



Chevron Resources Company

A Division of Chevron Industries, Inc.
P.O. Box 858, Milford, UT 84751

Re: RHSU 82-33 FALL 1989 CLEANOUTS
March 21, 1990

Terry S. Allen:

The following is a summary of the two cleanouts conducted last fall on injection well RHSU 82-33. Also attached are detailed job reports.

The perforations of injection well RHSU 82-33 were severely plugged with silica scale twice this past fall. As previously documented, the cause of this scale is dropping the temperature of the injected fluid below 270 degrees F. There are two main reasons for this temperature drop. The first is a loss of pressure due to inadequate flow in the pipeline. The second cause of temperature drop is due to dilution with the much cooler cooling tower blowdown. Controlling these factors is dependent upon operations and UP&L. Hence, at times these factors can't be controlled and the perforations get plugged.

On October 10, 1989 we cleaned out the perforations by acidizing with Dowell. We pumped 1250 gals of Formic Acid followed by 2500 gals. of 12-6 Super Mud Acid. This was the seventh cleanout of this well and the second by HF acid. The job was successful in that maximum injection was increased from 435 k LBM/HR to 675 K LBM/HR. The job was a disappointment in that previous cleanouts (including a mud acid job) have increased maximum injection to about 800 k LBM/HR. Total cost for this acid job was \$11366.

On November 30, 1989 we had to clean this well again. This is the shortest time period between cleanouts for this well. The fact that the prior cleanout was not 100% successful probably contributed to this early cleanout. The main reason though, was the aforementioned power plant control of this well. This time we attempted a new cleanout method. This new method was blasting, setting off a string shot across the perforations with Dialog. This was the eighth total cleanout for this well. This method was successful in that maximum injection was increased from 500 k LBM/HR to 802 k LBM/HR. Total job cost was \$4431.

We have now shown three different successful methods for clearing the silica scale damage at RHSU 82-33 perforations. They are 1) Re-perforating, 2) Acidizing with HF acid, and 3) Blasting with string shot across perforations. None of the aforementioned methods have shown to be superior to the other in return injection performance. They all seem to work fine. Acidizing is the easiest, but a bit more costly. There is also the concern of forming an insoluble precipitate when pumping HF acid. Perforating and string shot are essentially the same cost, and about the same amount of work. Realistically the difference between all methods is slight and we should be open to attempting any one of them when cleaning out this well. Personally I'm intrigued with the string shot method and will probably try this again the next time the well is plugged.

Ronald M. Dorovi

RHSU Operations Engineer

attachments

RHSU 82-33 PERFORATION CLEANOUT HISTORY

CLEANOUT #	DATE	METHOD - REMARKS	POST CLEANOUT INJECTION PERFORMANCE	PRE CLEANOUT INJECTION PERFORMANCE
	March 1978	Initial perforation - 1647-67 feet.		
1)	March 1983	1st Reperforation 1650-70 feet.		
2)	May 1984	2nd Reperforation 1650-70 feet.		
3)	Dec. 11, 1985	3rd Reperforation 1650-70 feet. Perforated at 4 spf with Gearhart, cost = \$3589.	795 k LBM/HR at 185 psig WHP	558 k LBM/HR AT 67 psig WHP
4)	May 5, 1987	4th Reperforation 1650-70 feet. Perforated at 4 spf, 120 deg phasing, 4 inch guns, 22 gram charges with Dresser Atlas. Cost = \$4200, includes a temperature log.	804 k LBM/HR at 130 psig WHP	498 k LBM/HR at 155 psig WHP
5)	Oct. 15, 1987	5th Reperforation 1650-70 feet. Perforated at 4 spf, 90 deg phasing, 4 inch guns, 23 gram charges with Gearhart. Cost = \$3690.	780 k LBM/HR at 195 psig WHP	418 k LBM/HR at 218 psig WHP
6)	Nov. 8, 1988	1st HF Acid Job. Pumped 1000 gals. Formic gals. and 2000 gals. 12-6 Super Mud Acid with Dowell. Cost = \$8633.	840 k LBM/HR at 195 psig WHP	585 k LBM/HR at 205 psig WHP
7)	Oct. 10, 1989	2nd HF Acid job. Pumped 1250 gals. Formic Acid and 2500 gals 12-6 Super Mud Acid with Dowell. Cost = \$11366.	675 k LBM/HR at 198 psig WHP	435 k LBM/HR at 210 psig WHP
8)	Nov. 30, 1989	Stringshot #1 across 1650-70 feet: Four - 20 foot lengths at 70 grains/ft (280 grains/ft total). Used Dialog, total job cost = \$4431.	802 k LBM/HR at 194 psig WHP	500 k LBM/HR at 210 psig WHP

