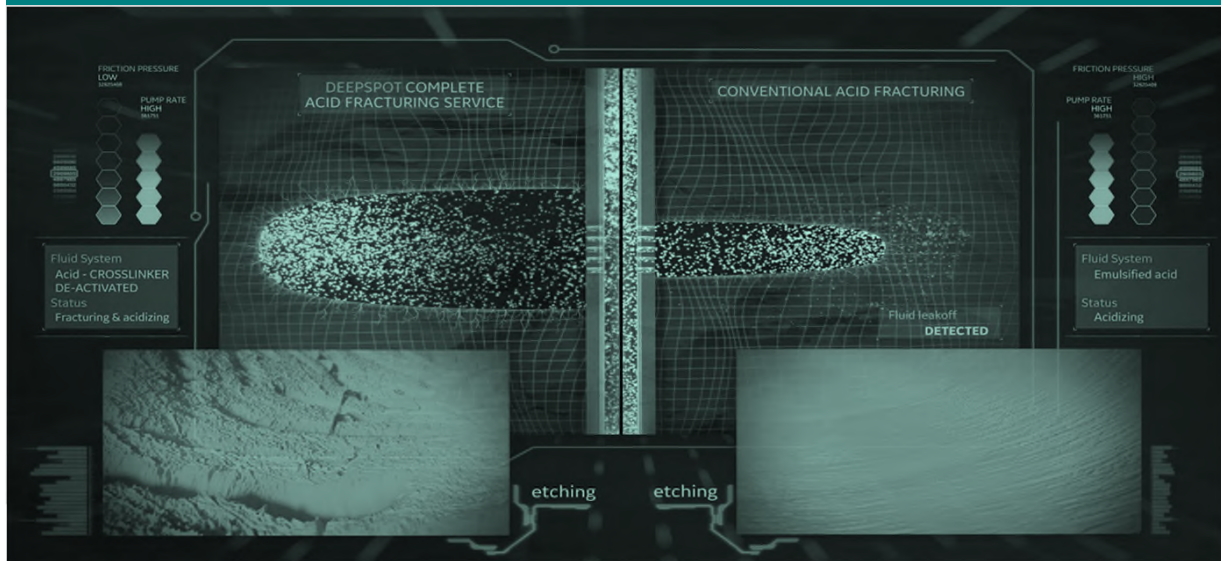


PT PERTAMINA EP Regional 1 Zona 4

SPA-034 LAP BRF 2333 - 2366 Mtr

15% HCL Matrix Acidizing



PRESENTED TO
PT PERTAMINA EP Regional 1 Zona 4
Herman Ratnofianto (08117822755)
Ayi Yanuardi (082199690030)

PREPARED BY
Donny Wirawan (08117065533)
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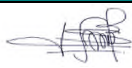


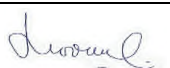
CONTRACT :
4650014332

Revision 0
2-Feb-23

FORMALITIES

DOCUMENT TITLE

15% HCL Matrix Acidizing - SPA-034

AUTHORIZATION				
	NAME	POSITION	SIGNATURE	DATE
PREPARED BY	Donny A Wirawan	Lead Stimulation Engineer		2-Feb-23
PREPARED BY	Nathanael Halawa	Field Engineer		2-Feb-23
PEER-REVIEWED BY	Nathanael Nainggolan	Lead Stimulation Engineer		2-Feb-23
APPROVED BY	Dadang Rochman	Engineering Manager		2-Feb-23

DISTRIBUTION LIST				
Name	Company	Location	digital	hard copy
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Farouk Afida	Bakerhughes	Prabumulih	X	
Noviana Maria	Bakerhughes	Prabumulih	X	

Revision History			
Revision	Date	Section	Remarks
0	February 2, 2023	All	Initial Proposal



