

OPT Field Operation Standard

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Contents

1.Standard Statement	3
2.Objective	3
3.Responsibilities	3
3.1Responsibilities of Operation and Field Service Manager	3
3.2Responsibilities of Technical engineer.....	3
3.3Responsibilities of Field Service Supervisor.....	3
3.4Responsibilities of all involved employees	3
4.Job Design and Preparation	4
4.1Cementing job design and preparation	4
4.2Fracturing job design and preparation	4
5.Wellsite Execution.....	5
5.1Cementing Wellsite Execution	5
5.2Fracturing well-site execution	6
6.Evaluation	6
Appendix 1: Cement Head Operation Procedure.....	7
Appendix 2: Cement Pump Pre-operation checklist and start up procedure	8
Appendix 3: Primary Cementing Procedure.....	10
Appendix 4: Liner Cementing Procedure	11
Appendix 5: Cement Squeeze Job Procedure	12
Appendix 6: Fracturing job equipment preparation.....	13
Appendix 7: Fracturing job Rig up.....	16
Appendix 8: Fluid Preparation	18

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1. Standard Statement

Field operation standard set the minimum requirement and procedure to be followed for all the personnel involved in the field operation, any deviation from this standard must be approved by Exemption of appropriated management.

2. Objective

To provide and maintain constant high quality services to meet the expectation of client with safe and professional manner. To prevent the injury to personnel and damage to equipment involved in the field operation.

3. Responsibilities

3.1 Responsibilities of Operation and Field Service Manager

- (1) Ensure all personnel compliant with relevant HSE standard and competent in performing the relevant Job.
- (2) Provide necessary resource and adequate equipment for the Job.
- (3) Approve the technical design after reviewing with the technical engineer.

3.2 Responsibilities of Technical engineer

- (1) Design the job to conform to this standard and relevant OPT safety standards.
- (2) Ensure the client has understood that all the job must be done in compliance with OPT and client safety standard (if client's standard exceeds the OPT safety standard).

3.3 Responsibilities of Field Service Supervisor

- (1) Ensure all personnel involved in the job at job site are in compliance with this standard and other relevant standards.
- (2) Perform the Risk Analysis with JSA and reduce the risk to as low as reasonable possible.
- (3) Identify any potential unplanned changes against the job program at wellsite and report to upper management to update procedure.
- (4) Take appropriate action, up to and including terminating the job, if unacceptable risks exist.

3.4 Responsibilities of all involved employees

- (1) Understand and comply with this standard.
- (2) Recognize and reduce the risks to as low as reasonable possible associated with operation.

- (3) Competent and qualified for the job.

4. Job Design and Preparation

4.1 Cementing job design and preparation

- (1) Job Design and procedure must be approved by client.
- (2) All Job Designs are in compliance with OPT Safety standards.
- (3) All personnel at wellsite are currently with QHSE certificate and have proper and functional PPE for the job.
- (4) Service Supervisor and Operator have done similar type of job previously and are deemed competent by Operation Manager.
- (5) Equipment assigned to the job have done Pre-job list check, and are currently with level I and Level II maintenance.
- (6) Equipment at wellsite are capable to perform the job (such as rate, volume, density, pressure).
- (7) Obtained necessary high pressure equipment to rig up with valid certificate.
- (8) Equipment are in clean /neat appearance.
- (9) Cement head has been maintained as per Maintenance Standards.
- (10) Material (such as cement, additives and chemicals) load has be verified as correct before leaving for location.
- (11) Job supervisor must receive, be briefed and understand the job design and procedure, (specific client's requirement must be discussed).
- (12) JSA must be performed accompanied with appropriated action item done.
- (13) Job supervisor must have Job sheet with relevant well information.
- (14) Laboratory test must be performed with material to be used on job for job time greater than 90 min, and temperature greater than 52°C.
- (15) Two 5kg field-blended dry material samples must be collected before the job, and one for testing, the other one should be kept at base for the period of 30 days after job (or longer if problem arises).
- (16) QC test must be performed for each new batch of cement received as per API Standards.
- (17) All laboratory must be scheduled for calibration as per laboratory standards.
- (18) Cement volume and additives calculation must be verified before loading job.

4.2 Fracturing job design and preparation

- (1) Job Design and procedure must be approved by client.
- (2) All Job Designs are compliance with OPT Safety standards.

