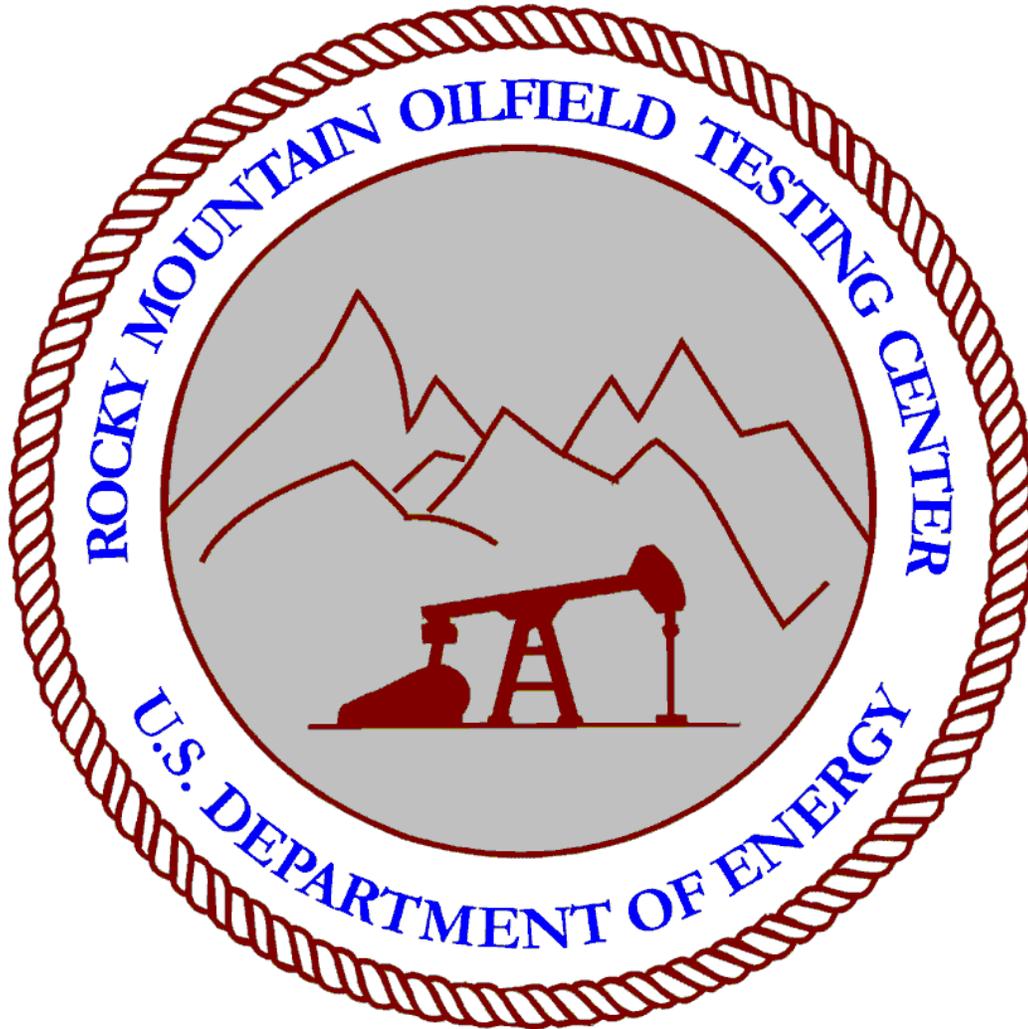


ROCKY MOUNTAIN OILFIELD TESTING CENTER

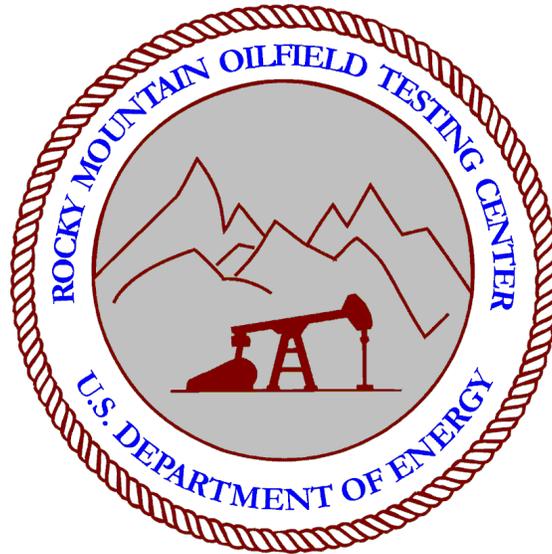
PROJECT TEST RESULTS



MAG-WELL DOWNHOLE MAGNETIC FLUID CONDITIONERS  
APRIL 4, 1995

FC9511 / 95PT5

ROCKY MOUNTAIN OILFIELD TESTING CENTER



# MAG-WELL DOWNHOLE MAGNETIC FLUID CONDITIONERS

## PROJECT TEST RESULTS

Prepared for:

Industry Publication

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November 28, 1995

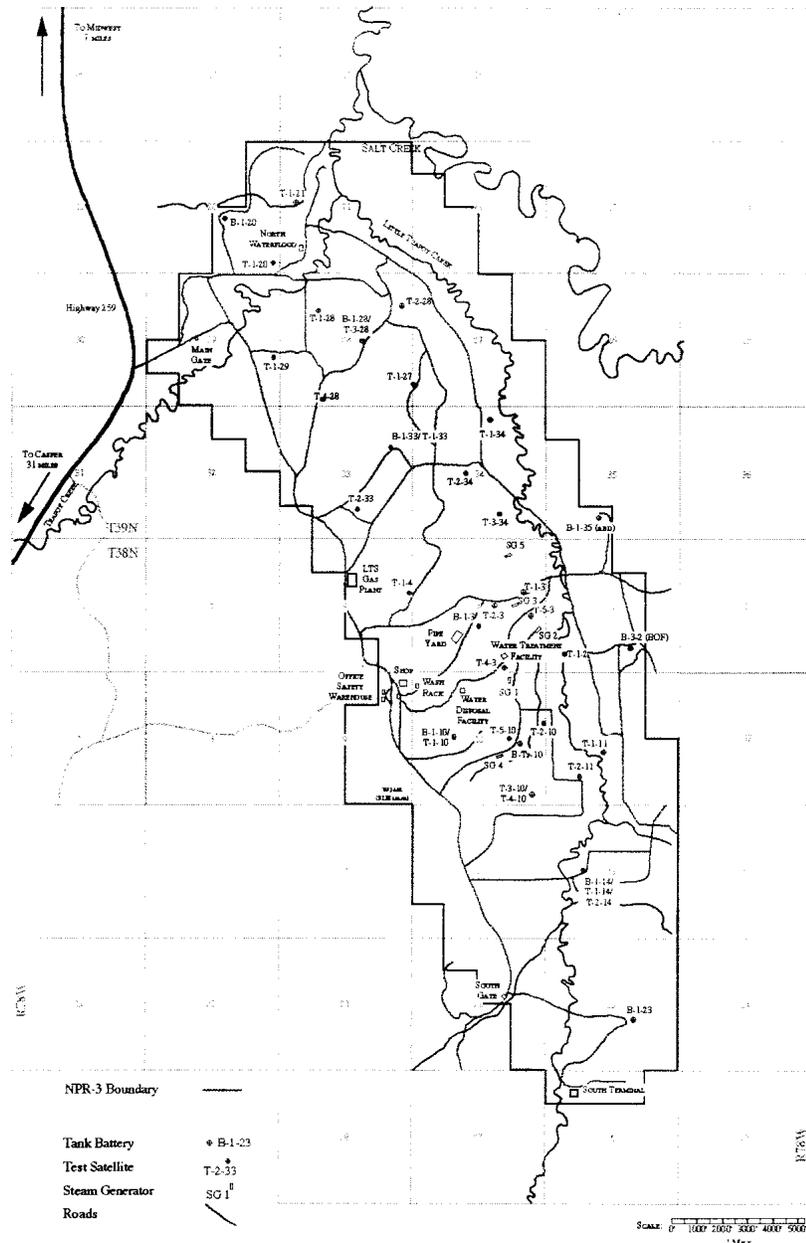
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**ABSTRACT**  
**November 28, 1995**

The Rocky Mountain Oilfield Testing Center (RMOTC) conducted a field test on the Mag-Well Downhole Magnetic Fluid Conditioners (MFCs), at the Naval Petroleum Reserve No. 3 (NPR-3) located 35 miles north of Casper in Natrona County, Wyoming. Mag-Well, Inc., manufactures the MFCs, that are designed to reduce scale and paraffin buildup on the rods, tubing and downhole pump of producing oil wells. The Mag-Well magnetic tools failed to reduce scale formation in the pump and on the rods and tubing of the wells tested. The formation of scale inside the magnetic tool showed that the tool is ineffective in the prevention of scale formation. There were no production increases or extended run times observed on the test wells.

