

1. DESCRIPTION OF WORK

- a) The CONTRACT covers **Acid Pumping** services for both exploration and production wells located in Adıyaman, Batman, Diyarbakır, Şırnak and Thrace regions, but not limited to them. Service period shall be (2) years from the date of first signed.
- b) CONTRACTOR shall be able to perform acidizing operations in abovementioned regions by means of necessary equipment and personnel quantity. If necessary, additional one frac unit and one crew shall be activated within 2 months after mutual agreement is reached by parties.
- c) CONTRACTOR shall submit CV for Key Personnel and case histories for successful acidizing operations.
- d) COMPANY has the right to order changes to the WORK specified in a work order. Such changes may include additions (may add other workover operation), alterations or replacements (provided such additions, alterations or replacements are within the capability and resources of the CONTRACTOR) or omissions to the WORK. Any adjustment to pricing contained in the applicable WORK ORDER resulting from any such changes shall be valued at the appropriate rates and prices or in the absence of any appropriate rates and price; a fair valuation shall be made and mutually agreed by COMPANY, and CONTRACTOR.
- e) CONTRACTOR shall furnish all labor, preparation of acid operation and injection to the well, tools, equipment, supervision, insurance, HSE equipment and incidentals, as specified herein and shall do all things necessary to perform the **Acid Pumping** service.
- f) CONTRACTOR shall be able to perform acidizing operation in place which TPAO operates by means of necessary equipment and personnel quantity on a call out basis.
- g) CONTRACTOR shall keep equipment, materials and other items in Diyarbakır or Batman province suitable for safe shipment to final site, discharge and stacking to perform work or service in requested well location respecting the operation time schedule as per COMPANY's request communication. Standby charges shall not be applicable for any period during which the units remain idle at the CONTRACTOR's base.
- h) CONTRACTOR shall be able to supply required amount of hydrochloric acid and formic acid in order to perform acid pumping services for both exploration and production wells.
- i) CONTRACTOR shall keep hydrochloric acid and formic acid in storage tanks placed in the base suitable for safe shipment to final site.
- j) Diesel shall be provided by CONTRACTOR.

2. HSE POLICY

- CONTRACTOR should provide hard hat, safety glasses, and steel-toed boots when outside the living accommodations and during all operations and emergency situations for their own personnel.
- CONTRACTOR shall, as a minimum, brief all personnel engaged in the Work of all the details of the aforementioned requirements imposed on CONTRACTOR.
- Personnel must be well trained according to the HSE policy and has to have necessary documents.
- CONTRACTOR shall keep the Work site free at all times from accumulation of water, material, or rubbish resulting from Work, and upon completion of Work shall thoroughly clean the premises and issue the removal of all CONTRACTOR Equipment.
- CONTRACTOR shall take all necessary precautions to comply with applicable regulations protecting environment.
- No trash shall be left on the well site.

3. SERVICE CONDITIONS

- The CONTRACTORS shall be fully responsible for providing all personnel, equipment, materials, logistics, testing, and operational support necessary to perform the ACID PUMPING SERVICES as requested by the COMPANY through written requisitions or call-out notifications.
- The CONTRACTOR shall be fully mobilized and commence the requested ACID PUMPING SERVICES within thirty (30) calendar days following the date of contract signature unless otherwise agreed in writing by the COMPANY.
- Failure to commence the WORK within the thirty (30) calendar day period due solely to reasons attributable to the CONTRACTORS shall constitute a breach of contract and shall entitle the COMPANY, without prejudice to any other rights or remedies, to:
 - ✓ reject the call-out without any financial liability,
 - ✓ apply the applicable penalty provisions,
 - ✓ pay delay penalty in the amount of USD 1,000 (One Thousand United States Dollars) per calendar day for each day of delay per each cementing units, starting from the thirty-first (31st) calendar day following the call-out notification, until the commencement of the WORK
 - ✓ deduct such penalties directly from the CONTRACTOR's interim or final payment certificates (progress payments), without the need for any prior notice or approval,
 - ✓ terminate the relevant call-out or the Contract in whole or in part.
- Delays caused by force majeure events or delays expressly approved in writing by the COMPANY shall be excluded from the thirty (30) calendar day limitation.