- (3) All personnel at wellsite are currently with QHSE certificate and have proper and functional PPE for the job.
- (4) Service Supervisor and Operator have done similar type of job previously and are deemed competent by Operation Manager.
- (5) Equipment assigned to job have done Pre-job list check, and are currently with level I and Level II maintenance.
- (6) Equipment at wellsite are capable to perform the job (such as rate, volume, density, pressure).
- (7) Obtained necessary high pressure equipment to rig up with valid certificate.
- (8) Equipment are in clean /neat appearance.
- (9) Material (Such as acid, additives and chemicals) load has be verified correct before leaving for location.
- (10) Job supervisor must receive, be briefed and understand the job design and procedure, (Specific client's requirement must be discussed).
- (11) JSA must be performed accompanied with appropriated action item done.
- (12) Job supervisor must have Job sheet with relevant well information.
- (13) Fracture fluid HTHP rheology laboratory test must be performed with material to be used for job whenever the temperature greater than 82°C.
- (14) All laboratory equipment must be scheduled for calibration as per laboratory standards.
- (15) The maximum working pressure and pump rate are verified for the low pressure hoses (max 8.0 bpm for 4" hose and max 20.0 bpm for 8" hose) and high pressure lines (max 8.5 bpm for 2", max 20.0 bpm for 3", 40bpm for 4"):
- (16) Ensure enough HHP on location to do the job as designed.
- (17) Ensure the manager has approved the exemption if any OPT standard cannot be followed for this job.

5. Wellsite Execution

5.1 Cementing Wellsite Execution

- (1) Conduct pre-job meeting with client representative and agree on the job procedure, design and contingency plan.
- (2) Pre-job meeting must be held with crew to discuss the job procedure, assignments and contingency plans.
- (3) Rig up equipment as per rig up procedure.
- (4) Follow the cement head operation procedure.

- (5) Record all job data as per Data Acquisition System.
- (6) Collect 10kg cement sample from each silo/ tank and 2 gallon of mixed fluid from tank for each type of mixed fluid.
- (7) Complete Field Service Ticket and get signed by Client Representative.

5.2 Fracturing well-site execution

- (1) Conduct pre-job meeting with client representative and agree on the job procedure, design, key roles assignment and contingency plan.
- (2) Crew have and use proper PPE for the operation.
- (3) The job supervisor or assigned personnel should check the chemical inventory and condition.
- (4) Check the mass balance according to the design during the job.
- (5) Rig up equipment as per rig up procedure.
- (6) Record all job data as per Data Acquisition System: Rate, Pressure, Density, Liquid Additive Rate, Dry Additive Rate, Proppant Weight, and Fluid Volume.
- (7) Collect sample and QA/QC the onsite fluid.
- (8) Start the job as per the client's expected job starting time.
- (9) Perform job operation as per approved job design program.
- (10) Complete field Service Ticket and Signed by client representative.

6. Evaluation

- (1) QHSE report and field ticket on to company data base.
- (2) Each Well should have End of Well Report and upload on to data base.
- (3) Operation Manager and Field Service Manager review Quarterly.

Appendix 1: Cement Head Operation Procedure

Operating cement head is related to high pressure operation, following are basic operation procedure must be followed for double plug cement head operation

- (1) Before performing any operation on cement head, must ensure that all pumping is ceased.
- (2) Confirm the plug drop indicator is in the correct position.
- (3) Open bottom plug launch valve.
- (4) Retract bottom plug retainer Pin by turning wheel fully open.
- (5) Close plug bypass valve.
- (6) Move personnel to safe area.
- (7) Confirm with Job Supervisor, then start the pumping operation.
- (8) Observe the Plug drop indicator to confirm the bottom plug is released.
- (9) Stop all pumping operations.
- (10) Reset plug drop indicator in correct position.
- (11) Open top plug launch valve.
- (12) Retract top plug retainer pin by turning wheel fully open.
- (13) Close bottom plug launch valve (also close bypass plug valve).
- (14) Move all personnel in safe area.
- (15) Confirm with Job Supervisor, then start the pumping operation.
- (16) Observe the plug drop indicator to confirm the top plug is released.
- (17) Ensure all valves are in open position during the displacement.

Appendix 2: Cement Pump Pre-operation checklist and start up procedure

1. Pre-operation check list:

One of the criteria for providing good services to client is to have well designed and well maintained equipment, the operator must perform below item check before start operation on the cement unit.

