

well file



Amoco Production Company

Security Life Building
Denver, Colorado 80202

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Joe D. Ramey
New Mexico Oil Conservation
Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

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Tocito Dome Gas Injectivity Test Results

This letter is to advise the New Mexico Oil Conservation Commission and other operators in the Tocito Dome Penn "D" Pool of the results of the 37 day gas injectivity test which was performed according to Order R-4983.

The primary purpose of this test was to determine injectivity characteristics of the reservoir and the injection capacity of Amoco's existing compressors. To determine these parameters, Navajo Tribal "U" No. 3, in SW/4 SW/4 Section 16, T26N, R18W was converted to gas injection as specified by the above-referenced order (refer to field map, Attachment No. 1). Two of Amoco's six compressors were manifolded so that gas compressed by these units could be reinjected.

In Amoco's opinion the test was very successful, in that we were able to inject significant quantities of gas at pressures at which all our existing compressors can operate. This is also true for equipment of other operators in the pool.

In all, a total of 85,778 MCF was injected during the 37 days of injection. The test ran longer than the 30 days specified by the Order because a packer leak was discovered six days after the test was initiated. Verbal approval to reinstitute the 30 day test was granted by the Aztec office of the New Mexico Oil Conservation Commission after proper repairs had been made.

Attachment No. 2 outlines the daily injection rates, daily injected volumes, cumulative injected volumes, wellhead tubing pressure during injection, the hours of operation and the compressor used. You will note that with the smaller Chicago Pneumatic (CP) compressor we were generally capable of injecting about 2.4 MMCFD at 810 psig. With the larger Ingersoll Rand (IR) machine, we could easily inject as much as 5.4 MMCFD or more at 940 psig. Amoco feels these rates and pressures would be very satisfactory should it be determined that a full scale gas injection project would be the optimum method to deplete the Tocito Dome Penn "D" reservoir.

Gas breakthrough occurred during the test at Amoco's Navajo Tribal "U" No. 14 in the NE/4 SW/4 Section 16, T26N, R16W (shown on the field map, Attachment No. 1). It was anticipated prior to the injectivity test that some gas cycling would occur in wells located close to the injector and at the same relative structural position. This was considered to be probable because of the excellent permeability (as much as 2800 millidarcies) in this portion of the Penn "D" reservoir and because the structurally high wells are located in the original gas cap area of the pool, where gas saturations are likely to still be quite high.

Amoco's Navajo Tribal "U" No. 14 is located approximately 1950 feet from the injection well "U" No. 3. Well "U" No. 14 is structurally located only 12 feet low to "U" No. 3 and "U" No. 14 is in the original gas cap area of the field. Prior to the test period and during the test period all the other wells surrounding the injector, except "U" No. 14, had been shut in because of high GOR's in an effort to conserve energy, an Amoco compressor failure which restricted sales, and pumping equipment problems. As "U" No. 14 thus offered the only pressure sink in this highly permeable area of the field, it is felt natural that the gas injected would move quickly to this location.

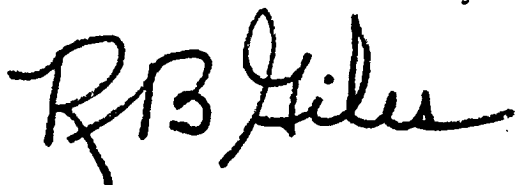
Of the 85,778,000 cubic feet of gas injected into the reservoir, some 71.3% was cycled out of "U" No. 14. The remaining 28.7% of the gas stayed in the reservoir and aided in maintaining reservoir pressure. In terms of reservoir barrels, an average of 7177 barrels per day was injected during the test and 5117 barrels per day was cycled. The net effect was a decrease in reservoir voidage of 2060 reservoir barrels per day less than what would have occurred had all the gas been sold.

It is anticipated that, if future gas injection is determined to be desirable by all the operators in the pool, this gas cycling will decrease as the gas cap expands into areas of the field where a steeper structural dip occurs.

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Well "U" No. 14's test rates before, during, and after the injection test are shown on Attachment No. 3. You will note that, although gas rates increased substantially, no adverse effect was shown on either the oil production or water production. Also at the conclusion of the test the GOR on this well began approaching pre-test rates, demonstrating that no permanent damage of any kind resulted from the temporarily high gas producing rates.

Pressure surveys were run on shut-in offset wells before and after the injection test. Well "N" No. 12 in NE/4 SE/4 Section 17, T26W, R18W recorded 895 psi on both 3-24-75 and 5-15-75. Well "U" No. 12 in SE/4 NW/4 Section 21 pressures were 1084 psi and 1086 psi on 3-24-75 and 5-15-75, respectively. The only significant pressure change was at the gas injector, "U" No. 3, where the bottom hole pressure went from 874 psi immediately prior to injection to 889 psi soon after the conclusion of injection. No significant pressure changes were anticipated as withdrawals were in excess of injection volumes.