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**Naval Petroleum Reserve  
No. 3 Roads and Facilities  
Map**

# ROCKY MOUNTAIN OILFIELD TESTING CENTER PROJECT TEST RESULTS

## MAG-WELL DOWNHOLE MAGNETIC FLUID CONDITIONERS

November 27, 1995

### INTRODUCTION:

The Rocky Mountain Oilfield Testing Center (RMOTC) conducted a field test on the Mag-Well Downhole Magnetic Fluid Conditioners (MFCs), at the Naval Petroleum Reserve No. 3 (NPR-3) located 35 miles north of Casper in Natrona County, Wyoming [T39N, R78W, Section 10 (see Map, page 2)].

Mag-Well Inc., of McAllen Texas, manufactures the MFCs, that are designed to reduce scale and paraffin buildup on the rods, tubing and downhole pump of producing oil wells. The MFC tools are designed to perform in any type of oil or water well. An MFC for downhole use in a pumping oil well is a device attached to the bottom of the rod pump that requires no external power to operate. Magnetic fields across fluid passages in the stainless steel body of the MFCs are powered by rare earth permanent magnets and designed to interact with many types of charged species in the produced fluids effecting precipitation and crystallization of both organic and inorganic solids. The elimination of these solids in the well and associated equipment should increase production, reduced operating costs and environmental damage.

**TEST RESULTS:****Scale Problem Wells**

Two downhole magnets were tested at NPR-3, on Wells 62-1 -SX-3 and 72-2SX-3. Both wells produce from the Shannon formation at depths of 382-520 ft, are in an active steam drive area, and had experienced high failure rates due to scale formation in the pump, pump inlet, on the sucker rods, and tubing. The wells were pulled frequently for pump changes or treated with an acid solution due to scale problems.

The downhole magnets were installed and the wells were treated with a 5% hydrochloric (HCl) acid treatment to clean the wellbore and tubulars of scale deposits. The wells were monitored by Pump-Off Controllers (POC's) daily for run time history and tested through vertical treaters for oil and water production. No other type of treatment was conducted on the wells during the test period.

**PRODUCTION HISTORY: Scale Problem Wells****WELL 62-1 -SX-3****WELL 72-2-SX-3**

<u>Month</u>	<u>Average Prod., BPD</u>		<u>Days on Production</u>	<u>Average Prod., BPD</u>		<u>Days on Production</u>
	<u>Oil</u>	<u>Water</u>		<u>Oil</u>	<u>Water</u>	
Jan	21	345	31	10	192	30
Feb	15	435	28	10	224	23
March	16	319	29	4	143	27
April	24	414	28	4	129	25
May	19	268	30	5	99	30
June	12	192	30	10	140	30

**PULLING AND TREATMENT HISTORY:**

<u>Date</u>	<u>Well 62-1 -SX-3</u>	<u>Remarks</u>
11-21-94 .....		Pump changed - Moderate scale
12-27-94 .....		Pump hanging up - Treated 5% HCL
02-22-95 .....		Pump hanging up - Treated 10% HCL
02-23-95 .....		<b>Mag-Well magnet installed</b>
03-21-95 .....		<b>Removed Mag- Well magnet - Pump inlet scaled off</b>

**Well 72-1-SX-3**

12-08-94 .....		Pump change - Moderate scale
01-25-95 .....		Pump hanging up - Treated 5% HCl
02-02-95 .....		Pump change - Pump intake scaled off
02-16-95 .....		Treated with 10% HCl
02-18-95 .....		<b>Mag-Well Magnet Installed</b>
03-14-95 .....		<b>Removed Mag-Well Magnet - Pump inlet scaled off</b>
04-13-95 .....		Treated 5% HCl
04-14-95 .....		Scale squeeze
05-11-95 .....		Pump change - No scale