This is additional to Pre-job Check list as described in maintenance procedure:

Item to be checked after engine starting up:

- (1) Start engine at idle speed.
- (2) Check engine oil and pressure.
- (3) Check hydraulic reservoir.
- (4) Check transmission oil level.
- (5) Check power end oil pressure.
- (6) Check lube filter by pass indicator.
- (7) Warm up ending and place engine in full throttle.
- (8) Check engine pressure.
- (9) Check transmission pressure.
- (10) Check for transmission torque convert lock up.
- (11) Check over pressure shut down.
- (12) Check power end filter by pass indicator.
- (13) Check engine air cleaner service indicator.

2. Startup procedure

The procedure outlined below assumes the operator has completed pre-operation check list as described above:

- (1) Open air supply valve.
- (2) Open fuel supply valve.
- (3) Place transmission in neutral position and engine throttle in idle position.
- (4) Turn on power to console.
- (5) Check over pressure shut down and reset if necessary.
- (6) Open all discharge valve on high pressure line.
- (7) Inform all personnel impending start up.

3. Shut down procedure

The following procedure should be followed when shutting the cement unit down.

- (1) Place transmission in neutral position with engine idle.
- (2) Close fluid make up valves.
- (3) Close pump suction valves.
- (4) Open bleed valve.
- (5) Close discharge valves.
- (6) Shut down engine.
- (7) Shut off power to console.
- (8) Shut off air supply valves.
- (9) Shut off fuel supply valve.

Appendix 3: Primary Cementing Procedure

- (1) RIH casing to design depth, place centralizer as per Centralize Design Program.
- (2) Install casing circulating swage and circulate well.
- (3) Remove circulating casing swage, rig up cementing head with bottom and top plug loaded.
- (4) Hold pre-job safety meeting with everyone on location. Discuss:
 - ✓ Job procedure
 - ✓ Contingency plans
 - ✓ Job responsibilities
 - ✓ Pressure and rate limitations
 - ✓ Mustering points
 - ✓ Chemical hazard
- (5) Flush and pressure test cementing line to 500 psi above the estimated maximum pumping pressure during the job for 10 min.
- (6) Pump chemical wash as per design.
- (7) Pump spacer as per design.
- (8) Drop bottom plug.
- (9) Start mixing and pumping lead slurry as per design density and volume.
- (10) Start mixing and pumping tail slurry as per design density and volume.
- (11) Drop top plug.
- (12) Start displacement.
- (13) Slow down rate to bump cement plug.
- (14) Bleed off pressure and check return.
- (15) Job complete.

Appendix 4: Liner Cementing Procedure

- (1) RIH liner to design depth, place centralizer as per Centralize Design Program.
- (2) Install Liner Cementing Head and circulate well.
- (3) Hold pre-job safety meeting with everyone on location. Discuss:
 - ✓ Job procedure
 - ✓ Contingency plans
 - ✓ Job responsibilities
 - ✓ Pressure and rate limitations
 - ✓ Mustering points
 - ✓ Chemical hazard
- (4) Flush and pressure test cementing line to 500 psi above the estimated maximum pumping pressure during the job for 10 min.
- (5) Pump chemical wash as per design.
- (6) Pump spacer as per design.
- (7) Start mixing and pumping lead slurry as per design density and volume.
- (8) Start mixing and pumping tail slurry as per design density and volume.
- (9) Drop wiper dart.
- (10) Start displacement, slow down rate when dart launch with top plug at liner hanger.
- (11) Slow down rate to pump Cement plug.
- (12) Bleed off pressure and check return.
- (13) Observe the liner hanger company release the hanger till all running tool are pull out from liner hanger and reverse or normal circulation complete.
- (14) Job complete.

Appendix 5: Cement Squeeze Job Procedure

- (1) Hold pre-job safety meeting with everyone on location. Discuss:
 - ✓ Job procedure
 - ✓ Contingency plans
 - ✓ Job responsibilities
 - ✓ Pressure and rate limitations
 - ✓ Mustering points
 - ✓ Chemical hazard
- (2) Flush and pressure test cementing line to 3000 psi for 10 min.
- (3) RIH drill pipe with Cement Retainer to setting depth.
- (4) Set Cement Retainer.
- (5) Sting into retainer and perform injection test with fresh water at: 0.25, 0.5, 1, 2, 3, 4, and 5 bpm, depends on the pressure achieved.
- (6) Record the rate and pressure.
- (7) Sting out of retainer.
- (8) Pump minimum 1 volume tubing ahead followed by 10 bbls of chemical wash @ 4 bpm.
- (9) Mix and pump slurry the amount depends on the infectivity test, follow the workflow attached.
- (10) Displace @ 3 bpm until spacer get to the end of tubing.
- (11) Sting into retainer.
- (12) Inject slurry by pumping fresh water (0 bbl inside the drill pipe) at 1-2 bpm, depend on injection test, or when reached the squeeze pressure. Do a HESITATION SQUEEZE.
- (13) Sting out of retainer.
- (14) POOH, reverse circulate to clean drill pipe and stinger.
- (15) W.O.C

Appendix 6: Fracturing job equipment preparation

1. Fracturing Equipment preparation

The equipment needed for the fracturing operation is in the following table.

