ROCKY MOUNTAIN OILFIELD TESTING CENTER

PROJECT TEST RESULTS

IN-SITU H_2S BIOREMEDIATION

JULY 11, 1994

FC9509 / 95PT3

Rocky Mountain Oilfield Testing Center
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IN-SITU H2S BIOREMEDIATION

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PREPARED BY
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July 11, 1994

TEST PURPOSE:
To treat producing oil wells that contain high concentrations of H2S with a product that will lower the levels of H2S in the well.

METHOD OF TREATMENT:
A bio-nutrient product (55 gallons) was mixed with 120 bbls of produced tensleep water and the mixture was pumped down the annulus of selected wells. The well was then shut-in for a 24 hour period and then was returned to production.

METHOD OF MEASUREMENT:
Four producing oil wells were selected for the test. An SENSIDYNE Gastec Precision Gas Detector system was used to gather the samples. Then 19 H2S samples were obtained from the wells over a 33 day period prior to the treatment. The treatment was completed on April 12, 1994. Then H2S samples were obtained from the wells with the following results.

	66-46-SX-3 AVG H2S PPM LEVEL		67-13-SX-3 AVG H2S PPM LEVEL		76-14-SX-3 AVG H2S PPM LEVEL		77-32-SX-3 AVG H2S PPM LEVEL	
MARCH	1494		1510		1500		1747	
APRIL	1242	-17%	1192	-21%	1180	-21%	1230	-30%
MAY	1268	-15%	1275	-15%	1268	-16%	1344	-23%
JUNE	1025	-32%	1091	-28%	1150	-24%	1050	-40%

OBSERVATIONS:
THE STEAM INJECTION TO THIS PATTERN OF WELLS WAS STOPPED IN EARLY MAY. THE ATTACHED PRODUCTION TEST REPORTS INDICATE A DECREASE IN OIL AND WATER DURING MAY AND JUNE. THE DECREASE IN H2S LEVELS IN JUNE REFLECT THIS PRODUCTION DECLINE. WITH LESS STEAM INJECTED, THE LESS H2S IS PRODUCED.
WELL 66-46-SX-3 HAD AN ACID TREATMENT IN JUNE.

Cost:
The cost of the Nutrient was $660.00 per well with National Parakleen providing two drums and Fluor Daniel purchasing two drums. The truck service was provided as an in kind service by Fluor Daniel. Had the truck time been included, the cost would have been $85.00 per well or a total cost of $340.00.

Conclusion:
The treatment was successful in lowering the H2S concentration at each well during April and May. The sudden decline' in H2S levels in June is attributed to the decrease in production caused by the cessation of steam injection into this pattern of wells. Further study is recommended to determine the frequency of treatment during a period when steam injection remains constant.