This injection well was treated with the second HF acid job in its history. The job consisted of 100 bbl water preflush, 36 bbl water containing 10 gpt A-250 high temperature inhibitor, 1250 gals Formic acid containing 8 gpt A-250 high temperature inhibitor and 10 gpt L-58 iron stabilizing agent, then 2500 gals 12-6 Super Mud Acid containing 8 gpt A-250 high temperature inhibitor and 5 gpt L-58 iron stabilizing agent, and then flush with 130 bbls water.

JOB LOG

DATE	TIME	EVENT
10/10/89	0730	D/S on location. One fracmaster on location, filled with 300 bbls cooling tower water.
	1015	Conduct safety meeting.
	1030	RHSU ready to treat well. Plant at reduced load (15 MWe) due to 2nd condensate pump being offline. UP&L start sending all of fields brine to 14-2.
	1044	SI RHSU 82-33, crack flow to pit by-pass to keep up temperature. Flowline temperature = 328 deg F.
	1050	Pressure test pump-in lines to 1000 psig, OK.
	1055	Start water preflush at 0.8 bpm, 0 psig.
	1106	Increase water preflush to 1.5 bpm, 0 psig, 10 bbls pumped.
	1112	Increase water preflush to 2.0 bpm, 0 psig, 20 bbls pumped.
	1126	Increase water preflush to 3.1 bpm, 0 psig, 50 bbls pumped.
	1142	End water preflush, 3.0 bpm, 0 psig, 100 bbls pumped. Go to water inhibited at 10 gpt with A-250 high temperature inhibitor at 3.5 bpm, 0 psig.
	1150	End inhibited water preflush, 36 bbls pumped, 136 bbls cumulative pumped. Go to Formic acid with 8 gpt A-250 high temperature inhibitor and 10 gpt L-58 iron stabilizing agent. Pumping at 3.1 bpm, 0 psig.
	1202	End Formic acid, 30 bbls pumped, 166 bbls cumulative job. Go to 12-6 Super Mud acid containing 8 gpt A-250 and 5 gpt L-58, rate = 3.5 bpm, 0 psig.
	1214	Pumping HF acid at 3.2 bpm, 0 psig. At 47 bbls HF pumped, lost charge pump, shut down to switch hoses to auxillary charge pump.
	1217	Resume Mud Acid OK.
	1223	End Mud Acid, pumped a total of 60 bbls Mud acid, 226 bbls total. Go to water displacement at 3.0 bpm, 0 psig. Injection flowline temperature = 319 deg F, flowing about 23 k lbm/hr to pit.
	1240	Continue water displacement, rate = 3.8 bpm, 0 psig, 57 bbls displacement pumped, cumulative pumped = 283 bbls. Not seeing any surface reaction to acid at perfs.

This injection well had its perforations cleaned with a new cleanout method, - utilizing a string shot to blast away the damaging silica scale. This consisted of four - 20 foot lengths of 70 grains/ft string shot (280 grains/ft total), ran across the damaged perforations. This is the first time this has been attempted at RHSU, and most likely the first time this has been tried in the industry. This method was a success, and I will probably try it again the next time this well is plugged.