Item	Description	Capacity	Qty
1	Fracturing Pump	2250 HHP	TBC
2	POD blender	500HHP, Max 75 BPM	1
3	Data acquisition van	8 analog signal, 8 frequent signals, control upto 30 pumps	1
4	Acid transfer C-pump	1ea 5X6	TBC
5	High/Low pressure manifold	double entry, 3 pump connections for each side total 6 pump connections	1 set
6	Acid Tank	400 bbls	TBC
7	Frac fluid tank	400 bbls	TBC
8	Low pressure manifold		TBC
9	Backside Pump	700HHP, Max Pressure 15000psi	1
10	High pressure line	3" HP treating line (40BPM max rate)	1 set
11	Wellhead crossover	BX156 10K Flange - 3" 1502 T crossover	2
12	Wellhead crossover	BX152 10K Flange - 2" 1502 T crossover	1
13	Crane	20 ton	1
14	Pickups		2
15	Generator		2
16	office container		2
17	relex container		2

2. Fluid Tanks preparation

- (1) Make sure the tanks are clean, inside and outside.
- (2) Make sure the tanks are internally coated and that the coating is not damaged.
- (3) Make sure the valves operate and do not leak.
- (4) Make sure that the top is skid proofed and the hatches are fully opening.
- (5) Make sure that the tanks are placed on level ground and leaning slightly forward.
- (6) Check to ensure that the ladders are secured.
- (7) Measure the tank depth and verify gauging procedures.
- (8) Check the condition of the suction lines and determine the height of the suction above the bottom.
- (9) Add biocide with the first load of water.

3. Manifold preparation

- (1) Understand the flow path from the blender and pump trucks through the manifold and to the well.
- (2) Know what is injected and where.
- (3) Check the condition of all the hoses and treating lines.
- (4) Review the valve system and make sure it is operable in case of a failure.
- (5) Check for any internal restrictions.
- (6) Make sure that the sample catcher valve is working.
- (7) Determine who will take the samples.
- (8) Determine the measurements to be taken on the sample.
- (9) Determine what changes will be made if the sample is not as expected.

4. Pump Trucks preparation

- (1) Verify that the horsepower required is on location; determine how it is distributed.
- (2) Know the horsepower available per truck.
- (3) Always have sufficient backup horsepower, truck for truck.
- (4) Make sure that fire extinguishers are by each truck.
- (5) Understand the drive mechanism of each pump truck.
- (6) Know the pump capacity and rating for each truck.
- (7) Determine the operators for each set of unit.
- (8) Keep all engines running.
- (9) Know at all times how many pumps are online.
- (10) If pumps go down, determine if it is temporary or permanent and re-check the backup.
- (11) Pressure test all lines and check for leaks; repair all leaks.
- (12) Pressure test casing pump truck and line; use pop-off bleed line and visual pressure gauge.
Monitor the amount of water pumped into the casing; this could indicate problems.

5. Blenders preparation

- (1) Make sure the blender is located in a position.
- (2) Inspect the hoppers for size, cleanliness, and exposed bearings.
- (3) Check the operation of all augers, tub paddles, and pumps.
- (4) Inspect the mixing tubs-look for leakage, additive injection points, leveler operation, and paddle operation.
- (5) Check the condition of hydraulic hoses-make sure the hydraulic oil supply is sufficient.
- (6) Inspect suction and discharge hoses for proper connections, proper routing, and good condition.
- (7) Inspect and diagram the flow path of fluids through the blender.

-
- (8) Check the diversion valves to ensure operation; practice switching valves during pre-pad stage to check operator competence and to measure pressure and rate changes.
 - (9) Ascertain who will be the primary blender operator and who will be the backup operator
 - (10) Verify that the densitometers operate and know their location.
 - (11) Operate both blenders at all times during the fracture treatment; maintain a state of constant readiness.

