been held with the State Oil & Gas Division and the Division of Environmental Protection, and the subject will continue to be discussed.

It should also be noted that water production from the coals is minimal. Water from the coals on TW1 averages about 2.2 bbls per pumping hour, and TW3 coal water is only 1.2 bbls per actual pumping hour. Based on swabbing and echometer tests done during workover, the water influx rate appears to be near 2 bbls per day from the coals on each well.

The most recent field activities in the WV Task involved the installation of a small 16hp compressor into the main CWV sales line. The purpose of this action was to observe the response of the coal zones to producing against 1-2 pounds suction pressure.

The results of compression near atmospheric pressure have been impressive with TW3 production quadrupling and TW1 coal gas increasing by a factor of 18. Pressure was held back to 25-30 psi on the deeper producing zones (sandstones and limestones) in order to prevent drowning these formations. Overall a 55% increase in gas production has been seen.

The College experimented with many approaches to dewatering the coal zones on these wells. The following general conclusions can be drawn from the research:

- As expected, dewatering greatly enhances gas production, tripling it within two weeks. Without continual dewatering efforts, production from these coals (Poca #3, Beckley) drops quickly in about 10 days to 0 mcfd.

- Long periods of pumping, in the range of 8-12 hours on followed by 8-10 hours off, are more beneficial to gas production than more elaborate timing schedules and methods (e.g. one hour on, one hour off throughout each 24 hour period).

- For coal zones in southern WV, experience indicates that standard pump jack units perform more effectively and efficiently than progressive cavity or rotary pumps. The dangers of pumping dry, the accumulation of coal fines or other debris, and the rate of system shut-down/stoppage prove more damaging to the rotary pumps.

- Water production from CWV coal zones averages 12 bbls per day during peak dewatering efforts, and the water is potable.

COMPARISON OF AVERAGE DAILY PRODUCTION LEVELS
Expressed in Thousands of Cubic Feet Per Day

		PRIOR TO COMPRESSION JAN 1994	AFTER COMPRESSION JAN 1995
TW1	Coal Zones	1	18
	Sandstone/Limestones	40	40
TW2	Sandstone/Limestones	9	10
TW3	Coal Zone	5	17
	TOTALS	55	85

NEW PROJECTS

As the College of West Virginia refined and perfected its processes, the Department of Energy determined that the College's work in West Virginia could produce major benefits in other areas. Two projects were developed including the establishment of methane gas wells in Alaska, and a Brine Separation project in Poland.

Alaska has nearly 200 isolated Native villages who must rely primarily on diesel fuel to provide heat for the winter. They import nearly 250,000 gallons of fuel per year, and must spend from 33% to 50% of their annual salaries for fuel. The State of Alaska has three trillion tons of coal reserves. The installation of gas wells in this coal rich area will bring the price of electricity to nearly $.06 from the current rate of $.76 per kilowatt hour. The methane gas well is expected to provide for the power needs of a tribe for nearly thirty years.

The disposal of brine is a major environmental problem. The College has entered into a working relationship with Aquatech

Services, Inc. of California. This company has developed a cost effective strategy for reducing or disposing of brine through a reserve osmosis process. The Company has completed phase one, a demonstration project, in Katowice, Poland. The highlights include the reduction of brine water into the environment by creating both potable water and commercially usable salt.

REFERENCES

1. Overbey, W.K., T.K. Reeves, S.P. Salamy, C.D. Locke, H.R. Johnson, R. Brunk, and L.K. Hawkins. A Novel Geotechnical/Geostatistical Approach for Exploration and Production of Natural Gas from Multiple Geologic Strata. Topical report submitted to U.S. Department of Energy, under Contract DE-AC21-89MC26026, May 1991.