MASTER

**NORTH STANLEY PROJECT
TERTIARY RECOVERY PROJECT
OSAGE COUNTY, OKLAHOMA**

**KEWANEE OIL COMPANY
REPORT OF OPERATIONS**

**September, 1977
BERC-0029-27**

9502386

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**B. M. DuBois III
District Engineer
October 10, 1977**

EP

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NORTH STANLEY PROJECT

TERTIARY RECOVERY PROJECT - OSAGE CO., OKLA.

KEWANEE OIL COMPANY - OPERATOR

OPERATIONAL SUMMARY

September, 1977

OIL PRODUCTION

Monthly Total Gross Oil	18,936
Daily Average	631
Monthly Total Tertiary Oil	4,380
Daily Average Tertiary	146
Cumulative Gross Since 7-1-75	479,377
Cumulative Tertiary	42,641

WATER PRODUCTION

Daily Average (BPD)	32,780
Current WOR	52.0
Cumulative Water Produced Since 7-1-75	29,883,340

WATER INJECTION

FRESH

PRODUCED

* Daily Average in Burbank (BPD)	29,584	5,158
Daily Average in Arbuckle (BPD)	0	27,273
** Cumulative in Burbank (Bbls)	18,881,426	11,437,162
Cumulative in Arbuckle (Bbls)	0	18,579,964
Since 2-23-73		

POLYMER INJECTION

Monthly Total (Lbs)	0
Daily Average (Lbs/day)	0
Cumulative Total (Lbs)	1,194,770

* Average daily produced water into Burbank shows produced water allocated to project from the boundary protection injection wells.

** Fresh water commenced 2/23/76

NORTH STANLEY PROJECT
TERTIARY RECOVERY PROJECT
September, 1977

Discussion

A. Project Performance

Oil production for September averaged 631 BOPD. This was 3 BPD less than the previous month's production, 41 BPD above the anticipated production with polymer, and 146 BPD above the estimated production without polymer. Oil production had averaged 642 BOPD during the first three weeks of the month, but well downtime at a number of strong producers the last week lowered the monthly average production to the 631 BPD level. See Production History Curve and Map #1 for oil production information.

Fresh water injection increased 588 BWPD and averaged 29,584 BWPD. Water production increased by 653 BWPD and averaged 32,780 BWPD.

The decreased oil production coupled with the increased water production caused the first appreciable increase in the WOR since initiating polymer injection in June 1976. The WOR increased from 50.7:1 in August to 52:1 for September.

B. Project Status

1. Results of the produced water polymer content tests caught during July, August, and September are shown on Table #3. Polymer was detected for the first time using the clay flocculation test at Pappin 4 and Pappin 15 during September. (It should be noted that the August polymer report is incomplete due to 10 sample bottles having been lost in shipping.)
2. Oil production increased at 10 wells and decreased at 11 wells during September. See Table #1 and Attachment #1 for individual well tests.
3. Fresh water increased by 588 BWPD during September. This increase was due to reactivating Brenner 7 WI and Brenner 9 WI. These two wells had been shut-in since July when water began to surface at a nearby inactive injection well.

See Attachment #2 and Table #2 for a project review of injection well injection rates, pressures, and cumulative injection volumes.

C. Status of Field Work

1. Hiram 12 WI was acidized with 500 gallons 15% HCL during September to increase its injection rate. The well had ceased to take fluid during April, 1977, and did not respond to the increased wellhead pressure when polymer injection was ended in June, 1977. The injection rate after treatment was 200 BPD @ 370 psi compared to 0 BPD @ 32 psi prior to treatment.
2. Brenner 8 WI, Gale 12, and Pappin 11 WI were plugged and abandoned during September. These wells have been inactive for a number of years and were of no value to the project.
3. Monitoring of produced water for fresh water invasion is continuing on a monthly basis. Tests include a positive/negative polymer test, analytical polymer content test, and a laboratory water analysis. See Attachment #3 for graphs of individual well total dissolved solids, specific gravities, and polymer contents.