WELL INFORMATION
SPA-034, PENDOPO
Revision 0

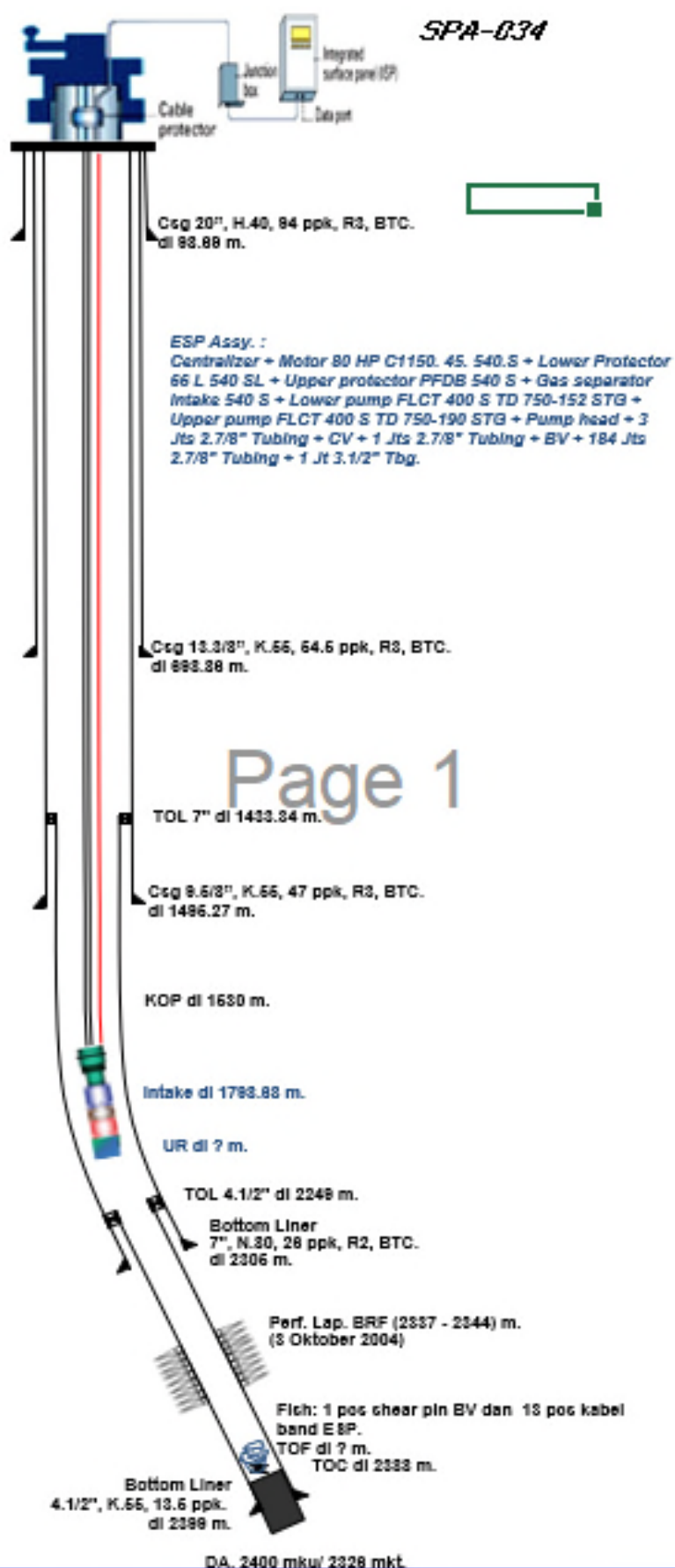
WELL INFO		PERFORATIONS ZONES		
Date	2-Feb-23	TOP	BOTTOM	NET
Field	PENDOPO	2333.0	2338.0	5
Well Name	SPA-034	2363.0	2366.0	3
Completion Type	Cased Hole			
Formation(s)	LAP BRF	TOTAL NET PAY (MTR)		8
Treatment Through	Tubing	GROSS PAY INTERVAL		33