The CONTRACTORS shall provide fully qualified laboratory personnel, service engineers, supervisors, and technical staff for the execution of the WORK.

- If the COMPANY call out email is sent after 17:00, the call-out initiating time starts at 06:00 the next day.
- After receiving call out e-mail from COMPANY for Acidizing Services, be ready for demanded operations within 12 hours if mobilization distance is less than 200 km within 24 hours for the mobilization distance between 200 – 500 km within 48 hours for the mobilization distance more than 500 km. Any delay beyond the specified call-out time due solely to the CONTRACTOR shall be subject to a penalty equivalent to the applicable COMPANY rig hourly rate for each delayed hour, up to a maximum of twenty-four (24) hours
- Upon arrival of the acid pumping crew and unit at the wellsite, no standby charges shall apply for the first eight (8) hours. If acidizing operations cannot commence after this period due to reasons attributable to the COMPANY, standby charges shall apply on an hourly basis for the actual waiting time.
- The COMPANY may retain the pumping unit and equipment at the wellsite without the crew. In such cases, only equipment standby charges shall apply.
- If the total acidizing operation volume is forty thousand (40,000) gallons or less, the operation preparation time shall be limited to twelve (12) hours; and if it exceeds forty thousand (40,000) gallons, the preparation time shall be limited to sixteen (16) hours. In the event that these time limits are exceeded, the hourly rig standby charges corresponding to the excess period shall be deducted from the Contractor's progress payments.
- Mobilization payments shall consist of two components:
 - i. mobilization from the CONTRACTOR's base to the field location, and
 - ii. mobilization from the last field worked to the next field location.
- For pumping volumes up to ninety thousand (90,000) gallons, the CONTRACTOR shall not be entitled to charge any additional operating or personnel costs.
- Ensure the equipment supplied to be fit for its intended purpose as per international standards and as outlined in this Specification.
- Perform management, co-ordination and operational support of Subcontractors, including but not limited to all acid operations and activities necessary to co-ordinate, organize, control, monitor and support the Work provided by Subcontractors and the provision of Contractor's support and administration facilities and services that Subcontractors require to perform their respective Work in accordance with the Contract.
- CONTRACTOR should be aware of that the Turkish Petroleum uses the acid type as HCL, HCL+ HF, HCL + Formic acid, Mud Acid, Pad Acid, etc.
- The CONTRACTORS shall provide all required treating iron, manifolds, associated pressure equipment. All such equipment shall be new or certified, pressure-rated, and suitable for acidizing operations.

- The CONTRACTORS shall establish and maintain a documented maintenance, redress, and inspection program for all equipment used in acidizing operations.
- The CONTRACTORS shall perform regular maintenance, function testing, and calibration of all contractor-owned tools and equipment prior to and during acidizing operations.
- The CONTRACTORS shall be fully responsible for the operation of its equipment, including but not limited to transportation, rig-up, pressure testing, operation, and rig-down, and shall obtain all necessary legal permits for the transportation of acid, chemicals, additives, and related materials.
- The CONTRACTORS shall perform quality assurance and quality control (QA/QC) testing on all CONTRACTOR-supplied materials and shall submit test results and documentation to the COMPANY upon request.
- The CONTRACTORS shall submit inspection and certification reports for all treating iron, manifolds, Inspection documentation shall be submitted to the COMPANY at least once per calendar year or upon request.
- The CONTRACTORS shall be fully responsible for the management, coordination, supervision, and operational control of all Subcontractors. This responsibility shall include, but not be limited to, planning, organizing, directing, monitoring, and supporting all Subcontractor activities, as well as providing all necessary administrative, technical, and logistical support to ensure that the Subcontractors perform their respective Work in full compliance with the Contract and COMPANY requirements.
- The CONTRACTORS shall submit a comprehensive end-of-WORK report in both hard copy and electronic format. The report shall include, at a minimum, operational summaries, pumping schedules, volumes, pressures, laboratory and field test results, equipment used, and a record of any deviations from the approved acidizing program.