NORTH STANLEY PROJECT

TECHNICAL SUMMARY

SIX MONTH SUMMARY

<u>OIL</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>September</u>
* Actual Oil Prod. (BPD)	654	658	645	628	634	631
Est. Normal Oil Prod. (BPD)	510	505	500	495	490	435
Tertiary Oil (BPD)	144	153	145	133	144	146
<u>WATER</u>						
** Injection (BPD)	36,470	36,404	35,205	33,015	33,815	34,742
Produced Water (BPD)	34,531	34,148	33,601	32,385	32,127	32,780
<u>RATIO</u>						
Injection Water/Produced Water	1.06	1.07	1.05	1.02	1.05	1.06
Produced Water/Produced Oil	52.8	51.9	52.1	51.6	50.7	52.0
<u>WELL STATUS</u>						
Oil	28	28	28	28	28	28
Injection	18	18	18	18	18	18
Inactive	12	12	12	12	12	9
Total	58	58	58	58	58	55
<u>POLYMER</u>						
Lbs per Day	1,098	1,024	1,058	0	0	0
Concentration PPM (Current)	99	93	97	0	0	0
Concentration PPM (Cumulative)	316	296	285	285	285	285

* Revised to include Skelly Barber #10 in North Stanley Production

** Injection rate is sum of polymer injection water plus 1/2 produced water injected along south border of project

TABLE 1
INDIVIDUAL WELL TESTS

September, 1977

<u>Well Name</u>		<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>
Art	3	21.2	1986.8	93.7						
Art	4	36.0	2340.0	65.0						
Art	5	54.4	1921.6	35.3						
Art	9	5.6	810.4	144.7						
Big Eagle	3	37.6	3210.4	85.4						
Big Eagle	4	4.4	182.6	41.5						
Big Eagle	8	6.4	468.6	73.2						
Big Eagle	10		Down							
Big Eagle	12	10.1	65.9	6.6						
Brenner	10	19.4	185.1	9.5						
Fanny	6	76.0	2056.	27.1						
Fanny	7	29.5	1206.	40.8						
Gale	13	25.6	3534.4	138.1						
Gale	15	24.8	729.8	29.4						
Gale	16	28.0	3676.0	131.3						
Hickman	3	40.8	1183.2	29.0						
Hickman	6	9.8	295.7	30.2						
Hickman	8	8.3	108.0	13.0						
Hiram	13	12.5	751.6	60.1						
Hiram	14	16.1	747.9	46.5						
Hiram	15	12.8	1239.2	96.8						
Hiram	16	6.8	737.2	108.4						
O'Dell	1	24.0	1392.0	58.0						

TABLE 1
INDIVIDUAL WELL TESTS

<u>September, 1977</u>										
<u>Well Name</u>		<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>
Pappin	4	21.6	2954.4	136.7						
Pappin	15	14.4	1081.6	75.1						
Pappin	16	14.4	777.6	54.0						
Skelly Barber	9	40.8	3643.2	89.3						
Skelly Barber	10	26.4	57.6	2.2						
Well Test TOTAL		627.7	37,342.8							
Monthly Average Production		631.2	33,716							
Correction Factor		1.006	.903							

NOTE: Well tests shown are actual tests and are not corrected back to average daily production, or adjusted for well downtime.

