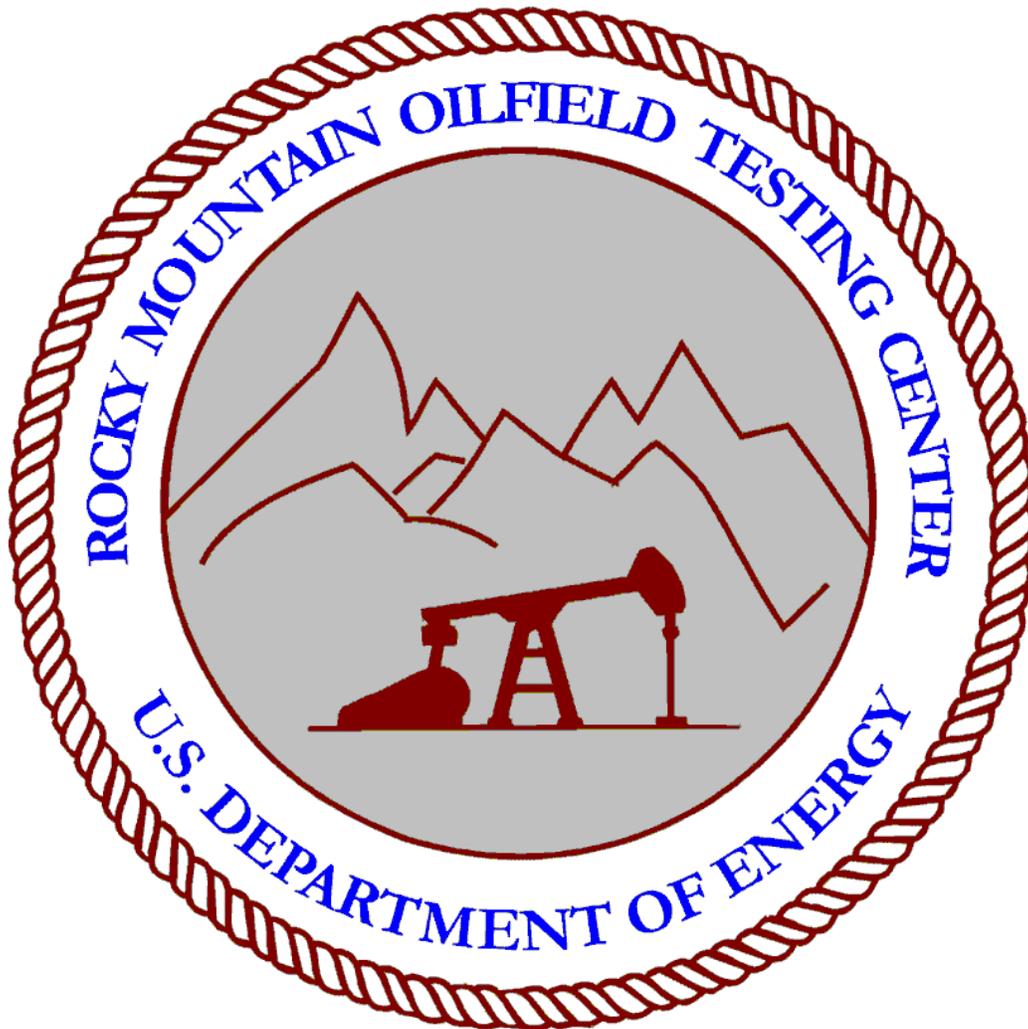


ROCKY MOUNTAIN OILFIELD TESTING CENTER

PROJECT TEST RESULTS



V-GER LUBRICATOR SYSTEM

1994

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1994 RMOTC

RESULTS OF THE V-GER LUBRICATOR SYSTEM TEST AT THE ROCKY MOUNTAIN OILFIELD TESTING CENTER (RMOTC)

Michael Tyler, Marvin Hendricks, and Rhonda Latham

(Tyler is the RMOTC Field Engineer, Hendricks is a Department of Energy Petroleum Engineer, and Latham handles RMOTC communications)

The Rocky Mountain Oilfield Testing Center (RMOTC) has recently released results of a seven month test of a new system which supplies supplementary lubrication to Oilwell pumping units. The following information and data indicate that the V-GER Lubricator System is an efficient device that can provide notable economic and environmental benefits to the petroleum industry.