4. RESPONSIBILITIES REGARDING EQUIPMENT, MATERIALS & SERVICES

The CONTRACTORS shall provide all qualified, fit-for-purpose, and certified equipment, materials, chemicals, consumables, and services necessary to safely and effectively perform cementing operations in accordance with this Contract and COMPANY requirements.

All tools and equipment shall be function-tested, calibrated, and verified prior to each acidizing operation.

Equipment;

- High pressure pump units including 2 Quintuplex Frac Units (min. 2000 HP & 12K psi), and Annulus Pumping Unit with min 400 HP, 10k pressure rating. COMPANY will not pay operating charges for frac unit and annulus pumping unit related to pumping line pressure tests.
- Acid pumping service charge starts when the liquid is pumped into the well and ends when the engine stops. Any non-pumping periods during the operation shall be excluded from the service charge calculation. In the event of a failure of any unit utilized during the operation, no service charge shall be payable to the CONTRACTOR for the affected operation.
- Frac Units shall be capable of pumping rate minimum 7 bpm at 10000 psi pressure rate. The company shall attach the pump performance curve documentation to the tender dossier.
- Acid blender having min. 20 bpm discharge rate capacity, min. 5 additive dosage system (4 liquid additive & 1 dry additive) metering efficiently and required hardware for feeding pumping units consistently during acidizing operations.
- 2 Acid transportation trucks (min. 4K gal per each) with acid tanks manufactured in accordance with the ADR agreement.
- Nitrogen Pumping System having required tank capacity, 10K psi discharge pressure rate and 3000 scf/min discharge rate.
- Necessary equipment to perform acid operations.
- High pressure and flowrate connections, flowline or manifolds, flange and adaptors to the well head equipment and should be durable to acid and solvent and also acid string designed as 3 ½" EUE or NU tubing therefore min 3" fig 1502 and 2" fig 1502 15K configuration should be used (min. 10K psi).
- Manifolds or pumping line for control or check the annulus pressure condition.
- Necessary hardware and software support for operations (flowmeter, pressure gauges data gathering program, real-time data acquisition and recording software.)
- At least 2 acid tanks which has level indicator as necessary quantity (min 10K gal per each),
- 2 batch mixers which has agitators as necessary quantity (min. 6K gal) and 2 mixing tanks which have agitators as necessary quantity (min. 15 K gal per each).
- At least 30K gallons acid storage tanks which has level indicator as necessary quantity located at Contractor Base. It shall be ready within one month as of the date of the contract signature.

Additives;

- The CONTRACTORS shall provide full technical documentation for all acidizing additives manufactured by the CONTRACTORS or produced under its proprietary or patented trademarks. Such documentation shall include manufacturing location(s), quality control procedures and applicable certifications. If the CONTRACTOR is outsourcing acidizing additives, CONTRACTOR shall use patented additives manufactured by Halliburton, Schlumberger, Baker Hughes, Viking and GeoChem.
- Upon written request by the COMPANY, the CONTRACTORS shall be able to supply relevant acidizing additives to other contractors providing acidizing services to the COMPANY, under the same technical and quality requirements defined herein.
- If required for the operation, the Company shall have the right to provide acids, chemicals or additives not included in the Cost Sheet List. The Contractor shall be responsible for the safe storage, handling, preparation and use of such materials in accordance with the approved operational program and applicable procedures.
- Upon request, the CONTRACTORS shall provide copies of applicable API certifications, Material Safety Data Sheets (MSDS), and Technical Data Sheets (TDS) for all acid additives.
- At the end of the Contract period, the CONTRACTORS shall remain fully responsible for all remaining acid and additives, and the COMPANY shall not make any payment for unused or remaining chemicals.
- CONTRACTOR shall provide acidizing additives listed below:
 - ✓ Fresh water,
 - ✓ 15% or 28% HCl acid,
 - ✓ Formic acid
 - ✓ Corrosion inhibitor
 - ✓ Nonemulsifier additive
 - ✓ Iron chelating agent,
 - ✓ Iron-reducing agent,
 - ✓ Clay stabilizing additive,
 - ✓ Anti-Sludging agent,
 - ✓ Gelling agent,
 - ✓ Gel breakers,
 - ✓ Friction Reducer,
 - ✓ Acid gelling agent
 - ✓ Crosslinker agent
 - ✓ Biocide
 - ✓ Micellar additive, surfactant
 - ✓ Butyl Glycol
 - ✓ pH Buffer

3.3. Laboratory Testing Protocols and Fluid Standards

When the mixing water is supplied by the COMPANY, it shall be subject to defined acceptance criteria prior to use in gel preparation. The water shall meet all required quality specifications to ensure proper performance of the gelling, crosslinking, and breaker systems. Any deviation from the specified water quality parameters shall require approval before use in the operation.