TABLE 1
INDIVIDUAL WELL TESTS

Well Name		<u>June, 1977</u>			<u>July, 1977</u>			<u>August, 1977</u>		
		<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>
Art	3	40.8	1831	44.8	40.0	1784	44.6	39.2	1801.0	45.9
Art	4	24.8	2327	93.8	40.8	2119.2	51.9	24.8	2295.2	92.5
Art	5	68.0	1836	27.0	48.0	1668	34.7	44.0	1765.0	40.1
Art	9	4.0	1028	257.0	12.8	915.2	71.5	6.4	841.6	131.5
Big Eagle	3	39.2	3072.8	78.4	36.8	2932.2	79.4	38.4	3225.6	84.0
Big Eagle	4	5.4	216.6	40.0	3.4	191.6	56.4	4.0	179.0	44.8
Big Eagle	8	9.4	501.6	53.0	5.0	506.0	101.2	8.5	476.5	56.1
Big Eagle	10	.8	255.7	319.0	8.2	155.8	19	Down		
Big Eagle	12	.9	78.0	86.0	2.6	93.4	35.9	4.8	48.2	10.0
Brenner	10	14.4	270.6	18.8	19.7	195.3	9.9	19.5	234.0	11.7
Fanny	6	103.2	2072.8	20.1	88.0	2072	23.5	76.0	1988.0	26.2
Fanny	7	18.4	1013.6	55.1	27.2	1124.8	41.4	29.4	1171.0	39.8
Gale	13	28.0	2300	82.0	28.0	3340	119.3	23.0	2408.8	146.9
Gale	15	18.4	662.4	36.0	24.4	668.4	27.4	20.0	796.0	39.8
Gale	16	15.2	800.8	52.7	15.2	872.8	57.4	16.8	859.2	51.1
Hickman	3	28.8	1315.2	45.6	33.6	1134.4	33.8	41.6	1262.4	30.3
Hickman	6	17.3	375.7	21.7	23.8	326.2	13.5	26.9	305.1	11.3
Hickman	8	19.6	235.6	12.0	16.6	138.4	8.3	25.9	99.4	3.8
Hiram	13	14.4	753.6	52.0	7.2	679.8	94.4	13.9	760.0	54.7
Hiram	14	16.3	751.6	46.1	16.0	688.0	43.0	17.6	790.4	44.9
Hiram	15	9.6	1342.4	139.8	9.6	1286.4	134.0	14.4	1299.6	90.3
Hiram	16	5.6	778.4	139.0	3.2	764.8	239.0	8.0	784.0	98.0
O'Dell	1	27.2	1196.8	44.0	28.0	1236	44.1	28.8	1259.2	43.7

TABLE I
INDIVIDUAL WELL TESTS

<u>Well Name</u>	<u>June, 1977</u>			<u>July, 1977</u>			<u>August, 1977</u>		
	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>	<u>Oil</u> <u>(bbl)</u>	<u>Water</u> <u>(bbl)</u>	<u>WOR</u>
Pappin 4	21.6	2810.4	130.1	19.2	2770.8	144.3	20.0	2780.	139.0
Pappin 15	14.4	1281.6	89.0	12.6	1139.4	90.4	12.8	1091.2	85.3
Pappin 16	19.2	820.8	42.8	11.4	811.6	71.2	8.8	799.2	90.8
Skelly Barber 9	25.6	3606.4	140.9	40.0	3752.	93.8	40.0	3544.0	88.9
Skelly Barber 10	<u>30.6</u>	<u>53.4</u>	<u>1.7</u>	<u>25.6</u>	<u>54.4</u>	<u>2.1</u>	<u>22.4</u>	<u>496.</u>	<u>2.2</u>
Well Test TOTAL	642.1	33,588.8		646.9	33,420.9	51.7	635.0	33,913	53.3
Monthly Average Production	645.0	33,601		628.0	32,385	51.6	634.0	32,127	50.7
Correction Factor	1.005	1.001		.97	.97		.997	.947	

NOTE: Well tests shown are actual tests and are not corrected back to average daily production, or adjusted for well downtime.