JOB LOG

DATE	TIME	EVENT
11/30/89	0800	Rocky Mtn. Wireline (mast truck) on location. Dialog called, they will be out one hour late as they "ran out of gas". Note both service companies were on RHSU 35-3 35-3 CIBP attempt yesterday 11/29/89. It was decided ahead of time to try this new cleanout method while they were down here for the 35-3 work.
	0830	Field at 11.6 MWe, reduced load due to UP&L not having 2nd condensate pump available. UP&L diverting all of field's brine to RHSU 14-2, take 82-33 offline.
	0945	All on location, found pit-by pass plugged, notify UP&L as this is there equipment.
	1015	Well SI, SIWHP holding at 60 psig, begin bleed off to atmosphere.
	1030	Continue opening 3 inch swab valve bleeding down WHP. Ambient = 20 deg F, getting a pretty good roar, 30 foot plume, WHP = 10 psig. Flowline still plugged to pit by-pass, flowline temperature = 300 deg F.
	1045	Still bleeding down well, Dialog still prepping equipment, WHP = 5 psig.
	1100	Pit by-pass broke free, suspect ice plug. R/U lubricator, zero wellhead pressure, still have 5 foot vapor plume.
	1420	Finally Dialog prepped, next time have them on location earlier waiting on us, not visa versa. Flowline temperature = 282 deg F, well flowing on by-pass to pit.
	1500	Attempting depth control (CCL on top of string shot). Dialog having problems with strip chart, having to go up and down the hole to reconfirm depth. Now the string shot assembly is hanging up in the hole. Suspect homemade centralizers tangling up assembly. POOH.
	1525	String shot and centralizers (bailing wire) in a rats nest, cause was up and down motion in hole. The reason we had to go up and down was due to Dialog's depth control equipment malfunctioning. Next time make sure depth control equipment is working properly ahead of time so as to eliminate unnecessary up and down movement. Re-rig up entire string shot assembly again.
	1645	New assembly built, RIH.
	1725	Depth control OK, finding DV tool makes it easy. CCL to top of string shot = 3 feet. Using Gearhart GR correlation log 3/9/83 as the cased hole log. Open hole log = Schlumberger Induction - GR log 11/28/75 run #1. Correlation shows Open = Cased - 1ft. Fired Ok when on depth, POOH.
	1740	R/D Dialog. Flowline temperature = 288 deg F even though fluid flowing on by-pass to pit.

JOB LOG (continued)

DATE	TIME	EVENT
11/30/89	1800	82-33 online, UP&L afraid to run maximum injection test tonight (don't rock the boat). Leave well as needed for plant production.
12/1/89	0830	Run maximum injection test, got to 802 k LBM/HR at 194 psig WHP. This new cleanout method was a success as precleanout injection was = 500 k LBM/HR at 210 psig WHP.

TOTAL JOB COST = \$4431. Note this included a standby charge as Dialog was here yesterday for RHSU 35-3 work. It is estimated this job would cost \$3807 if done by itself.

Well Data: Perfs: 1650-70 ft. Open Hole: 2001-6028 ft.
 (Perfs take all injected fluid)
 Casing = 9 5/8 in, 40 #/ft, K-55, BT&C, set at 2001 ft.
 Gravity flow injection well, silica scale damage across the perforations

DISCUSSION AND RESULTS

As noted above this job was a success. Maximum injection was increased from 500 k LBM/HR to 802 k LBM/HR. This was the soonest this well needed to be recleaned in its history. This is due to two factors. One is the standard cause of the plugging (UP&L losing control and low temperature fluids being injected into RHSU 82-33). The second reason is the initial starting point was the worst ever, as it appeared cleanout # 7 did not eliminate all of the previous damage. Hence we were that much closer to a cleanout point. Silica scale across the 1650-70 ft. perforations/fracture face is the cause for reduced injection capacity. This scaling is a result of dropping RHSU injection brine below 270 deg F. This temperature drop is mainly a result of two causes. 1) Dropping pressure due to inadequate amount of flow in the pipeline, and 2) Diluting the brine with the much cooler cooling tower blowdown. I have now shown three different successful methods for removing this scale from 1650-70 ft. and hence restoring injection capacity. These are reperforating, acidizing with HF, and blasting. Acidizing is the easiest, yet the most expensive. Perforating and blasting are essentially the same cost and would be a matter of personal choice which one is easier. It appears perforating is location specific, while blasting give complete radial coverage. Handling the string shot is easier than handling the four inch guns. Personally, I would retry the string shot when 82-33 needs to be recleaned. None of the three aforementioned methods has shown to be superior to the other in return injection performance. They all seem to work fine. It should also be noted that the 280 grains/ft. used in this string shot cleanout was based on Dialogs recommendation. The fishing industry's publications for back-offs recommend using 200 grains/ft for backing off 9 5/8 inch casing. We were in 9 5/8 inch casing and then we added a bit of a safety factor to end up with 280 grains/ft. There are two other items worth noting from this job that would improve job efficiency for string shots. One, is to have Dialog rig up the string shot ahead of time, as there is a good amount of pre rig up time. This job took four hours to rig up. The second item is to make sure you minimize up and down motion while in the hole with the string shot. The assembly is very vulnerable to tangling up. This means having your depth control method ready to go.