Water Quality Parameter	Mandatory Acceptance Value
pH	6.0 – 8.0
Bicarbonates	< 300 ppm
Hardness	< 2.000 ppm
Iron	< 10 ppm
Phosphates	< 5 ppm
Sulphates	< 1.000 ppm
Specific Gravity	< 1.038
Total Dissolved Solids (TDS)	< 5.000 ppm

Table 1. Operational Water Standards

All laboratory screening of stimulation fluids and additive formulations must be performed according to the standardized procedures and acceptance criteria detailed below:

- Acid Corrosion Inhibitor Test (ASTM G31): Steel test coupons must be selected to match the metallurgy of the downhole production tubing string specified in the Work Order (such as N-80, J-55, or P-110) with standardized dimensions of 5 cm x 1 cm x 0.2 cm. Coupons shall be prepared in general accordance with ASTM G31 guidelines, sanded to eliminate surface oxides, dried completely, and weighed on an analytical balance to 0.1 mg precision to record the initial weight (W_1). A 100 mL volume of live acid blend containing the designated concentrations of Acid Corrosion Inhibitor, and/or Intensifier, and other dynamic additives shall be placed inside a non-reactive glass inside an HP-HT Corrosion Autoclave Tester. The metal coupon shall be fully submerged. The cell body shall be sealed and hydraulically pressurized to a minimum of 3.000 psi to suppress fluid vaporization and maintain the live acid state. The system shall be heated to the target bottomhole temperature (BHT) and maintained under static conditions for exactly 4 hours. Following exposure, the cell shall be rapidly cooled, safely depressurized and the coupon removed. The coupon shall be cleaned with a neutralizing solution and a soft bristle brush to remove corrosion products, rinsed with ethyl alcohol, dried completely and re-weighed to record the final weight (W_2).

For fields with BHT < 250 °F (121 °C), the mass loss must be strictly ≤ 0.02 lb/ft² (0.098 kg/m²). For high-temperature fields with BHT ≥ 250 °F (121 °C), the mass loss must be ≤ 0.05 lb/ft² (0.244 kg/m²). Examination of the treated metal surface must confirm a total

absence of localized pitting corrosion (Grade 2 or above), edge biting or deep crater anomalies; uniform surface erosion is mandatory.

- Iron Control and Sequestration Performance Test (ISO 13503-9 & ASTM E394): To evaluate the iron chelation and stabilization capability of Iron Control Agents in spent systems, a strict baseline contamination of 10,000 ppm Ferric iron (Fe^{3+}) shall be established inside 100 mL of live acid by dissolving exactly 4,840 grams of Ferric Chloride Hexahydrate ($\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$). The live acid system containing the iron control additive package shall be spent/neutralized by adding premium pure Calcium Carbonate (CaCO_3) powder under stirring until complete acid neutralization is achieved and a stable spent acid state with a $\text{pH} \geq 5.0 - 5.5$ is reached. The spent solution shall be transferred to a laboratory oven at the target reservoir temperature and aged statically for a block of 4 hours, then centrifuged at 3,000 rpm for 15 minutes. To quantify the remaining dissolved iron fraction via the ASTM E394 spectrophotometric 1,10-Phenanthroline protocol, a 2 mL aliquot of the filtered supernatant fluid shall be sampled. Exactly 5 mL of a 10% (w/v) Hydroxylamine Hydrochloride ($\text{NH}_2\text{OH} \cdot \text{HCl}$) solution shall be added to completely reduce all remaining dissolved Fe^{3+} to Fe^{2+} . Next, exactly 10 mL of an Ammonium Acetate ($\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$) buffer solution shall be introduced to adjust and stabilize the sample pH between 3.5 and 4.5. Finally, 5 mL of a 0.1% (w/v) 1,10-Phenanthroline indicator solution is added, and the volumetric flask is filled to volume with deionized water. After 10 minutes of color development, the light absorbance shall be measured at exactly 510 nm using a UV-Vis Spectrophotometer against a calibrated standard concentration curve.