cc: Fred Brown
Alan Khatib

07/11/94

DATES SELECTED: 01/01/94-07/10/94

PRODUCTION SYSTEM

WELL TEST REPORT BY WELL

	TEST						FLUID							AVERAGE		
	DATE	HOURS	OIL	WATER	GAS	GOR	WOR	SHOT DATE	ABOVE PUMP	TRT PSI	TBG PSI	CSG PSI	SPM	TC ON PCT	OIL	WATER	GAS
66-46-SX-3			B-1-3														
	01/02/94	8.0	6.9	37.5	.0	0	5.4	12/15/93	0		40	OP	13.0	100.0	13.7 P	38.2	.0
	01/27/94	8.0	9.9	45.0	.0	0	4.6	12/15/93	0		40	OP	13.0	100.0	13.7 P	38.2	.0
	02/15/94	8.0	7.8	39.3	.0	0	5.0	12/15/93	0		40	OP	13.0	100.0	13.7 P	39.7	.0
	03/03/94	16.0	5.9	52.8	.0	0	9.0	12/15/93	0		40	OP	13.0	100.0	13.7 P	40.6	.0
	03/21/94	8.0	9.6	163.8	.0	0	17.1	03/21/94	0		40	0	13.0	100.0	13.7 P	45.7	.0
	03/25/94	8.0	13.5	69.9	.0	0	5.2	03/21/94	0		40	0	13.0	100.0	13.7 A	85.3	.0
	04/03/94	16.0	8.7	111.5	.0	0	12.8	03/21/94	0		40	0	13.0	100.0	13.7 A	95.5	.0
	04/22/94	16.0	14.7	145.2	.0	0	9.9	03/21/94	0		40	0	13.0	100.0	13.7 A	115.1	.0
	04/24/94	16.0	13.7	142.4	.0	0	10.4	03/21/94	0		40	0	13.0	100.0	13.7 A	108.9	.0
	05/08/94	8.0	10.2	145.2	.0	0	14.2	03/21/94	0		40	0	13.0	100.0	13.7 A	133.0	.0
	06/05/94	24.0	11.5	59.5	.0	0	5.2	03/21/94	0		40	0	13.0	100.0	13.7 A	144.3	.0
	06/07/94	17.0	9.0	29.1	.0	0	3.2	03/21/94	0		40	0	13.0	100.0	13.7 A	144.3	.0
	06/08/94	20.0	25.9	87.5	.0	0	3.4	03/21/94	0		40	0	13.0	100.0	13.7 A	77.9	.0
	06/18/94	22.0	11.2	56.9	.0	0	5.1	03/21/94	0		40	0	13.0	100.0	13.7 A	58.7	.0
	06/28/94	24.0	10.7	55.5	.0	0	5.2	03/21/94	0		40	0	13.0	100.0	13.7 A	58.3	.0
67-13-SX-3			B-1-3														
H	01/05/94	24.0	.0	.2	.0	0	.0	12/13/93	0		70	OP	12.5	100.0	7.0 A	81.1	.0
H	01/09/94	24.0	2.7	6.5	.0	0	2.4	01/09/94	0		30	0	12.5	100.0	7.0 A	81.1	.0
	01/12/94	24.0	8.2	90.8	.0	0	11.1	01/09/94	0		30	0	12.5	100.0	7.0 A	81.1	.0
	01/14/94	24.0	8.4	70.4	.0	0	8.4	01/09/94	0		30	0	12.5	100.0	7.0 A	83.4	.0
	01/31/94	24.0	2.3	28.1	.0	0	12.2	01/09/94	0		30	0	12.5	100.0	7.0 P	81.7	.0
	02/27/94	24.0	8.9	53.1	.0	0	6.0	02/27/94	0		30	0	12.5	100.0	7.0 P	63.1	.0
	03/22/94	24.0	8.0	49.2	.0	0	6.2	03/22/94	0		35	0	12.5	100.0	7.0 P	50.5	.0
	03/25/94	24.0	8.2	48.6	.0	0	5.9	03/22/94	0		35	0	12.5	100.0	7.0 A	43.5	.0
	04/09/94	24.0	7.6	49.9	.0	0	6.6	04/09/94	0		30	0	12.5	100.0	7.0 A	50.3	.0
	04/17/94	24.0	8.1	58.5	.0	0	7.2	04/17/94	0		35	0	12.5	100.0	7.0 A	49.2	.0
H	05/10/94	24.0	2.6	16.2	.0	0	6.2	04/17/94	0		35	0	12.5	100.0	7.0 A	52.3	.0
	05/22/94	24.0	7.9	44.5	.0	0	5.6	04/17/94	0		35	0	12.5	100.0	7.0 A	52.3	.0
	06/10/94	24.0	6.7	42.6	.0	0	6.4	04/17/94	0		35	0	12.5	100.0	7.0 A	51.0	.0
	06/17/94	24.0	6.4	41.3	.0	0	6.5	04/17/94	0		35	0	12.5	100.0	7.0 A	48.5	.0
	07/02/94	24.0	6.2	39.1	.0	0	6.3	04/17/94	0		35	0	12.5	100.0	7.0 A	42.8	.0
76-14-SX-3			B-1-3														
	01/04/94	24.0	8.0	104.1	.0	0	13.0	11/30/93	0		50	0	21.0	100.0	12.1 P	94.8	.0
	01/16/94	24.0	7.4	119.7	.0	0	16.2	01/16/94	0		60	0	16.5	100.0	12.1 P	97.3	.0
	01/30/94	24.0	5.5	61.1	.0	0	11.1	01/16/94	0		60	0	16.5	100.0	12.1 P	106.7	.0
	02/19/94	24.0	5.7	105.8	.0	0	18.6	02/19/94	0		60	0	16.5	100.0	12.1 P	95.0	.0
	03/07/94	24.0	7.4	78.9	.0	0	10.7	03/07/94	0		60	0	16.5	100.0	12.1 P	95.5	.0
	04/01/94	24.0	6.7	72.7	.0	0	10.9	04/01/94	0		60	0	16.5	100.0	12.1 P	81.9	.0
	04/18/94	24.0	9.4	108.1	.0	0	11.5	04/01/94	0		60	0	16.5	100.0	12.1 A	85.8	.0
	05/06/94	24.0	9.1	69.2	.0	0	7.6	04/01/94	0		60	0	16.5	100.0	12.1 A	86.6	.0
	05/13/94	24.0	13.2	119.5	.0	0	9.1	04/01/94	0		60	0	16.5	100.0	12.1 A	83.3	.0
	05/14/94	24.0	15.5	115.8	.0	0	7.5	04/01/94	0		60	0	16.5	100.0	12.1 A	83.3	.0
	05/20/94	24.0	16.0	91.5	.0	0	5.7	04/01/94	0		60	0	16.5	100.0	12.1 A	101.5	.0
	05/21/94	24.0	15.8	91.2	.0	0	5.8	04/01/94	0		60	0	16.5	100.0	12.1 A	101.5	.0
	06/08/94	20.0	11.2	74.5	.0	0	6.7	04/01/94	0		60	0	16.5	100.0	12.1 A	99.5	.0
	06/22/94	24.0	9.4	53.3	.0	0	5.7	04/01/94	0		60	0	16.5	100.0	12.1 A	85.7	.0