COMPLETION DATA		WELL DATA	
Casing OD	9.625 inch	Top Pay Zone	2333 meter
Casing ID	8.681 inch	Bottom Pay Zone	2366 meter
Casing Weight	47.0 lbs/ft	Ave Depth Pay Zone	2350 meter
Casing Volume Factor	0.0732 bbl/ft	Gross Pay Interval	33 meter
Casing Depth	1486.3 meter	Permeability	2.00 mD
		Formation Porosity	10.0 %
Liner OD	7.00 inch	Testing date	na
Liner ID	6.28 inch	Fluid Production Rate	na bfpd
Liner Weight	26.0 lbs/ft	Oil Production Rate	na bopd
Liner Volume Factor	0.0383 bbl/ft	Water Cut	na %
Top of Liner	1433.0 meter	SBHP	3027 psi
Bottom of Liner	2306.0 meter	PBHP	na psi
		BHST	289 deg F
Liner OD	4.50 inch	Tubing Pressure	na psi
Liner ID	4.00 inch	Casing Pressure	na psi
Liner Weight	13.5 lbs/ft	Productivity Index (PI)	na
Liner Volume Factor	0.0155 bbl/ft		
Top of Liner	2249.0 meter		
Bottom of Liner	2333.0 meter		

PRESSURE	
Bottom Perforation (TVD)	2296.6 mtr
	7535.14 ft
PHyd 15% HCL SG 1.075	3513 psi
Estimate Frac Gradient	0.7 psi/ft
Treating Pressure, No Friction	1762 psi

Tbg / Csg Annulus Vol Factor	0.0302 bbl/ft (dual tbg)
Total Vertical Depth	2325.7 meter
Measured PBTD Depth (TOC)	2388 meter
Deviation at Perforations	28.23 degrees
Packer (if any)	2328 meter
Short String Depth (if any)	na meter
Production Packer	na meter
Tubing Volume	44.6 bbl
Vol to Top of Perfs	43.7 bbl
Vol to Bottom of Perfs	45.4 bbl
Annular Csg-Tubing volume	233.2 bbl

WELL PROFILE SPA-034



Page 1

JOB PROCEDURE

1. PREPARE WELL FOR STIMULATION

- a Hold SAFETY MEETING
 - brief discussion and review the job program, job objectives, and procedures
 - Review material MSDS, PPHA and QHRA / JSA. Fill up on-site JSA for any additional hazard identified on the well site.
 - Discuss within the team if any deviation of the program and need to be communicate with Client representative.
 - Review well site access control, emergency escape route and contingency plan.
 - Discuss about well site layout, equipment spotting and set up
 - Manage personnel roles and responsibilities for :
 - i. Equipment set up
 - ii. Rig up treating line and hoses
 - iii. Chemical handling and mixing
 - iv. High pressure test line and bullhead pumping
- b Prepare BJ lines and set up data monitoring unit.
- c PT PERTAMINA EP Regional 1 Zona 4 will prepare line thru annulus.

2. PRESSURE TEST LINES

- a Verify Maximum treating pressure with company on-site representative. Set Over-Pressure Pop-Off Valves to maximum treating pressure and function test. Adjust and repeat test as necessary. Maximum treating pressure should be at least 500 psi below test pressure.
- b Secure and repair any leak.

3. RUN PACKER

- a Pertamina must run scrapper before run packer.
- b RIH OE with packer. Consist of tailpipe + packer + 2-7/8in tubing. Set end of tailpipe between perforatin at 2350.5 mtr, and set packer as close to perforation (around 1-5meter above perforation)
NOTE: final setting depth for OE & packer will be based on actual well condition.

4. PICKLE TUBING STRING (OPTIONAL IF NECESSARY)

- If you wish to pump tubing pickle before packer is set, please go to step "4A".
- If you do not wish to pump tubing pickle before packer is set, please go to step "4B".

4A. PUMP PICKLE

- a Mix 5 bbl of 15% HCL PICKLE STRING as follow:

			PER JOB	
562 GPT	FRESH WATER		119 GALS	2.8 BBL
4 GPT	CI-41	(Corrosion Inhibitor)	1 GALS	0.02 DRUM
434 GPT	HCL, 32%	(Concentrated Acid)	92 GALS	1.7 DRUM
40 PPTG	FERROTROL 210	(Iron Reducing Agent)	9 LBS	0.2 SACK

- b Pump 5 bbls pickle solution, displace with 38 bbls of completion fluid (pickle will stay inside the tubing).
- c Reverse circulate spent pickle with rig pump. If reverse-circulating is not feasible, overdisplace spent pickle by pumping 90bbls of brine/formation fluid.