**OBSERVATIONS:**

The run time on Well 62-1 -SX-3 was 26 days, and on Well 72-1 -SX-3 24 days before the pumps failed and the magnets were removed. On each well, pump problems were observed in the pumping cycle as suggested by the POC's, but due to rig availability the wells were not pulled until days showed. When the pumps were disassembled for repair, heavy scale deposits were found on the inside of the magnets, on the ball and seat of the pumps, and on the sucker rods above the pumps.

## TEST RESULTS: Paraffin Problem Wells

Two downhole magnets were tested at NPR-3, on Wells 55-STX-23 and 48-2-SHX-34. Both wells produce from the Niobrara Shale formation. Well 55-STX-23 is completed with 4.5" casing with perforations from 2682 to 2684 ft with one shot per foot. Well 48-2-SHX-34 is completed Open Hole from 2204 to 2230 ft. Both wells have experienced heavy paraffin buildup on the pump, pump inlet, on the sucker rods, and tubing. The wells were pulled frequently for pump changes or treated with a paraffin solvent or hot oil treatment on a regular schedule to maintain production and reduce pulling cost.

## PRODUCTION HISTORY: Paraffin Problem Wells

<u>Month</u>	<u>WELL 55-STX-23</u>		<u>Days On- Production</u>	<u>WELL 48-2-ShX-34</u>		<u>Days on Production</u>
	<u>Average Prod., BPD</u>	<u>Average Prod., BPD</u>		<u>Oil</u>	<u>Water</u>	
	<u>Oil</u>	<u>Water</u>		<u>Oil</u>	<u>Water</u>	
Jan	30	0	31	5	0	31
Feb	29	0	28	5	0	28
March	30	0	30	5	0	31
April	28	0	28	8	0	22
May	27	0	27	8	0	31
June	26	0	29	3	0	30
July	21	0	31	4	0	31
August	23	0	31	4	0	31
Sept	23	0	30	5	0	30
Oct	23	0	31	5	0	31

**PULLING AND TREATMENT HISTORY:**

Date	Well 55-STX-23	Remarks
11-30-94	.....	Pump changed. Heavy paraffin. Tubing treated with 40 bbls of hot oil to remove pump and rods. 20 bbls of xyelene/diesel mix down tubing before install new pump and rods.
12-15-94	.....	Pump hanging up. Treated with 10 bbls paraffin solvent mix.
03-06-95	.....	Treated with 40 bbls hot oil and paraffin solvent to clean tubulars prior to install of Mag-Well Magnet.
03-07-95	.....	<b>Mag-Well Magnet Installed</b>
06-07-95	.....	<b>Removed Mag- Welt Magnet.</b> Moderate to heavy paraffin found throughout rod string and in pump.
07-20-95	.....	Treated with 20 bbls solvent and 40 bbls hotoil.

**Well 48-2-SHX-34**

04-19-95	.....	Pump change. Heavy paraffin.
04-20-95	.....	<b>Mag-Well Magnet Installed.</b> Well treated with 10 bbls paraffin solvent and 40 bbls of hot Tensleep oil.
08-02-95	.....	<b>Removed Mag- Well Magnet.</b> Light paraffin observed on sucker rods.
10-8-95	.....	Pump change. Rods and pump had heavy paraffin buildup. Hot diesel had to be poured in tubing to install new pump and rods.

## **CONCLUSION:**

The Mag-Well magnetic tools failed to reduce scale formation on the pump and rods of the wells tested. The formation of scale inside the magnetic tool and in the pump shows that the tool is ineffective in the prevention of scale formation. There were no production increases or extended run times observed on these test wells. The Mag-Well magnetic tools are not recommended for use in steamflood applications for oil production.

The Mag-Well magnetic tools did demonstrate moderate success in the paraffin test wells. On Well 48-2-SHX-34 the paraffin buildup was reduced during the test period when the MFC was in the well. Heavy paraffin was seen in the well after the tool was removed. On Well 55-STX-23 paraffin was reduced but well production declined. The MFC did treat the oil as it passed through the tool but had no effect on the formation or perforations. The well was returned to regular hot-oil treatments.