The spent acid solution must maintain total structural clarity with absolute zero visible red-brown Ferric Hydroxide [$\text{Fe}(\text{OH})_3$] precipitation, flocculation, or gelatinous sludge formation. The calculated iron sequestration efficiency must be $\geq 99.5\%$, meaning the total precipitated iron fraction must be less than 0.5% (< 50 ppm) of the initial 10,000 ppm input after thermal aging.

- Non-Emulsifier Performance Test (ISO 13503-9 & ASTM D4007 Modified Bottle Test): Evaluation of emulsion breakout dynamics shall be performed using a representative fresh crude oil sample from the target field. Pour 50 mL of the fully-formulated acid/treatment fluid containing the designated Non-Emulsifier additive and 50 mL of the fresh crude oil sample into a graduated glass bottle (1:1 volumetric ratio). The bottle shall be shaken vigorously by hand or mechanically shaken using a reciprocal wrist-action shaker at a minimum rate of 200 strokes/min for exactly 1 minute to generate a standardized, homogeneous emulsion phase. The container shall be immediately placed vertically into a calibrated water bath maintained at target reservoir temperature. The fluid separation breakout volumes (Water Break Rate) shall be recorded visually at 15, 30, 45, and 60 minutes.

Fluid phase separation must exhibit a breakout efficiency of $\geq 50\%$ at the 15-minute mark and achieve 100% complete separation back to original component volumes (50 mL clear aqueous phase) at the 60-minute mark. The boundary layer between the crude oil and the separated acid must be completely sharp, distinct, and flat, with zero residual rag layer, emulsion cushion, or localized clotting. The separated acid phase must be completely clear and free of suspended oil droplets or color contamination.

- Anti-Sludge Performance Test (ISO 13503-9 Guidelines): Combine 50 mL of the fully-formulated treatment fluid and 50 mL of fresh crude oil in a laboratory glass container. The mixture shall be shaken vigorously by hand or high-speed shaker for 1 minute to ensure intense contact between the live acid matrix and reactive asphaltene fractions. The container shall be placed into a water bath or oven maintained at target reservoir temperature and aged statically for exactly 1 hour. Remove the container, and while the mixture is still hot, filter the entire fluid volume through a pre-weighed 100-mesh (150-micron) stainless steel filter screen. The retained hydrocarbons and residues on the filter screen shall be thoroughly washed with cold petroleum ether or pentane to remove residual crude oil, and the screen assembly shall be dried in a laboratory oven and weighed on an analytical precision balance.

The net dry weight of the asphaltene residue, precipitate, or solidified organic complexes retained on the 100-mesh screen must be exactly 0.0 grams (Zero Sludge). Any visible accumulation of tar, asphaltic mass, or rigid solids on the filter screen shall constitute a failure of the Anti-Sludge formulation.

- Clay Stabilization and Linear Swelling Test (ISO 13503-9 & ASTM Standard Procedures): Particle expansion inhibition shall be tested using a precise Linear Swell Meter (LSM) assembly equipped with an LVDT sensor. Weigh exactly 10.50 grams of dried standardized sodium bentonite or pulverized reservoir core material and pack it into a high-pressure pellet die. Apply a hydraulic pressure compaction of 6.000 psi for exactly 2 hours to form a highly compressed, uniform clay pellet cake. Position the clay pellet into the sample chamber beneath the LVDT (Linear Variable Differential Transformer) displacement sensor of the LSM device. Flood the sample chamber with 80 mL of operational base water containing the optimized concentration of the Clay Stabilizer additive. Initiate the data acquisition software to continuously record the vertical displacement/expansion percentage (% Swell) for exactly 1.440 minutes (24 hours).