4B. SET PACKER

- d Set packer, setting weight as per Pertamina's SOP.
- e Check backside for integrity test by pressure test annulus 200 psi or as per Pertamina's SOP.

5. PREPARE 97 BBL BRINE WATER FOR INJECTIVITY TEST & DISPLACEMENT, AS FOLLOW

				PER JOB	
953	GPT	FRESH WATER		3883 GALS	92.5 BBL
167	GPT	KCL	(Pottasium Chloride)	681 LBS	6.2 SACK
5	GPT	CLAYMASTER-10	(Clay Stabilizer)	21 GALS	0.4 DRUM
5	GPT	NE-118	(Non-Emulsifier)	21 GALS	0.4 DRUM

6. PERFORM INJECTIVITY TEST

- a Perform injection rate test as follow (record rate and pressure):

NOTE Maximum surface treating pressure should not exceed 1762 psi OR as advised by Company Man

TIME	RATE	PRESSURE	VOLUME
	0.25		
	0.5		
	0.5		
	1		
	1.5		
	2		

DO NOT MIX TREATMENT FLUID UNTIL INJECTIVITY IS ESTABLISHED

- b Once injectivity test completed, standby for mixing fluid.

7. MIXING MAIN TREATMENT FLUID

- a Mix 78 bbl of 15% HCL Acid

				PER JOB	
461	GPT	FRESH WATER		1511 GALS	36.0 BBL
10	GPT	CLAYMASTER-10	(Clay Stabilizer)	33 GALS	0.7 DRUM
5	GPT	HYTEMPO	(Corrosion Inhibitor Inte	17 GALS	0.3 DRUM
10	GPT	NE-118	(Non-Emulsifier)	33 GALS	0.6 DRUM
10	GPT	CI-41	(Corrosion Inhibitor)	33 GALS	0.6 DRUM
20	GPT	NE-32	(Surfactant)	66 GALS	1.3 DRUM
50	GPT	US-40	(Mutual Solvent)	164 GALS	3.0 DRUM
50	PPTG	FERROTROL 210	(Iron Reducing Agent)	164 LBS	3.3 SACK
50	PPTG	FERROTROL 300	(Iron Chelating Agent)	164 LBS	3.0 SACK
434	GPT	HCL, 32%	(Concentrated Acid)	1422 GALS	25.9 DRUM

8. PUMPING STAGE

Depend on pumping pressure during injectivity result:

- If pumping pressure BELOW maximum allowable pumping pressure, please go to step "8A".
- If pumping pressure ABOVE maximum allowable pumping pressure, please go to step "8B".

8A. Pumping pressure BELOW maximum allowable pumping pressure

- With packer position is **SET**.
- Open master valve.
- Pump fluid with optimum rate possible without exceed pressure limit, as per schedule below.

	STEP	FLUID SYSTEM	FLUID VOLUME		FLUID RATE
			BBL	GALON	
1	Main Acid	15% HCL Acid	78	3276	1 – 2
2	Acid Overflush	Brine	21	872	1 – 2
3	Displace	Brine	45	1908	1 – 2
STOP PUMP. SHUT IN WELL, SOAKING FORMATION FOR 1 HOUR					

8B. Pumping pressure ABOVE maximum allowable pumping pressure

- With packer position is **UNSET**.
- Open master valve.
- Pump fluid with optimum rate possible without exceed pressure limit, as per schedule below.

	STEP	FLUID SYSTEM	FLUID VOLUME		FLUID RATE
			BBL	GALON	
1	Main Acid	15% HCL Acid	44	1833	1 – 2
2	Displace 1bbl to flush acid from line. At this stage, acid in the tip of OE	Brine	1	42	1 – 2
3	Break 2in line on floor.	N/A	0	0	0
4	Set packer & test packer as per Pertamina's SOP	N/A	0	0	0
5	Connect 2in line on floor.	N/A	0	0	0
6	Continue pump acid with hesitation mode	15% HCL Acid	34	1443	1 – 2
7	Over Flush	Brine	21	872	1 – 2
8	Displace	Brine	45	1908	1 – 2
STOP PUMP. SHUT IN WELL, SOAKING FORMATION FOR 1 HOUR.					