R.J. DOROV

PERF #1
 PERF #2
 PERF #7

160

Cont

389 PERF #4

1200 PERF #5

3690

8633 acid #1

11366 acid #2

4431 Stringshot #1

12/85

5/87

10/15/87

11/88

10/10/89

11/30/89

4200 22 gm 120 45 PF 411

23 gm 45 PF 90

795/185
 806/130
 804/130

780/195 OK

840/195

675/198

802/194

POST

552/67

498/155

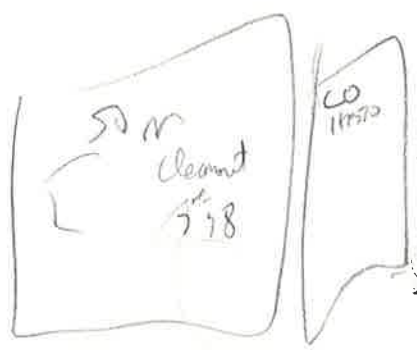
418/218

585/205

435/210

500/210

PRIOR



cleaned #7
 TOP 10%

Remedy DISCUSS

cleaned #8

T63 Log

Remedy prep

82-33
11/30/89
Dialing
DR
slings down pump
to cable
new #5

ATTN.

- W/ TALL
- BAKER
- CM7
- RBP
- W/ TALL
- PUMPS
- THANKS
- PRODUCE

(37) 28' (13) 54'
LOCATIONS
ICE
WRITE UP'S
costs
B.C.
Temo
10,441

Drift 12.259 70 grain
Temp. 480
FT

x 4 STRANDS

82-33 280

11/27

0800

ROCKIN MOUNTAIN ON LOCATION

0835

DIMOB CALLED WITH Delay out of fuel

0831

82-33 offline rate before = 496 @ 210

0945

Drive to location all here

FOUND

BY PADS LINE PLUGGED?

bel

Began to bleed off well SJWAP-60

1030

OPEN OPEN OPEN

10PSIG - good

ambient
= 20°F

Flowline temp = 300°F

Flowline temp = 300°F

30' plume

1045

Bleeding 5PSIG FL. Temp = 300°F

1100

Flowline BROKE FREE, PROBABLY ICE

R/U LUBRICATOR - 5 plume - no pressure

1235

STILL RUNNING - NO PRESSURE

1978 original

STILL R/U

3/83

1300

F.L. Temp = 288°F

(84) 7

5/87

450

10/87

11/10/89

A-1

D/S

DU

11/30/89

SS

500

12/85

600

1300

1320

T.L. Temp = 270°F 235°

1335

277°F

still R/U

1400

282°F

1420 215°F

R/U LUB (4 hrs to R/U)

1500

1500

1645 ne 4 lines 25' cone
70 grains/ft/line = 280 grains/ft

95/2" 40 backoff = 200 grains/ft

⊙ R1H - DV took 2 collars
ok ca to TOP SHOT
= 3' collar is 3' above
perf

pulled into collar @ 1648

6000 lb
1651 TOP shot
1651 TOP shot
1651 TOP shot

1680-70 string shot

1725 shot OK POOTH

1740 R/O flowline temp = 288°F

Run out rate 12/1

IMPROVED

802

@ 194 WHP !!