The total axial linear expansion of the clay pellet at the 1.440-minute (24-hour) mark must be $\leq 10\%$, indicating a minimum swelling inhibition efficiency of $\geq 90\%$ compared to an untreated deionized water blank sample.

- Surfactant and Interfacial Tension (IFT) Test (Pendant Drop Method): Surface and interfacial properties shall be verified using an optical Drop Shape Analyzer (DSA) or Contact Angle Goniometer setup. The optical quartz cuvette cell of the instrument shall be filled with a fresh sample of the field crude oil at ambient laboratory temperature under atmospheric pressure conditions. Fill the automated dosing syringe with the fully formulated acid/fluid package containing the Surfactant / Mutual Solvent additive. Lower the stainless-steel needle into the crude oil phase and carefully discharge a droplet of the fluid system to form a stable inverted Pendant Drop. Utilize the digital Drop Shape Analysis software to capture droplet profile geometries, execute numerical edge-fitting, and calculate the dynamic Interfacial Tension (IFT) in dyne/cm. Rock wettability alteration shall be verified concurrently by measuring the contact angle θ with the optical goniometer on oil-saturated reservoir core wafers exposed to the surfactant fluid system.

The air surface tension of the clean fluid package must be < 28 dyne/cm. The dynamic IFT boundary against crude oil under atmospheric conditions must drop to < 2 dyne/cm, with an optimized target value for maximum load recovery set at < 0.5 dyne/cm. The optical contact angle (θ) on treated oil-wet core surfaces must establish strongly water-wet properties, registering an angle of less than 30 degrees ($\theta < 30^\circ$).

- Friction Reducer Additive Performance Test (Lubricity Coefficient Method): The performance of friction reducer additives shall be evaluated using an industry-standard Lubricity Tester for lubricity coefficient measurements. Test samples shall be placed into the test cell, and the equipment shall be conditioned by operating at 60 rpm without applied torque for 1 hour prior to testing. The instrument shall first be calibrated using deionized water at 25 ± 1 °C by applying a load of 150 inch-pounds to the rotating metal ring and metal block assembly operating at 60 rpm.

The torque reading recorded at the 5th minute for water (t_{su}) shall be 34 ± 2 . If the measured value falls outside this range, the device components shall be inspected, cleaned, reassembled, and adjusted until the required calibration value is achieved. Following successful calibration, measurements shall be performed for the base solution and for solutions containing the friction reducer additive under the same operating conditions. Torque values at the 5th minute shall be recorded for each sample. Between each measurement, all wetted equipment components shall be thoroughly cleaned with acetone and dried. Upon completion of testing, the equipment shall be cleaned in accordance with the manufacturer's instructions. The lubricity coefficient shall be calculated for all samples using the applicable correction factor (DF) to verify the final test results.

- HP-HT and Atmospheric Rheological Evaluations for Gel Systems (ISO 13503-1 & API RP 39 Rotational Rheometer Protocols):

This comprehensive protocol applies strictly to all visually gelled or viscous fluid packages, including Gel Diverting Agents (mixed at 0.36% w/w / 30 lb/1,000 gal gel loading), Breaker Additive Performance validation, Crosslinked Gel fluid designs, Acid Gelling Agents (mixed at 1–2%), and Viscoelastic Surfactant (VES) Profiles used for Self-Diverting Acid (SDA) configurations.

For operations where the target reservoir bottomhole temperature (BHT) is up to 180 °F (82 °C), an Atmospheric Rotational Viscometer / Rheometer equipped with an evaporation shield over the cup assembly may be used, with the heating jacket temperature set to a maximum cap of 180 °F (82 °C) to prevent fluid evaporation and boiling anomalies at atmospheric pressure. For operations where the target BHT exceeds 180 °F (82 °C), an HP-HT Pressurized Rotational Rheometer (Coaxial Cylinder / Bob-and-Cup configuration equipped with acid-resistant metallurgy) must be used. The cup cell shall be loaded, sealed, and the headspace shall be pneumatically pressurized with Nitrogen (N_2) gas to a minimum of 300 to 400 psi to suppress fluid boiling and evaporation anomalies. The heating jacket shall subject the fluid sample to a continuous thermal sweep rising from ambient surface temperature to the exact target reservoir BHT specified in the Work Order.