NOTES:

- CHECK MAXIMUM PRESSURE ALLOWED FROM COMPANY REP ON LOCATION OR MAXIMUM STP 1762 PSI
- IF DURING PUMPING ACID, SURFACE PRESSURE INDICATING DECREASE, INCREASE PUMP RATE FOR BETTER ACID PENETRATING LENGTH. BUT PLEASE KEEP MONITORING MAXIMUM PRESSURE.

- Stop pumping. Job complete.

9. JOB COMPLETE, RIG DOWN Treating Line and prepare for moved out.



JOB PROCEDURE
SPA-034, PENDOPO
Revision 0

INTERVALS

Net Interval	26	ft MD
Gross Interval	108	ft MD

VOLUMES

	Gal	bbls	Gal/ft
15% HCL Pickle String	210	5	N/A
Brine	3620	86	N/A
15% HCL Acid	3255	78	125
Over Flush	872	21	34

* Excluding Tank Bottom

* Excluding Tank Bottom

* Excluding Tank Bottom

DEPTH PENETRATION OF RADIAL FLOW

Perforated Interval	26	feet
Wellbore Diameter	6.500	inch
Ave. Porosity (10% = 0.1)	0.10	
Irreducible Sw	0.1%	

FLUSH VOLUME

Size	Tubing 2.875	CT 1.5in
Factor	0.0058	
EOT	7712 ft	
Volume	44.7 bbl	

Desired depth penetration	7.0	ft
Volume Injected	3255	gal

OVERFLUSH CALCULATION

Desired depth penetration	3.5	ft
Volume Injected	872	gal

MATERIAL REQUIREMENT AND COST

15% HCL PICKLE STRING

	5	BBL				
Additive	Concentration		Total		Cost	Price
FRESH WATER	562	GPT	119	GALS	\$ -	\$ -
CI-41	4	GPT	1	GALS	\$ 45.36	\$ 45.36
HCL, 32%	434	GPT	92	GALS	\$ 1.62	\$ 149.04
FERROTROL 210	40	PPTG	9	LBS	\$ 6.90	\$ 62.10
Total					\$ 256.50	

BRINE

	97	BBL	* Including Tank Bottom 10 bbls			
Additive	Concentration		Total		Cost	Price
FRESH WATER	953	GPT	3883	GALS	\$ -	\$ -
KCL	167	PPTG	681	LBS	\$ 0.39	\$ 265.59
CLAYMASTER-10	5	GPT	21	GALS	\$ 17.01	\$ 357.21
NE-118	5	GPT	21	GALS	\$ 9.07	\$ 190.47
Total					\$ 813.27	

**JOB PROCEDURE**

SPA-034, PENDOPO

Revision 0

15% HCL ACID	78	BBL	* Excluding Tank Bottom			
Additive	Concentration		Total		Cost	Price
FRESH WATER	461	GPT	1511	GALS	\$ -	\$ -
CLAYMASTER-10	10	GPT	33	GALS	\$ 17.01	\$ 561.33
HYTEMPO	5	GPT	17	GALS	\$ 13.88	\$ 235.96
NE-118	10	GPT	33	GALS	\$ 9.07	\$ 299.31
CI-41	10	GPT	33	GALS	\$ 45.36	\$ 1,496.88
NE-32	20	GPT	66	GALS	\$ 11.75	\$ 775.50
US-40	50	GPT	164	GALS	\$ 13.56	\$ 2,223.84
FERROTROL 210	50	PPTG	164	LBS	\$ 6.90	\$ 1,131.60
FERROTROL 300	50	PPTG	164	LBS	\$ 0.98	\$ 160.72
HCL, 32%	434	GPT	1422	GALS	\$ 1.62	\$ 2,303.64
Total					\$ 9,188.78	

SODA ASH

Additive	Total	Cost	Price
SODA ASH	1100 LBS	\$ 1.00	\$ 1,100.00

Total Material Price	\$ 11,358.55
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EQUIPMENT AND PERSONNEL COSTS

SERVICE CHARGE	Qty	Unit	Cost	Price
ACIDIZING / STIMULASI	1	Job	\$ 15,000.00	\$ 15,000.00