COST=

500

@ 210 WHP

MAST — 860
1635/150500

1635/150500

4200

1355

1232

3800

(2807)

SERVICE ORDER AND JOB TICKET

THE DIA-LOG COMPANY

A BIG THREE INDUSTRY

27503

CALIFORNIA DIVISION
THE DIA-LOG COMPANYP. O. BOX 4008
WHITTIER, CALIFORNIA 90607-4008

OIL WELL ELECTRIC LINE SERVICES

P. O. BOX 14103
HOUSTON, TEXAS 77221-4103
PHONE (713) 747-2100Date 11-30-89Operating
Base VERNALCustomer's
Order No. S-031941 DSHSCharge to CHEVRON RESOURCESMailing Address:
Street or Box Number _____

City _____ State _____ Zip _____

Well Name
and Number RHSU 92-33Location
or Field ROOSEVELT WISHINGCounty
or Parish BEAVERState UT.

OFFICE USE ONLY	DESCRIPTION	CHARGE
Truck No. <u>325</u>	Skid Unit No. <u>NA</u>	Round Trip Miles <u>NA</u>
	Miles Charged for _____	
	1) RAN DIA LOG SPECIAL HIGH TEMP STRING SHOT TO CLEAN PERFORATIONS IN 9 5/8" CASING @ 1650' TO DEPTH CHARGE: \$275.00	
	CLEANING CHARGE @ MINIMUM \$600.00	
	HIGH WELL TEMPERATURE CHARGE \$300.00	
	2) RENTAL TITMIS USED	
	DIA-LOG 2 7/8" LUBRICATOR 3 SECTIONS @ 20' EA \$60.00	
	DIA-LOG 2 7/8" PUMPIN SUB \$80.00	
	DIA-LOG 2 7/8" TIW VALVE \$170.00	
	MAST = 420 MILE 1300 (650 lb) <u>SPUT</u> + 8605 <u>35182</u>	
	1720 <u>FIELD TOTAL</u> \$1635.00	
	SERVICEMEN'S EXPENSE 2 MEN 1 DAY \$150.00	

SERVICE ORDER AND JOB TICKET

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CALIFORNIA DIVISION
THE DIA-LOG COMPANYP. O. BOX 4008
WHITTIER, CALIFORNIA 90607-4008

OIL WELL ELECTRIC LINE SERVICES

P. O. BOX 14103
HOUSTON, TEXAS 77221-4103
PHONE (713) 747-2100Date 11-30-89Operating
Base VERNALCustomer's
Order No. S-031941 DSHSCharge to CHEVRON RESOURCESMailing Address:
Street or Box Number

City

State

Zip

Well Name
and Number RHSU 82-33Location
or Field ROOSEVELT NO. 3County
or Parish BEAVERState UT.

OFFICE USE ONLY	DESCRIPTION	CHARGE
Truck No. <u>325</u>	Skid Unit No. <u>NA</u>	Round Trip Miles <u>NA</u>
	Miles Charged for	
	1) RAN DIA LOG SPECIAL HIGH TEMP STRING SHOT TO CLEAN PERFORATIONS IN 9 5/8" CASING @ 1050' 1670' DEPTH CHARGE:	\$275.00
	CLEANING CHARGE: @ MINIMUM	\$600.00
	HIGHWELL TEMPERATURE CHARGE	\$300.00
	2) RENTAL ITEMS USED	
	DIA-LOG 2 7/8" LUBRICATOR 3 SECTIONS @ \$20.00 EA	\$60.00
	DIA-LOG 2 7/8" PUMPIN SUB	\$80.00
	DIA-LOG 2 7/8" TIW VALVE	\$80.00
	1) STAND BY TOOL AND 3 MAN CREW	FIELD TOTAL \$1635.00
	SERVICEMEN'S EXPENSE	
	2 MEN 1 DAY	\$150.00

OPERATOR

RECEIPT OF THE SERVICES AND/OR EQUIPMENT LISTED ABOVE IS ACKNOWLEDGED AND IT IS HEREBY AGREED THAT THE DIA-LOG COMPANY IS NOT LIABLE FOR DAMAGES, INJURIES OR LOSS OF ANY NATURE RESULTING DIRECTLY OR INDIRECTLY FROM SERVICES PERFORMED OR EQUIPMENT USED, AND FURTHER, THAT THE TERMS AND CONDITIONS SET FORTH ON THE REVERSE SIDE HEREOF ARE ACCEPTED.