Rotational shear testing shall be executed according to specific fluid application matrices:

- Crosslinked Fluids and Gelled Acids: Continuous rheograms shall be logged at a baseline shear rate of 100 s^{-1} during the heating sweep, with periodic automated shear rate ramps (e.g., sweeps at 100, 75, 50, and 25 s^{-1} conducted at discrete temperature

intervals) in accordance with API RP 39 to determine the power-law flow behavior index (n') and consistency index (k').

- VES Systems: The live acid matrix shall be reacted with excess pure CaCO_3 and CaCl_2 in the laboratory prior to loading to trigger micellar gel development, establishing an operational neutralized spent condition of $\text{pH} \geq 2.5 - 3.0$ before evaluation under 100 s^{-1} steady shear rate.

Technical Acceptance Criteria:

- Gel Diverting Agents: The gel system must provide a minimum dynamic viscosity of 30 cP at the target reservoir temperature (or 180 °F max for atmospheric setups) and maintain its viscosity stability within a strict tolerance profile of $\pm 10\%$ for a continuous aging block of at least 24 hours.
- Breaker Additive Performance: Incorporated at a 0.1% concentration into the linear gel system, the breaker must effectively degrade and reduce the fluid viscosity down to a clean, water-thin range of 1 to 2 cP within a maximum duration of two (2) hours at simulated reservoir temperature.
- Crosslinked Gel Systems: The crosslinked fluid must show a delayed crosslinking profile where Vortex Closure Time is 3–4 seconds and Crowning Time stabilizes within 5–6 seconds during surface blender preparation. Under the rheometer sweep at reservoir temperature, the peak dynamic viscosity at 100 s^{-1} must register $\geq 600 \text{ cP}$ and must remain continuously above 400 cP for the planned duration of the job stage. The ratio of the gelling agent to the breaker must be a minimum of 10. The broken gel must pass crude oil emulsion compatibility testing (100-mesh zero sludge).
- Acid Gelling Agents: The acid gel matrix must demonstrate non-destructive non-Newtonian pseudoplastic behavior with a reproducible hysteresis loop across shear rate cycles. Viscosity retention after a 24-hour thermal aging block at reservoir temperature must be $\geq 90\%$ of the initial baseline profile.
- Viscoelastic Surfactant (VES) Systems: The fully spent/neutralized VES gel package must achieve a dynamic viscosity of no less than 50 cP at 100 s^{-1} under the reservoir temperature sweep to confirm efficient matrix diversion. Furthermore, to prevent reservoir formation damage, this visco-elastic micellar network must break completely to a thin fluid viscosity of $\leq 5 \text{ cP}$ within a maximum window of 4 hours upon direct exposure to a representative crude oil sample at reservoir temperature, ensuring zero residual formation damage without requiring external chemical breakers.
- H₂S Scavenger Performance Test (AMPP/NACE TM0214 & ASTM D5705 Setup): To systematically evaluate the dynamic chemical stripping capacity of H₂S Scavenger additives under safe laboratory conditions, a direct liquid-to-vapor phase breakthrough test shall be managed according to NACE/AMPP TM0214. A 500 mL test matrix composed of operational water or sour hydrocarbon is placed into a laboratory glass sparging reactor cell. A precise concentration of H₂S gas is induced into the fluid matrix to construct a continuous liquid sour baseline of 2,000 ppm H₂S. The CONTRACTOR's recommended dosage of H₂S Scavenger is injected into the sour fluid matrix. The reactor cell shall be maintained at a standardized testing temperature of 140 °F (60 °C) or target field conditions. A high-purity carrier gas (N_2) is sparged through the liquid

fluid matrix at a continuous rate of 200 mL/min for a total tracking block of 4 hours to sweep liberated sour fractions into the vapor headspace. The H₂S gas breakthrough profile emerging in the vapor phase shall be monitored continuously using a calibrated electrochemical gas sensor or gas chromatography coupled with a sulfur chemiluminescence detector (GC-SCD) in general accordance with ASTM D5705. Acceptance Criteria: The H₂S Scavenger formulation must show an immediate chemical reaction rate, ensuring that the liberated vapor-phase H₂S concentration drops down to and stays at 0 ppm for the initial 2 hours of continuous gas sweeping. Over the total 4-hour tracking block, the absolute cumulative H₂S vapor breakthrough must not exceed a maximum cap of 5 ppm, proving a minimum scavenger conversion capacity efficiency of $\geq 99.75\%$ under atmospheric operating conditions.