ROCKY MOUNTAIN OILFIELD TESTING CENTER (RMOTC)

The Rocky Mountain Oilfield Testing Center is operated at Naval Petroleum Reserve No. 3 (NPR-3), also known as the Teapot Dome Oilfield, near Casper, Wyoming. NPR-3 is the only 100% government-owned oilfield in the United States. It is managed and operated by Fluor Daniel, under the direction of the Department of Energy (DOE). This industry-driven venture is in line with the first action strategy of the Secretary of Energy's Domestic Natural Gas and Oil Initiative which mandates use of the Naval Petroleum Reserves for advanced technology testing, evaluation, and training in new oilfield and environmental technologies.

Since our modest beginnings in late 1993, RMOTC has already started to produce results. Projects completed include an Energy-Efficient Motors Study conducted in cooperation with the University of Wyoming and two projects recommended and funded by DOE's Energy-Related Inventions Program: the Oilwell Power Controller and the V-GER Lubricator System (the full V-GER report follows). Several projects are in process, and our Technical Review Panel recently evaluated and ranked proposals for new environmental remediation, drilling, and production techniques.

Teapot Dome field has nine producing horizons ranging in depth from 300 to 6,000 feet (90 to 1,830 in). We currently have 620 producers and 68 injectors, and many types of wells are available for testing. RMOTC also has video/teleconferencing equipment and extensive databases used for computer geologic mapping.

In December of 1993, the Interstate Oil and Gas Compact Commission passed a unanimous resolution in support of RMOTC. Other supporters include the Society of Petroleum Engineers, National Stripper Well Association, the Independent Petroleum Association of America, the Rocky Mountain Oil and Gas Association, and the Independent Petroleum Association of Mountain States.

MANUFACTURER OF THE V-GER LUBRICATOR SYSTEM

The manufacturer of the V-GER Lubricator is Rayco Industries, headed by Raymond Elam of Bakersfield, California. The address and phone number will be found at the end of this article, along with information on how you may contact RMOTC about your proposals for testing oilfield or environmental technologies.

TESTING INFORMATION ON THE V-GER LUBRICATOR

DESCRIPTION:

The V-GER Lubricator is an oilwell polish rod lubrication system that applies a continuous flow of grease to the polish rod (Fig. 1). The unit is mounted above the stuffing box by a clamp that attaches to the walking beam. A chain connects the clamp to the ratchet arm of the V-GER Lubricator. This arm operates the pump that propels the grease through a hose to the polish rod. The lubricator holds six pounds of this grease which is continuously applied to the polish rod at a rate determined by the operator. The unit has the following benefits:

1. Reduces friction between the polish rod and packing, resulting in less heat damage, thereby extending the life of the stuffing box packing
2. Protects the polish rod from electrolysis and corrosive production fluids
3. Lessens the risk/frequency of stuffing box leaks which enhances protection of the environment
4. Reduces labor requirements per well due to less time spent packing stuffing boxes
5. Reduces electrical consumption

TEST RESULTS:

The unit was tested on four wells at Naval Petroleum Reserve No. 3 (NPR-3), in Natrona County, Wyoming, from Dec. 3, 1993, through July 1, 1994. These wells produce from two formations: the Shannon (SX) and the Second Wall Creek (AX). The SX wells are in the steamflood portion of the Shannon formation where wellhead temperatures of 1880 F (87' C) are reached. The unit functioned well in all applications. In the past, Well 52-45-SX-10 had experienced a problem with the polish rod hanging up and the bridle being thrown from the unit. After the V-GER was installed, this problem did not recur. Weather conditions varied from extreme cold to intense heat, and the units operated reliably. There were no spills or other pollution problems while the units were in operation. This avoided downtime, lost production, and extra manhours for maintenance and cleanup of equipment and the environment, which are common difficulties experienced in the oilfield.

COST REDUCTION:

The electrical consumption was measured on well 38-1-AX-34 with a Dranetz Energy Analyzer, and results confirmed an 8% reduction in electricity as anticipated by the inventor. This well had already been equipped with a 7.5 HP (5.6 kW) energy-efficient motor. (Electricity cost is 2.7 Cents per kWh at NPR-3).