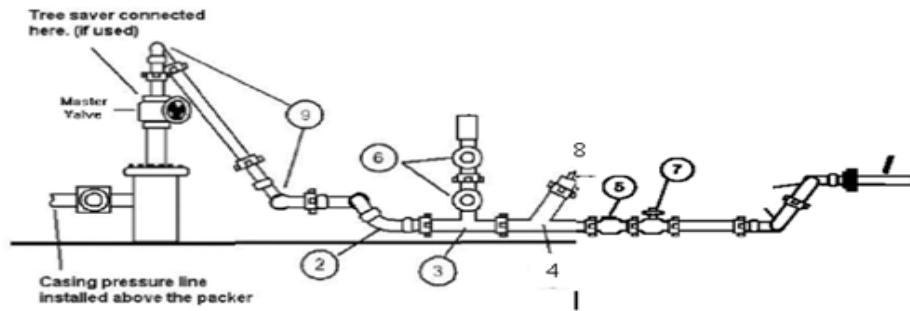
6. Fluid and Additives preparation

- (1) Make sure that the required additives are on location according to the design.
- (2) Verify the quantity according to the design.
- (3) Have the mixing crew assigned who will be in charge of the additives.
- (4) Determine how the additive will be measured.
- (5) Make sure that the additive pumps as per design.
- (6) Check tanks and record the chemical inventory at the end of the job.

Appendix 7: Fracturing job Rig up

1. Wellhead rig up

The well head rig up need follow the following rig up layout Fig1.



1. Flowback choke
2. 3 Way chickson
3. Tee
4. Yee
5. 3" plug valve
6. 3" plug valve
7. Flapper type Check valve
8. HP transducer
9. Chicksons

Fig 1 wellhead rig up chart

2. Pump truck rig up

The pump rig up need to follow the rig up chart below Fig 2.

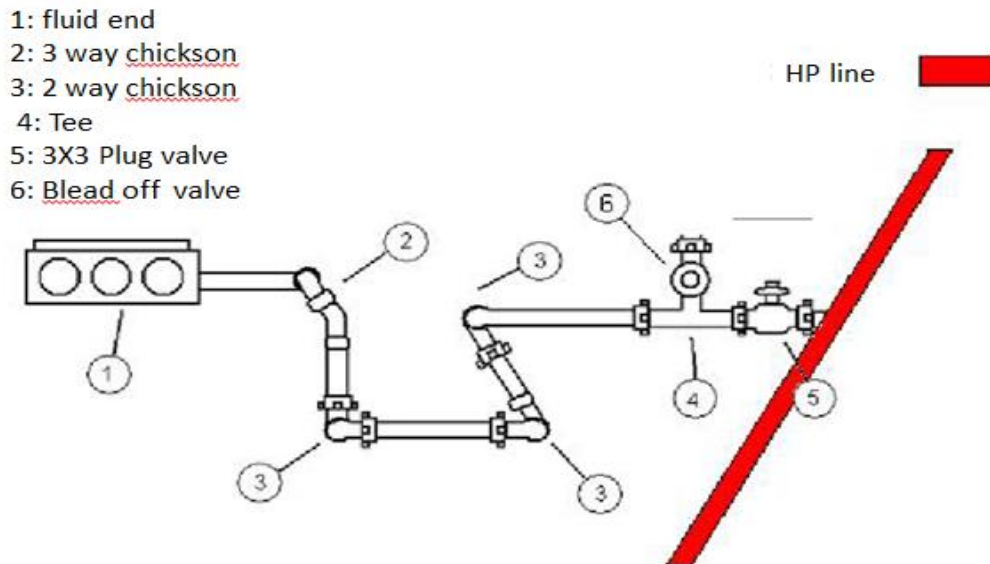


Fig 2 pump rig up chart

3. Surface equipment layout

The surface equipment layout is showed in the below Fig 3.