TABLE 2

CUMULATIVE INJECTION DATA

Well Name		Fresh Water Preflush (Bbl)	* P-700 Polymer Injected (Bbl)	P-700 Polymer Injected (lbs)	Fresh Water Flush (Bbl)	Salt Water Flush (Bbl)
Art	7 WI	278,142	820,446	93,928	232,810	
Art	8 WI	89,282	705,083	67,626	151,572	
Big Eagle	9 WI	77,965	145,741	12,995	32,665	
Big Eagle	11 WI	281,521	510,201	38,541	166,033	
Brenner	7 WI	81,988	305,804	30,338	46,293	
Brenner	9 WI	207,479	711,708	76,190	58,744	
Brenner	12 WI	110,356	406,161	31,259	201,432	
Fanny	4 WI	147,705	719,307	72,048	176,419	
Fanny	5 WI	252,537	836,768	86,066	174,632	
Gale	10 WI	89,142	373,473	33,697	143,050	
Gale	11 WI	226,372	1,008,820	100,235	201,332	
Gale	14 WI	522,360	1,329,869	138,057	263,932	
Hiram	10 WI	329,427	624,418	58,362	239,211	
Hiram	11 WI	150,146	412,629	40,229	119,398	
Hiram	12 WI	98,086	154,101	17,204	9,001	
Hiram	17 WI	355,566	1,258,072	125,913	284,875	
Pappin	12 WI	168,942	1,014,023	105,410	231,177	
Pappin	13 WI	385,492	588,387	61,750	206,600	
Pappin	14 WI	126,826	38,007	4,922	0	
TOTAL INJECTED		3,979,334	11,962,918	0	2,939,176	
TOTAL POLYMER INJECTED (lbs)		0	0	1,194,770		

* See June, 1977 report for a breakdown of P-700 Polymer Injected during each phase of polymer injection.

TABLE 3

DOW CHEMICAL COMPANY

DESIGNED PRODUCTS TS&D PRODUCING TRACER REPORT

Field: North Stanley July, 1977

<u>Well</u>	<u>Date</u>	<u>Polymer (ppm)</u>	<u>Chloride (ppm)</u>
Art 3	7-21-77	64	20,700
Art 4	"	48	19,100
Art 5	"	0*	30,500
Art 9	"	9	36,500
Big Eagle 3	7-22-77	0*	33,700
Fanny 6	7-21-77	54	26,100
Fanny 7	"	9	14,000
Gale 13	"	63	19,500
Gale 15	"	0*	45,700
Gale 16	"	29	22,200
Hickman 3	"	38	21,600
Hickman 6	"	16	31,400
Hickman 8	"	0*	47,000
Hiram 13	"	6	55,100
Hiram 14	"	14	36,700
Hiram 15	"	16	12,100
Hiram 16	"	38	17,700
Odell 1	7-20-77	33	18,600
Skelly Barber 10	7-21-77	12	50,200

*Trace of polymer, 5 ppm or less.

TABLE 3

DOW CHEMICAL COMPANY

DESIGNED PRODUCTS TS&D PRODUCING TRACER REPORT

Field: North Stanley

August, 1977

<u>Well</u>	<u>Date</u>	<u>Polymer (ppm)</u>	<u>Chloride (ppm)</u>
Art 3	8-17-77	66	21,800
Art 4	"	56	24,300
Art 5	"	2	33,900
Art 9	"	6	35,300
Big Eagle 3	"	0	32,100
Hiram 13	"	9	53,700
Hiram 14	"	6	33,900
Hiram 15	"	8	9,400
Hiram 16	"	37	17,000

TABLE 3

DOW CHEMICAL COMPANY

DESIGNED PRODUCTS TS&D PRODUCING TRACER REPORT

Field: North Stanley

September, 1977

<u>Well</u>	<u>Date</u>	<u>Polymer (ppm)</u>	<u>Chloride (ppm)</u>
Art 3	9-14-77	37	29,300
Art 4	"	64	16,500
Art 5	"	10	26,100
Art 9	"	9	35,500
Big Eagle 3	"	0*	27,300
Fanny 6	"	54	26,100
Fanny 7	"	15	11,500
Gale 13	"	38	17,700
Gale 16	"	24	23,400
Hickman 3	"	38	19,000
Hickman 6	"	0*	31,200
Hickman 8	"	0*	44,700
Hiram 13	"	8	48,400
Hiram 14	"	20	33,700
Hiram 15	"	8	12,200
Hiram 16	"	19	16,000
Odell 1	"	0	7,800
Pappin 4	"	0	31,700
Pappin 15	"	0	45,900
Pappin 16	"	21	15,100