## **ACKNOWLEDGEMENTS:**

This research was funded by the Mag-Well and the Rocky Mountain Oilfield Testing Center (RMOTC). Work was directed by Michael R. Tyler, RMOTC Field Engineer, and supported by Jeanette Buelt, RMOTC Engineering Technician; Matt Hoffman, Sr. Well Technician; Pete Toups, Workover Rig Supervisor; Bill Gillam, Pumper A; and Brian Meidinger, Pumper A. RMOTC is operated by Fluor Daniel (NPOSR), Inc., the Management and Operating Contractor for the Department of Energy Naval Petroleum and Oil Shale Reserves in Colorado, Utah, and Wyoming (NPOSR-CUW).

RMOTCs goal is to partner with the oil industry to improve productivity through field testing of new petroleum technology, evaluate new equipment and techniques, disseminate information to the petroleum industry, and conduct training for universities, Native Americans, and private industry. For more information contact the Rocky Mountain Oilfield Testing Center, 907 North Poplar, Suite 100, Casper, Wyoming 82601 or telephone (307) 261-5000, Extension 5060.

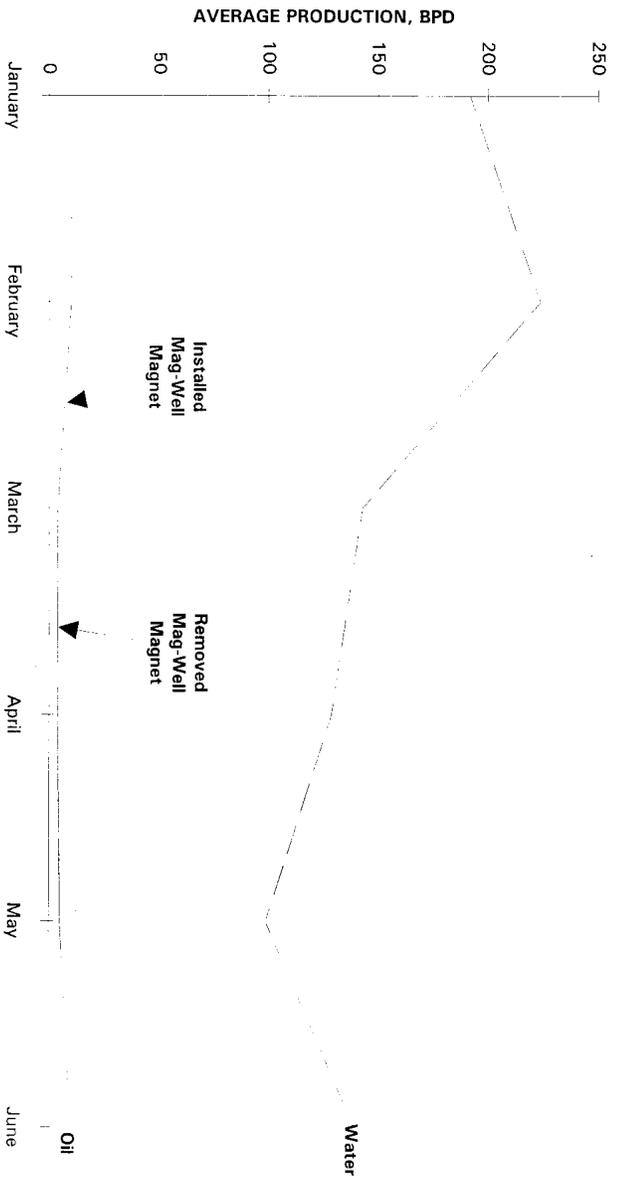
**PRODUCTION HISTORY (Scale Problem) WELL 72-2-SX-3**

Month	Average Production, BPD		Days on Production
	Oil	Water	
Jan	10	192	30
Feb	10	224	23
March	4	143	27
April	4	129	25
May	5	99	30
June	10	140	30