An annual reduction of 36 manhours per well was a direct benefit of the V-GER unit. Cost savings were also shown in reduced downtime and longer life of stuffing box packing. The average cost of materials to repack a stuffing box is \$23.00. The frequency of repacking the stuffing box was reduced by 50%, from 8 to 4 times per year, on the test wells. (The average time a well is down to repack the stuffing box is 30 minutes).

ANNUAL EXPENSE SUMMARY			ANNUAL SAVINGS SUMMARY				
			Labor	=	\$ 20.00/hr	x 36 hr	\$ 720.00
			Packing	=	\$ 23.00	x 4	92.00
V-GER Unit	\$365.00	\$365.00	2 hr/yr downtime	=	\$ 7.50/yr	x 1	7.50
Grease 6-lb.	19.65		Electricity cost	=	\$ 0.0271/kWh		
12 Cans	235.80	<u>235.80</u>	460 kWh/yr x \$ 0.027/kWh				<u>12.42</u>
Total Cost		\$600.80	Total Savings				\$ 831.92

Payout of the V-GER Lubrication System will be 9 months, based upon the specific application of Well 38-1-AX-34, equipped with an energy-efficient motor. (It should be noted that results could be even more significant on wells equipped with standard or over-sized motors).

SUMMARY:

The V-GER Lubricator did lower operational costs by reducing manhours, material costs, and electrical requirements. Corrosion of the polish rod was minimized and pollution control was enhanced. The V-GER worked with extremely hot fluids and in, adverse weather conditions.

The V-GER Lubrication System performed well in all test applications on wells at NPR-3. The unit's initial cost and the grease supply cost should be recovered in 9 months.

As the grease is the most important component of this system. consideration should be given to the method of its application. Modification to allow the grease to be applied as required rather than continuously would be beneficial.

NOTE:

Performance of the unit may prove to be different at other oilfields. RMOTC and the Department of Energy are publishing these results to disseminate information to the industry, but do not in any way endorse this or any other device or process tested or to be tested at NPR-3.

V-GER TEST RESULTS

DATE	WELL	UNIT*	SPM*	SL*	TC*	COMMENTS
12-3-93	71-1-SX-10	22821386	7	86	100%	
		OIL BPD	WATER BPD		GREASE VOLUME	
12-31-93	avg*	7.0	78.0			
1-21-94				6 1/16"		
1-26-94						Acidized well
1-31-94	avg	4.0	52.0	4 1/4"		Wellhead 188°F
2-1-94						Pump lost prime -20°F
2-24-94						Repaired priming mechanism, installed new screw on unit
2-25-94				1 1/4"		
2-26-94				5 5/8"		New grease can
2-28-94	avg	3.0	53.0	5 1/2"		
3-1-94				5 1/4"		
3-4-94						Replaced skinner wiping rubber
3-12-94						Wellhead temp 1300° F
3-25-94				5/16"		Wellhead temp 124° F
3-26-94			New grease can			
3-27-94				5 5/8"		
3-31-94	avg	2.0	26.0			
	AVG	Average daily allocated production for the month				
	UNIT	API Pumping Unit				
	SPM	Strokes Per Minute				
	SL	Stroke Length				
	TC	Time Clock, % on				

V-GER TEST RESULTS

DATE	WELL	UNIT	SPM	SL	TC COMMENTS
4-1-94	64-25-SX-10	57B76E54	18	54	100% V-GER installed
		OIL BPD	WATER BPD	GREASE VOLUME	
1-31-94	avg	5.0	94.0		
2-28-94	avg	5.0	127.0		
3-31-94	avg	4.0	165.0		
4-1-94				6 ¼"	Installed new stuffing box packing
4-17-94				2"	New grease can
4-18-94				6 5/8"	Adjusted to use less grease
4-30-94	avg	4.0	165.0	2 ¼"	Adjusted to use less grease
5-1-94				2 ¼"	
5-6-94				2"	Tightened stuffing box 1/4 turn
5-12-94				1 ½"	
5-18-94					Tightened stuffing box 1/4 turn
5-20-94				7 1/8"	New grease can
5-27-94				6 ½"	
5-31-94	avg	4.0	167.0	6"	Tightened stuffing box 1/4 turn