Equipment & Personnel Charge	\$ 15,000.00
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Total Estimated Price For Products And Services For: SPA-034	\$ 26,358.55
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LOAD OUT REQUIREMENT
SPA-034, PENDOPO
Revision 0

MATERIAL	QUANTITY	UNIT PACKING	
FRESH WATER	5513 GALS	42 GALS/BBL	132 BBLS
KCL	681 LBS	110 LBS/SACK	7 SACKS
CLAYMASTER-10	54 GALS	50 GALS/DRUM	2 DRUMS
NE-118	54 GALS	55 GALS/DRUM	1 DRUMS
CI-41	34 GALS	55 GALS/DRUM	1 DRUMS
NE-32	66 GALS	55 GALS/DRUM	2 DRUMS
PARAVAN 25S	0 GALS	55 GALS/DRUM	0 DRUMS
US-40	164 GALS	55 GALS/DRUM	3 DRUMS
FERROTROL 210	173 LBS	50 LBS/SACK	4 SACKS
FERROTROL 300	164 LBS	55 LBS/SACK	3 SACKS
HCL, 32%	1514 GALS	55 GALS/DRUM	28 DRUMS
SODA ASH	1100 LBS	55 LBS/SACK	10 SACKS

TOTAL LOAD OUT
37 DRUMS
24 SACKS
0 MEGAS

INPUT EXCESS **0%**

ESTIMATED PACKING LIST



11 PALLETS + 0 MEGATAINERS

MATERIAL	DESCRIPTION
FRESH WATER	
KCL	(Potassium chloride) - Often used as the base salt for completion fluids. Do not use KCl as an overflush behind an HF acid system. It can be used as the final displacement fluid IF an NH ₄ Cl fluid has already been used behind the HF acid system.
CLAYMASTER-10	(Clay stabilizer) - Clay stabilizing agent used to protect water sensitive formations against permeability damage. It can generally be used in any treatment fluid to prevent formation clay swelling and migration. At times it can work as a non-emulsifier in stimulation fluids to help reduce emulsion tendencies and/or break emulsions that can occur when acid and oil come in contact with each other. Non-emulsion testing should be performed when combining anionic surfactants with Clatrol.
NE-118	(Nonionic) - Non-emulsifier used in stimulation fluids to help reduce emulsion tendencies and/or break emulsions that can occur when acid and oil come in contact with each other. Water wets sandstone and limestone.
CI-41	(Corrosion Inhibitor) - An acid corrosion inhibitor for all temperatures up to 350°F. Recommended when the patented BJ Services Sandstone Acid is used. Effective in all concentrations of HCl or HCl-HF acid formulations.
NE-32	(Surfactant) - Anti-sludge agent and non-emulsifier used in stimulation fluids to help reduce sludging and emulsion tendencies and/or break emulsions that can occur when acid and oil come in contact with each other.
US-40	(EGMBE - nonionic) - Mutual solvent (soluble in hydrocarbon and aqueous phases) giving high water wettability in limestone and sandstones and good reduction in surface and interfacial tension. Also can be very beneficial in helping to reduce or prevent downhole emulsions.
FERROTROL 210	(Erythorbic acid) – A sodium free iron control product used as a Ferric iron reducing agent in acidizing work. Very effective in preventing asphaltene sludging and downhole emulsions. Especially useful when performing sandstone acid jobs utilizing HF (hydrofluoric) acid because it minimizes secondary precipitates in combination with HF acid. Can also be used in HCl, HCl-HF and acetic acids. Remains effective above 200°F. Can help reduce flowback emulsion upsets.
FERROTROL 300	(Citric acid) - Utilized as an iron chelating agent when acidizing. It can be used in HCl, HCl-HF and acetic acids. At temperatures above 200 oF it is recommended that a combination of Ferrotrol 300 and other Ferrotrol agents be used.
HCL, 32%	(Hydrochloric Acid) - Inorganic acid commonly used in well stimulation treatments. Very useful in carbonate formation because of it's high solubility. Also useful in removing carbonate and other types of scale. In sandstone formations it is often used as a preflush (often as a afterflush) in front of (and behind) HCl-HF acid treatments to remove calcium carbonate material prior to the mud acid contacting it. HCl is generally very non-reactive with sandstone (quartz).