**PULLING AND TREATMENT HISTORY WELL 72-2-SX-3**

<u>Date</u>	<u>Remarks</u>
12-08-94	Pump change - Moderate scale
01-25-95	Pump hanging up - Treated 5% HCl
02-02-95	Pump change - Pump intake scaled off
02-16-95	Treated with 10% HCl
02-18-95	<b>Mag-Well Magnet Installed</b>
03-14-95	<b>Removed Mag-Well Magnet - Pump inlet scaled off</b>
04-13-95	Treated 5% HCl
04-14-95	Scale squeeze
05-11-95	Pump change - No scale

**MAG-WELL / SCALE PROBLEM  
 PRODUCTION HISTORY WELL 72-2-SX-3**



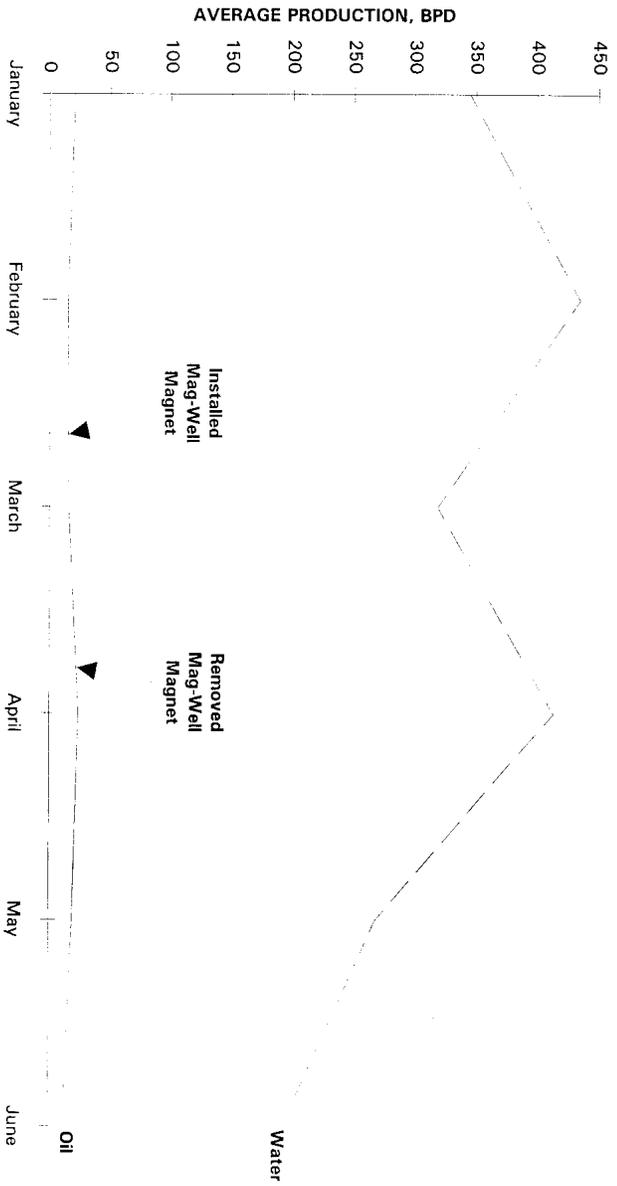
### PRODUCTION HISTORY (Scale Problem) WELL 62-1-SX-3

Month	Average Production, BPD		Days on Production
	Oil	Water	
Jan	21	345	31
Feb	15	435	28
March	16	319	29
April	24	414	28
May	19	268	30
June	12	192	30

### PULLING AND TREATMENT HISTORY WELL 62-1-SX-3

Date	Remarks
11-21-94	Pump changed - Moderate scale
12-27-94	Pump hanging up - Treated 5% HCL
02-22-95	Pump hanging up - Treated 10% HCL
02-23-95	<i>Mag-Well magnet installed</i>
03-21-95	<i>Removed Mag-Well magnet - Pump inlet scaled off</i>