*Trace of polymer, 5 ppm or less.

map #1

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SEPTEMBER WELL TESTS

- ⊙ POLYMER INJECTION WELLS
- ⊙ BOUNDARY PROTECTION WELLS (OPD)

LEGEND		KEWANEE OIL COMPANY	DISTRICT: BURBANK	Drawn		REVISED	
				PLM	DATE	BY	
• Oil Well	⊙ Inactive Well	STANLEY POLYMER PROJECT	AREA: EAST AREA	Traced	3-22-77	J.S.	
• Abdn Oil Well	⊙ Water Input Well			Checked			
○ Location	⊙ S.W.D.	OSAGE CO., OKLAHOMA	SCALE 660' 0' 1320' 2640'	Date	6-21-59	File	B-6A
◇ Dry Hole	⊙ W.S.W.						
☆ Gas Well	⊙ Gas Input Well						
★ Abdn Gas Well							

NORTH STANLEY PROJECT INJECTION - PRODUCTION HISTORY

ATTACHMENT #1

LEGEND

PRODUCTION WELLS

Total Dissolved Solids	_____
Specific Gravity (Lab)	-----
Specific Gravity (Field Test)	oooooooooooo
Polymer Breakthrough (Field Test)	△

INJECTION WELLS

Wellhead Pressure	-----
Injection Rate	_____

WATER PROFILE

100% Brine	67,700	TDS
75% Brine 25% Fresh	48,600	TDS
50% Brine 50% Fresh	34,200	TDS
25% Brine 75% Fresh	17,000	TDS
100% Fresh Water	800	TDS

0

50

100

WOR

0

20

40

Daily Oil Production (BOPD)

0 50 100 WOR 0 50 100 150

Daily Oil Production (BOPD)

Daily Oil Production (BOPD)

Daily Oil Production (BOPD)

Daily Oil Production (BOPD)

ATTACHMENT #2

INJECTION WELL DATA

WELL HEAD PRESSURE PSI x 100

BIG EAGLE 11

BIG EAGLE 9

ART 8

ART 7

WELL HEAD PRESSURE PSI x 100

FANNY 4

BRENNER 12

BRENNER 9

BRENNER 7

INJECTION WELL DATA

— BPD
- - - Pressure

WELL HEAD PRESSURE PSI x 100

GALE 14

GALE 11

GALE 10

FANNY 5

INJECTION WELL DATA

— BPD
- - - - Pressure

WELL HEAD PRESSURE PSI x 100

HIRAM 17

HIRAM 12

HIRAM 11

HIRAM 10

INJECTION WELL DATA

— BPD
- - - Pressure

INJECTION WELL DATA

WELL HEAD PRESSURE PSI x 100

PAPPIN 14

PAPPIN 13

PAPPIN 12

ATTACHMENT #3

POLYMER CONTENT - PPM x 10
 TOTAL DISSOLVED SOLIDS - MG/L x 1000

ART 5

ART 4

ART 3

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

BIG EAGLE 4

BIG EAGLE 3

ART 9

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

BIG EAGLE 12

BIG EAGLE 10

BIG EAGLE 8

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

FANNY 7

FANNY 6

BRENNER 10

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

HICKMAN 8

HICKMAN 6

HICKMAN 3

POLYMER CONTENT - PPM x 10
 TOTAL DISSOLVED SOLIDS - MG/L x 1000

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

PAPPIN 4A

O'DELL 1

HIRAM 16

POLYMER CONTENT - PPM x 10
TOTAL DISSOLVED SOLIDS - MG/L x 1000

SKELLY BARBER 9

PAPPIN 16

PAPPIN 15

POLYMER CONTENT - PPM x 10
 TOTAL DISSOLVED SOLIDS - MG/L x 1000

SKELLY BARBER 10

PRODUCED WATER - TOTAL DISSOLVED SOLIDS