ASSISTANT OPERATOR

CUSTOMER

AUTHORIZED AGENT

Departed From
Operating Base: Date 11-29-89 A.M. 5:30 P.M.Arrived
At Location: Date 11-29-89 A.M. 8:00 P.M.Released
From Location: Date 11-30-89 A.M. 7:30 P.M.Arrived At
Operating Base: Date A.M. P.M.

FA-12

REMARKS FIELD PRICE SUBJECT TO CHANGECUSTOMER RECEIVED 2 COPIES OFJOB TICKET.

SERVICES FOR 82-33 WELL INJECTION

SITUATION - THE 82-33 WELL IS A WATER DISPOSAL WELL CASED WITH 95/8 40.0# CASING. THE PERFORATIONS IN A 20' ZONE FROM 1650'-1670' PLUG OFF WITH SILICA SCALE. CHEVRON WANTS US TO RE-PERFORATE 4 SHOTS PER FOOT 180° PHASED FOR THE 20', OR POSSIBLY SHOOT A PERFORATION CLEANING SHOT. THIS WELL HAS BEEN PERFORATED NO WELL PRESSURE - 320° AT 1650' ACROSS THIS INTERVAL NUMEROUS TIMES

ESTIMATED COST

PERFORATE - 20' OF 2 7/8" DYNA CAP DISPOSABLE RETREIVABLE PERFORATORS 4 SHOTS PER FOOT - 80 TOTAL - 1 RUN 180° PHASED

1-	SERVICE CHARGE	
2-	SPECIAL HI PERFORMANCE JET PERF. CHARGE FOR FIRST 10 HOLES	1100. ⁰⁰
3-	70 ADDITIONAL HOLES @ 23. ⁰⁰ EACH	1610. ⁰⁰
4-	HIGH WELL TEMP CHARGE	300. ⁰⁰
5-	RENTAL HYDRAULIC WIRELINE PACK - OFF	180. ⁰⁰
	- 30% DISCOUNT 3010 - 903. ⁰⁰ = 2107. ⁰⁰	
		<u>TOTAL 2287.⁰⁰</u>

OR

1-	RUN OIA-LOG SPECIAL HIGH TEMPERATURE 6TRING SHOT TO CLEAN PERFORATIONS IN 95/8 CASING FROM 1650-1670'	
	DEPTH CHARGE	275. ⁰⁰
	CLEANING CHARGE (MINIMUM)	600. ⁰⁰
2-	HIGH WELL TEMP CHARGE	300. ⁰⁰
3-	RENTAL HYDRAULIC WIRELINE PACK - OFF	180. ⁰⁰
		<u>TOTAL 1355.⁰⁰</u>

YES
75%
2300
425

2 7/8 EUE LUBRICATOR

FAX 387-5030

3" 600

CCL 3'

82-33 WELL CONT PAGE 2

MATERIALS -

3 - 1 5/8 CONDUCTOR WEIGHTS

1 - 1 1/2 COLLAR LOCATOR

1 - DYNA CAP GUN

22' DYNA-CAP QUAD WIRES

80 - 2 1/8 DYNA CAP PERFS 325° RATING

ENTRY HOLE - .36

PENETRATION - 18.24 CEMENT

90 GR. HMX PRIMACORD

HIGH TEMPERATURE E98 LEAD CAP N/SLEEVES

DO WE NEED PACK-OFF OR LUBRICATOR FOR THIS WELL? YES -

2 1/8 BOX OR PIN LOOKING UP OFF WELLHEAD

RON, IF YOU NEED FURTHER SPECS PLEASE CALL

801-789-4763

HAVE A GOOD TURKEY DAY, SAY HI TO

TERRY

RESPECTFULLY,

HBSmu-.