**MAG-WELL / SCALE PROBLEM  
 PRODUCTION HISTORY WELL 62-1-SX-3**



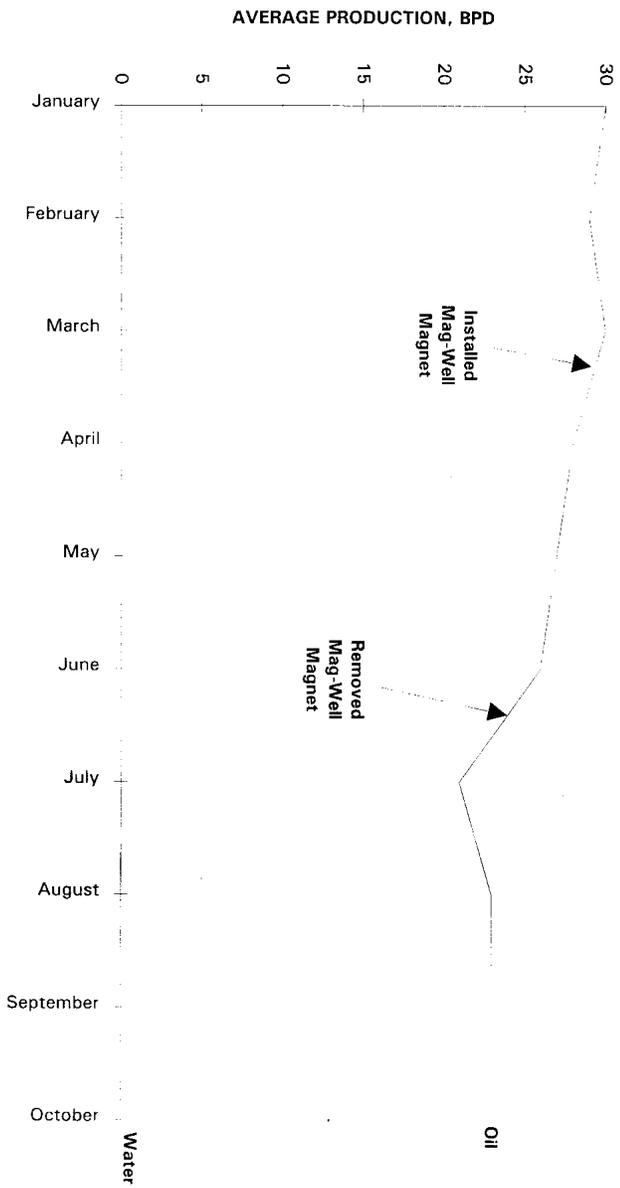
## PRODUCTION HISTORY (Paraffin Problem) WELL 55-STX-23

<u>Month</u>	<u>Average Production, BPD</u>		<u>Days on Production</u>
	<u>Oil</u>	<u>Water</u>	
Jan	30	0	31
Feb	29	0	28
March	30	0	30
April	28	0	28
May	27	0	27
June	26	0	29
July	21	0	31
August	23	0	31
Sept	23	0	30
Oct	23	0	31

## PULLING AND TREATMENT HISTORY WELL 55-STX-23

<u>Date</u>	<u>Remarks</u>
11-30-94	Pump changed - Heavy paraffin
12-15-94	Pump hanging up - Treated with paraffin solvent mix
03-06-95	Treated with hot oil and paraffin solvent
03-07-95	<i>Installed Mag-Well Magnet</i>
06-07-95	<i>Removed Mag-Well Magnet</i> - Moderate to heavy paraffin
07-20-95	Treated with solvent and hot oil

# MAG-WELL / PARAFFIN PROBLEM PRODUCTION HISTORY WELL 55-STX-23



**PRODUCTION HISTORY (Paraffin Problem) WELL 48-2-SHX-34**

<u>Month</u>	<u>Average Production, BPD</u>		<u>Days on Production</u>
	<u>Oil</u>	<u>Water</u>	
Jan	5	0	31
Feb	5	0	28
March	5	0	31
April	8	0	22
May	8	0	31
June	3	0	30
July	4	0	31
August	4	0	31
Sept	5	0	30
Oct	5	0	31

**PULLING AND TREATMENT HISTORY WELL 48-2-SHX-34**

<u>Date</u>	<u>Remarks</u>
04-19-95	..... Pump change - Heavy paraffin
04-20-95	..... <i>Installed Mag-Well Magnet</i>
08-02-95	..... <i>Removed Mag-Well Magnet</i> - Light paraffin observed
10-08-95	..... Pump change - Heavy paraffin - Hot diesel treatment

# MAG-WELL / PARAFFIN PROBLEM PRODUCTION HISTORY WELL 48-2-SHX-34