V-GER TEST RESULTS

DATE	WELL	UNIT	SPM	SL	TC	COMMENTS
2-4-94	52-45-SX-	10 25B53E30	17	36	100	V-GER installed Well has scale problem & 180' F fluid
		OIL BPD	WATER BPD	GREASE VOLUME		
1-31-94	avg	5.0	77.0			
2-4-94				1 1/2"		
2-11-94						Wellhead assembly bends easily
2-17-94				3/16"		Unit threw off bridle New grease can
2-18-94				6 3/8"		
2-23-94				5 7/8"		Very cold -7' F
2-24-94						Measurement problems
2-28-94	avg	5.0	72.0	5 11/16		
3-1-94				5 5/8"		Vented annulus
3-11-94				5 1/16"		Adjusted to use less grease
3-19-94				4 3/4"		Tightened stuffing box 1/4 turn
3-31-94	avg	5.0	72.0	4 5/16"		Unit working okay
4-1-94				4 5/16"		
4-13-94						Installed new packing
4-15-94						Tightened stuffing box 1/4/turn
4-18-94						Acidized flowline
4-30-94	avg	5.0	72.0	2 3/4"		
5-1-94				2 1/4 "		
5-6-94				2"		Tightened stuffing box 1/4 turn
5-12-94				1 1/2 "		
5-16-94						F?
5-18-94						Tighten stuffing box 1/4 turn
5-20-94				7 1/8"		New grease can
5-27-94				6 1/2 "		
5-31-94	avg	4.0	72.0	6"		Tightened stuffing box 1/4 turn

V-GER TEST RESULTS

DATE	WELL	UNIT	SPM	SL	TC	COMMENTS
4-14-94	82-AX-20	160D15068	10.5	86	75%	V-GER installed
		OIL BPD	WATER BPD	GREASE VOLUME		
1-31-94	avg	2.0	272.0			
2-28-94	avg	2.0	272.0			
3-31-94	avg	3.0	272.0			
4-14-9				5 1/4"		V-GER installed
4-31-94	avg	2.0	272.0	1 1/8"		
5-1-94				1 1/8"		New grease can
5-2-94				7"		
5-3-94				6 1/2		
5-4-94				6"		
5-5-94				5 3/4"		
5-6-94				5 1/2 "		
5-7-94				5 1/4 "		
5-8-94				5"		
5-9-94				4 3/4"		
5-10-94				4 1/2 "		
5-11-94				4 1/4 "		
5-12-94				4"		
5-13-94				3 3/4"		
5-14-94				3 1/2 "		
5-15-94				3 1/4 "		
5-16-94				3"		
5-17-94				2 3/4"		
5-18-94				2 1/4		
5-31-94	avg	2.0	272.0			

For more information on the V-GER, please feel free to contact the manufacturer:

Raymond Elam
Rayco Industries
8536 Kern Canyon Rd., Sp-41
Bakersfield, California 93306
(805) 366-9416; FAX (805) 366-9416

If you are interested in *RMOTC: WHERE YOUR IDEA CAN BECOME A REALITY!*, please request our information packet and brochure from:

Rhonda Latham, Communications
Rocky Mt. Oilfield Testing Center
% Fluor Daniel (NPOSR), Inc.
907 North Poplar, Suite 100
Casper, Wyoming 82601
(307) 261-5000, ext. 5060
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Tests show benefits of new polished rod lubricator

Michael R. Tyler, Alan Khatib Rocky Mountain Oilfield Testing Center Casper, Wyo.

Tests with beam-pumped oil wells, completed over 7-months at the Rocky Mountain Oilfield Testing Center (Rmotc), indicated that a new lubricator supplying supplementary grease to polished rods lowered operating costs by reducing maintenance, material costs, and electrical requirements.

It also minimized polished rod corrosion and enhanced pollution control.

The lubricator worked with extremely hot fluids and in adverse weather conditions.

Rmotc

Rmotc is at Naval Petroleum Reserve No. 3 (NPR-3), also known as the Teapot Dome oil field in Natrona County, near Casper, Wyo. NPR-3 is the only 100% U.S. government-owned oil field. Fluor Daniel manages and operates the field for the U.S. Department of Energy (DOE).