JWC/dc

Attachments

cc: E. C. Arnold
New Mexico Oil Conservation
Commission
1000 Rio Brazos Road
Aztec, New Mexico 87410

John D. Howard
Mobil Oil Corporation
Box 633
Midland, Texas 79701

L. O. Speer, Jr.
Farmington

J. C. White
Texaco, Inc.
Box 2100
Denver, Colorado 80201

P. T. McGrath
United States Geological Survey
P. O. Box 959
Farmington, New Mexico

300 752, 301 701, 707

Attachment No. 2

Tocito Dome Gas Injection Data

<u>Date</u>	<u>Injection Rate MCFD</u>	<u>Daily Volume MCF</u>	<u>Cumulative MCF</u>	<u>Wellhead Tubing Pressure-PSI</u>	<u>Hours Injected and Compressor</u>
4-4-75	2136	979	979	820	11 hrs. - CP comp.
4-5-75	2085	2085	3064	810	24 hrs.
4-6-75	1998	1998	5062	810	24 hrs.
4-7-75	2053	2053	7115	810	24 hrs.
4-8-75	2167	2167	9282	800	24 hrs.
4-9-75	1999	1999	11281	817	24 hrs.
4-10-75	2025	913	12194	817	10 hrs.

Gas injection ceased 4-10-75 to repair packer leak at injection well.

4-15-75	2098	1311	13505	800	15 hrs.
4-16-75	2075	2075	15580	800	24 hrs.
4-17-75	1889	1889	17469	798	24 hrs.
4-18-75	2187	2187	19656	800	24 hrs.
4-19-75	2067	2067	21723	798	24 hrs.
4-20-75	2189	2189	23912	810	24 hrs.
4-21-75	2292	2292	26204	813	24 hrs.
4-22-75	2443	2443	28647	813	24 hrs.
4-23-75	2451	2451	31098	813	24 hrs.
4-24-75	2228	2228	33326	790	24 hrs.
4-25-75	2265	2265	35591	800	24 hrs.
4-26-75	2447	2447	38038	800	24 hrs.
4-27-75	2544	2544	40582	805	24 hrs.
4-28-75	2446	2446	43028	800	24 hrs.
4-29-75	2482	2482	45510	790	24 hrs.
4-30-75	2383	2383	47893	790	24 hrs.
5-1-75	2257	2257	50150	792	24 hrs.
5-2-75	2209	2209	52359	790	24 hrs.
5-3-75	2286	2286	54645	790	24 hrs.
5-4-75	2072	2072	56717	768	24 hrs.
5-5-75	2241	1494	58211	750	16 hrs.
5-6-75	2308	2308	60519	770	24 hrs.
5-7-75	5284	4403	64922	940	20 hrs. - IR comp.
5-8-75	5413	4511	69433	940	20 hrs.
5-9-75	3545	2954	72387	850	20 hrs.
5-10-75	2554	2341	74728	730	16 hrs. - IR comp.
					6 hrs. - CP comp.
5-11-75	3339	3339	78067	900	14 hrs. - CP comp.
					10 hrs. - IR comp.
5-12-75	3671	2753	80820	850	13 hrs. - IR comp.
					5 hrs. - CP comp.
5-13-75	7437	4958	85778	980	16 hrs. - IR comp.
5-14-75	Test Concluded 5-14-75				

Attachment No. 3

Production Tests During Gas Injection Period
Navajo Tribal "U" Well No. 14
Tocito Dome Field

	<u>Date</u>	<u>BOPD</u>	<u>BWPD</u>	<u>MCFD</u>	<u>GOR</u>
Before Gas Injection	3-2-75	82	524	234	2841
	3-4-75	80	467	241	3012
	3-5-75	79	496	233	2949
Gas Injection Commenced	4-4-75				
Gas Injection Down	4-10-75 to Repair Packer Leak				
Gas Injection Restarted	4-15-75				
	4-27-75	93	511	1131	12161
	4-28-75	91	538	1578	17340
	4-29-75	76	544	1758	23131
	5-2-75	73	504	2532	34865
	5-5-75	67	517	2729	40731
	5-9-75	93	472	--	--
	5-10-75	90	489	--	--
	5-11-75	74	529	3569	48230
	5-12-75	70	541	3578	51114
	5-13-75	95	593	3723	39189
Gas Injection Ceased	5-14-75	68	538	3700	54412
5-14-75					
	5-16-75	58	519	2523	43500
	5-17-75	61	490	2019	33098
	5-20-75	80	535	886	11075
	5-21-75	79	509	745	9430
	5-22-75	79	513	595	7532
	5-23-75	75	508	487	6493
	5-24-75	75	508	463	6173