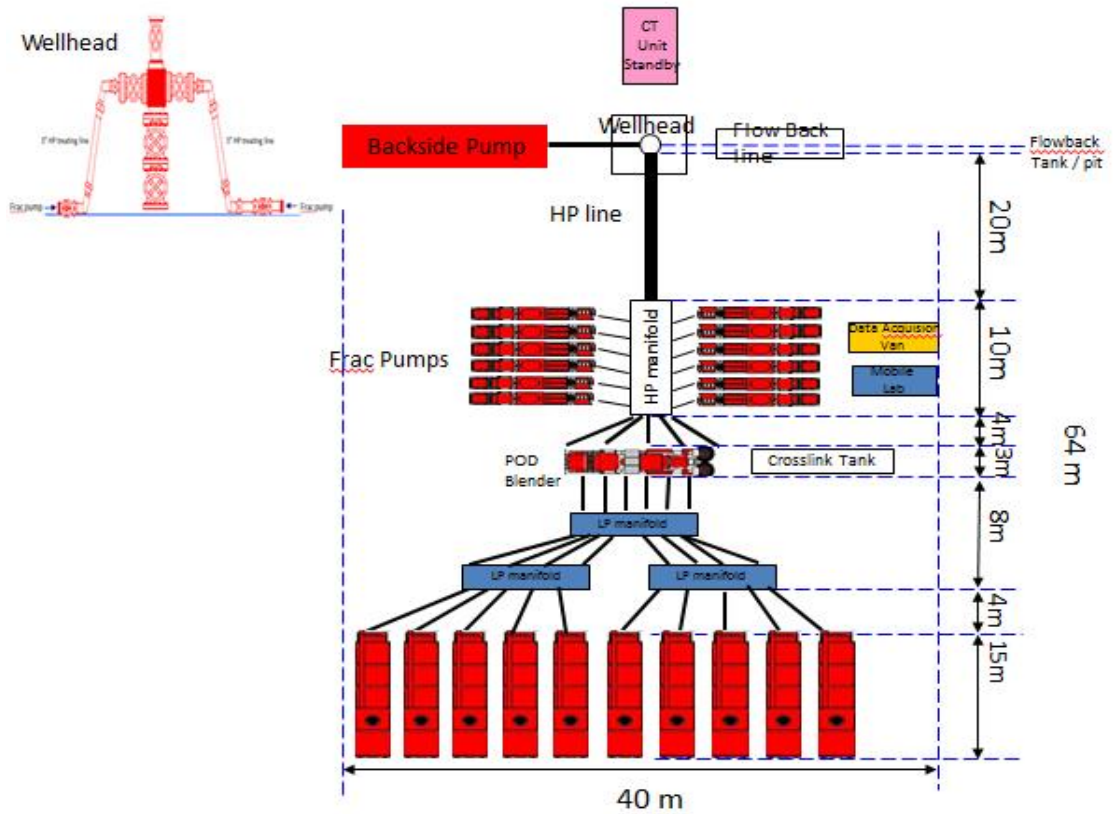


Fig 3 Surface equipment layout

Appendix 8: Fluid Preparation

1. Frac Fluid Preparation

- (1) Check the tank is clean.
- (2) Verify fluid volume.
- (3) Check the water quality before load the water into the water tank.
- (4) Run a pilot test to make sure the fluid will gel.
- (5) Add the additives in order as in the following table.

Code	Name	Unit	Con. per Mgal
KHF002L	Clay Stabilizer	GAL	
KHF003	Biocide	GAL	
KHF006	Defoamer	GAL	
KHF005	Stabilizer Aid	LB	
KMA005	Demulsifier / Anti Sludge	GAL	
KHF004	Stabilizer	GAL	
KHF021	Gelling Agent	LB	
KHF007	Surfactant	GAL	

- (6) Circulating for 30 mins.
- (7) Once the fluid has been gelled, the lab technician need measure pH, temperature, and apparent viscosity. Make sure the quality of the fluid meet the QAQC requirement.
- (8) Repeat these measurements just before pumping to ensure no gel deterioration.

2. Acid fluid preparation

- (1) Check the tank is clean.
- (2) Verify fluid volume.
- (3) Check the water quality before load the water into the water tank.
- (4) Check the HCl concentration with hydrometer.
- (5) Add the additives in order as in the following table for HCl.

Code	Name	Unit	Con. per Mgal
KMA006	Clay Stabilizer	LB	
KMA015	Acid Friction reducer	LB	
KMA004	Corrosion Inhibitor	GAL	
KMA005	Demulsifier / Anti Sludge	GAL	
KMA003B	Iron Stabilizer	LB	
KMA009	H2S Scavenger	GAL	
29%HCl	29% HCl	GAL	
KMA001	Surfactant	GAL	

- (6) Add the additives in order as in the following table for CAT.

Code	Name	unit	con per Mgal
KMA004	Corrosion Inhibitor	GAL	
KMA005	Demulsifier / Anti Sludge	GAL	
KMA009	H2S Scavenger	GAL	
KMA007	Diverting Agent	GAL	
29%HCl	29% HCl	GAL	