The activities at Rmotc are

in line with the Secretary of Energy's mandates to use the Naval petroleum reserves for advanced technology testing, evaluation, and training in new oil field and environmental technologies.

Teapot Dome has nine producing horizons, ranging in depth from 300 to 6,000 ft. Currently there are 571 producing and 76 injection wells. Many different types of wells are available for testing. Rmotc also has video/teleconferencing equipment and extensive data bases for computer geologic mapping.

Although subcontractors are used at times, NPR-3 is a self-contained operation that provides great flexibility.

On site support includes water treatment and disposal facilities, steam generators, drilling and workover rigs, heavy equipment, etc. NPR-3 also has a stable and highly trained workforce that is knowledgeable in environ-

mental, safety, and health compliance.

New lubricator

Rayco Industries manufactures the lubricator, V-GER. The lubricator applies continuous flow of a specially designed grease to the polished rod (Fig. 1). The lubricator is mounted on the pumping unit base. The ratchet arm of the lubricator is connected by a chain to a clamp on the walking beam. This arm operates the pump for injecting the grease through a hose to the polished rod (Fig. 2).

The lubricator holds 6 lb of grease that is continuously pumped at a rate determined by the operator. The benefits of the unit are as follows:

- Extends stuffing box life by reducing friction between the polished rod and packing that can cause heat damage.
- Protects the polished rod from electrolysis and corrosive production fluids
- Lessens the risk/frequency of stuffing box leaks that can affect the environment
- Reduces labor require-

ments per well because less time is spent packing stuffing boxes

- Reduces electrical consumption.

Test wells

The lubricator was tested on four wells at NPR-3 from Dec. 3, 1993, through July 1, 1994. These wells produce from two formations: the Shannon (SX) at about 300 ft and the Second Wall Creek (AX) at about 2,300 ft.

The SX wells are in the steam flood portion of the Shannon formation. Here, wellhead temperatures reach 188° F.

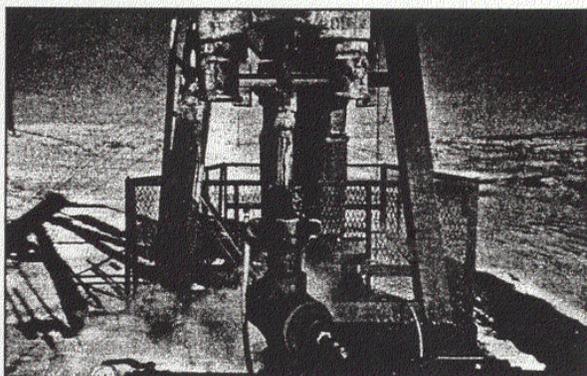
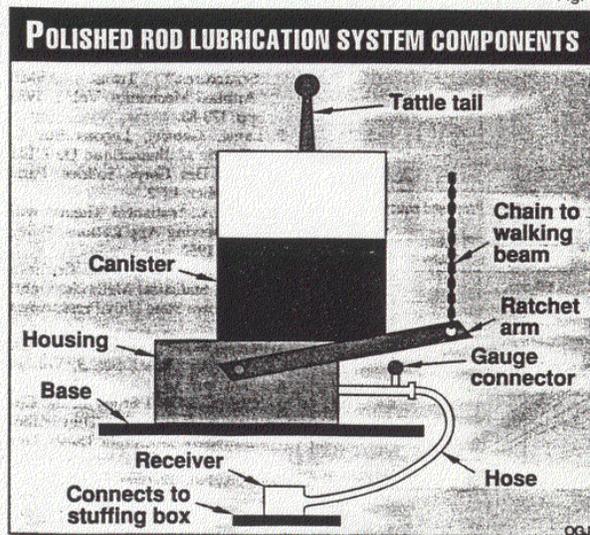
The Second Wall Creek wells were selected because their produced water is corrosive.

The lubricators operated reliably in weather conditions that varied from extreme cold to intense heat.

On Well 52-45-SX-10, a problem with the polished rod hanging up and the bridle being thrown from the unit did not recur after installation of the new lubricator.

There were no spills or other pollution problems while the lubricators were operating.

Fig. 1



The V-GER lubricator on a producing well in the steam flood area of Teapot Dome field (Fig. 2).