BUG
(Oil)
T. 36 S., R. 25-26 E., SLPM
San Juan County, Utah

GEOLOGY

Regional Setting: South-central Paradox Basin
Surface Formations: Jurassic, Morrison Formation and Cretaceous, Dakota Sandstone and Burro Canyon Formation
Exploration Method Leading to Discovery: Subsurface geology
Type of Trap: Stratigraphic
Producing Formation: Pennsylvanian, Desert Creek zone of the Paradox Formation
Gross Thickness and Lithology of Reservoir Rock: Maximum 40 feet, minimum 12 feet, average 20 feet of algal dolostone
Geometry of Reservoir Rock: Lenticular, probably oval shape in plan view, northwest, northeast and southeast limits of porosity are not defined
Other Significant Shows: Pennsylvania, lower Ismay zone of the Paradox Formation (gas), and Honaker Trail Formation (gas).
Oldest Stratigraphic Horizon Penetrated: Pennsylvanian, Akah zone of the Paradox Formation

DISCOVERY WELL

Name: Wexpro Bug Well No. 1
Location: NE SE (407' FEL, 2,400' FSL), sec. 12, T. 36 S., R. 25 E., SLPM
Elevation (KB): 6,586 feet
Date of Completion: February 19, 1980
Total Depth: 6,382 feet
Production Casing: Set 5 1/2" casing at 6,382 feet, cemented with 715 sacks 50-50 Pozmix treated with 2 percent bentonite
Perforations: 6,289 to 6,293 feet, 2 jet holes per foot
Stimulation: None
Initial Potential: Flowed 608 BOD, 1,128 MCFGD, 180 BSWD on a 1/4" choke; flowing tubing pressure 900 psig, flowing casing pressure 1,400 psig
Bottom Hole Pressure: Shut-in pressure 3,561 psig (from drillstem test no. 2)

DRILLING AND COMPLETION PRACTICES

A typical drilling program for a Bug field well starts by using a dry hole digger to drill a 17 1/2" hole to a depth of 35 to 50 feet, and setting 16" conductor pipe which is cemented with construction grade concrete. A rotary rig is used below conductor pipe to drill a 12 1/4" hole about 100 feet into the Chine Formation where 9 5/8" casing is run. The surface string is set into the Chine to protect the numerous, shallow, fresh-water-bearing sandstones of the San Rafael and Glen Canyon Groups. A regular grade cement treated with two to three percent CaCl and 1/4 pound floecele per sack is used. Approximately 700 to 1,000 sacks of cement are needed for good surface returns depending upon the depth of the surface string. From below surface pipe an 8 1/2" to 8 5/8" hole is drilled to total depth into the Pennsylvanian, Akah salt. If commercial hydrocarbons are indicated, 5 1/2" casing is run and cemented with a 50-50 Pozmix. Usually 500 to 800 sacks are sufficient to cement above the highest zone of interest.

A typical mud program utilizes water as the drilling fluid for the surface hole. Lost circulation sometimes occurs in the sandstones of the Morrison Formation or the San Rafael and Glen Canyon Groups but this can generally be corrected with a light treatment of lost circulation material. Below surface pipe the drilling fluid again is water which is kept as clear as possible (free from solids), promoting faster penetration rates. Lost circulation or water flow zones below surface pipe are rare. The mud weight is gradually increased, usually after drilling into the "B" zone shale of the Ismay zone. To permit safe drilling into the Desert Creek porosity, where the formation pressure is about 3,600 psig, a dispersed weighted mud system consisting of barite, gel (bentonite) and a dispersant such as lignosulfonate is used. Mud weights through the Ismay carbonates are generally kept at less than 9.5 pounds per gallon. Mud weights through the overpressured Desert Creek porosity vary depending on depth but generally run in the 11.0 to 12.5 pounds per gallon range.

On the discovery well a two man mud logging unit was employed from 1,600 feet to total depth. On subsequent wells a two man mud logging unit was employed from a depth of a few hundred feet above the top of the Honaker Trail Formation (usually about 4,000 feet) to total depth. The mud units used a filament type hot wire detector for total gas readings and a gas chromatograph for sample breakdown. Drill cuttings were collected and described generally in 10 foot intervals and in 5 foot intervals through known zones of importance. Mud gas shows were reported on a 24 hour basis immediately to the company geologist responsible for field development. If a drill-stem test was called, it was run as soon as possible after drilling through the show interval to prevent damage to the formation from drilling fluid and to increase chances for a successful test. Straddle tests run after drilling to total depth have a high failure rate.

Cores were cut in eight of the sixteen wells drilled in the field. The coring program was designed to gain a full understanding of reservoir parameters and fluid contacts and to acquire a knowledge of lithofacies, environments of deposition, and diagenetic history.

Wireline logs run in the discovery well included a dual induction electric log, compensated neutron-compensated density log, acoustic log, and dipmeter log. This logging program was followed for the initial four or five wells. On subsequent wells, the standard logging suite included only the dual induction electric log and the compensated neutron-compensated density log.

A typical Desert Creek completion calls for running 2 7/8" tubing into the well. A through tubing perforating gun is used to perforate the desired interval with 2 jet shots per foot. After a sufficient test period, usually a few days, the well is completed. If stimulation is required, the Desert Creek porosity is acidized with 15 to 28 percent hydrochloric acid, then flow tested and completed. All of the wells were completed with the tubing hanging open ended so that fresh water could be pumped down the casing-tubing annulus. This dilutes the supersaturated formation brine thereby preventing salt buildup in the tubing and surface equipment.

In late 1982, well costs were running about $350,000 to $400,000 for a dry hole and $650,000 to $700,000 for a completed well. Another $300,000 to $350,000 is required for flow lines, tankage, and production equipment.