- Sulfate-Reducing Bacteria (SRB) and Biocide Performance Test: Water samples from wellsite mix tanks are collected under sterile conditions. A 15 mL sample is injected into a sterile BART (Biocide Automated Resistance Test) tube containing a selective SRB nutrient medium and a diagnostic floating ball. The CONTRACTOR's recommended biocide dosage (typically 0.2% w/v) is applied. An untreated water sample is maintained as a blank control. Both tubes are stored in a laboratory incubator at 30 °C - 35 °C for 8 days (192 hours) and inspected daily for anaerobic H₂S gas generation and black Iron Sulfide (FeS) precipitation. Acceptance Criteria: The biocide-treated vial must exhibit zero black color transition, zero charring, and zero black particulate precipitate at the end of the 8-day (192-hour) tracking block (Zero SRB Activity). The control blank must develop active blackening to confirm test validity.

5. REQUIRED QUANTITY & QUALIFICATIONS FOR PERSONNEL

Personnel;

CONTRACTOR shall provide necessary personnel for the scope of work herein. All personnel shall be fully qualified and be able to inspect, adjust, prepare, assemble, redress, maintain and/or repair CONTRACTOR supplied equipment.

The following lists show the minimum requirements for the personnel to be supplied by the Contractor in order to carry out the Services in accordance with the scope of work herein. Personnel lists represent one each required acidizing and N₂ pumping team.

ACIDIZING TEAM		
Technical Personnel	Quantity	Min. Year Experience
Operation Director	1	5
Operation Engineer	1	3
Technician	1	5
Worker	TBD	2
N2 PUMPING TEAM		
Technical Personnel	Quantity	Min. Year Experience
N2 Pump Operator	1	5
N2 Helper	1	2

6. PENALTIES

- The CONTRACTOR shall be fined USD 2,500 for contamination of the wellsite or surrounding area with hazardous chemicals in reportable quantities due solely to the CONTRACTOR's fault, including improper handling, spills, or failure to remove waste and garbage from the location.
- In the event of an operational failure due solely to the CONTRACTOR's equipment malfunction, personnel negligence or procedural non-compliance, the COMPANY shall make no payment for the affected acidizing operation and the CONTRACTOR shall compensate the COMPANY for the resulting non-productive time by paying the applicable daily rig rate as specified in the relevant Work Order.
- In the event of mobilization delay or failure attributable to the CONTRACTOR, the CONTRACTOR shall pay a penalty calculated based on the rig's hourly rate for each hour exceeding the call-out times specified in the Contract. The total penalty shall not exceed the daily operating rate of the rig.
- The viscosity of the crosslinked gel to be used in acidizing operations shall not be less than 600 cP at surface conditions. In cases where this requirement is not met due to reasons attributable to the CONTRACTOR, the COMPANY shall have the right, at its discretion, to apply a deduction equal to 10% of the operation charge.
- The use of any unauthorized additives without the prior written approval of the COMPANY shall constitute a material non-compliance with the Technical Specification, and the COMPANY shall have the right to reject the relevant acidizing operation without any payment.
- In acidizing operations, if the deviation between the planned total fluid volume to be pumped and the actual pumped fluid volume exceeds 10%, the COMPANY shall have the right, at its discretion, to apply a deduction of 10% of the operation charge from the invoice.
- Equipment shall achieve desired pumping rate during acidizing job. Reduction will be if desired rate is not achieved for more than 10% of duration of any stage. COMPANY

shall have the right, at its discretion, to apply a deduction of 10% of the operation charge from the invoice

- In the event that surface line test duration exceeds two (2) hours, any Non-Productive Time (NPT) incurred beyond this threshold shall be calculated based on the CONTRACTOR's hourly crew standby rate, and an equivalent deduction corresponding to the NPT duration shall be applied to the invoice.