07/11/94

DATES SELECTED: 01/01/94-07/10/94

PRODUCTION SYSTEM
WELL TEST REPORT BY WELL

TEST							FLUID							AVERAGE		
DATE	HOURS	OIL	WATER	GAS	GOR	WOR	SHOT DATE	ABOVE PUMP	TRT PSI	TBG PSI	CSG PSI	SPM	TC ON PCT	OIL	WATER	GAS
77-32-SX-3		B-1-3														
01/03/94	8.0	5.4	55.8	.0	0	10.3	12/13/93	0		50	OP	14.0	100.0	11.0 P	70.0	.0
02/01/94	8.0	4.5	66.0	.0	0	14.7	12/13/93	0		50	OP	14.0	100.0	11.0 P	67.0	.0
02/09/94	16.0	11.1	84.5	.0	0	7.6	12/13/93	0		50	OP	14.0	100.0	11.0 P	64.5	.0
02/14/94	8.0	5.4	64.2	.0	0	11.9	12/13/93	0		50	OP	14.0	100.0	11.0 P	68.8	.0
03/05/94	8.0	10.2	92.4	.0	0	9.1	03/05/94	0		50	0	14.0	100.0	11.0 P	71.6	.0
03/23/94	16.0	10.5	67.5	.0	0	6.4	03/23/94	0		50	0	14.0	100.0	11.0 A	80.4	.0
04/02/94	8.0	14.7	117.0	.0	0	8.0	03/23/94	0		50	0	14.0	100.0	11.0 A	74.7	.0
04/04/94	8.0	9.9	159.3	.0	0	16.1	03/23/94	0		50	0	14.0	100.0	11.0 A	74.7	.0
04/21/94	16.0	13.2	90.3	.0	0	6.8	03/23/94	0		50	0	14.0	100.0	11.0 A	114.6	.0
04/25/94	16.0	13.1	87.9	.0	0	6.7	03/23/94	0		50	0	14.0	100.0	11.0 A	122.2	.0
06/02/94	24.0	9.7	66.8	.0	0	6.9	03/23/94	0		50	0	14.0	100.0	11.0 A	112.5	.0
06/03/94	24.0	10.1	70.0	.0	0	6.9	03/23/94	0		50	0	14.0	100.0	11.0 A	112.5	.0

* INDICATES INVALID TEST
I INDICATES INTERMITTENT PRODUCER TEST
H INDICATES TEST UNDER ABNORMAL COND. - KEPT FOR HISTORY ONLY
D INDICATES SPECIAL 24 HOUR TEST ON DUAL FLOWLINE WELLS
OIL, WATER, GAS FIGURES ARE FOR 24 HOUR TEST
OIL FIGURES FOLLOWED BY P INDICATE POTENTIAL
OIL FIGURES FOLLOWED BY A INDICATE AVERAGE