

العطاء رقم 2026/69

فحص زيوت التوربينات لمحطات الشركة ولمدة خمس سنوات بمعدل تقريبي
100-80 فحص سنوي وحسب المرفق



LUBE OIL ANALYSIS AND SAMPLING SERVICE

Five (5) Year Service Contract | 2026 – 2030

1. INTRODUCTION AND BACKGROUND

Samra Electric Power Plant operates a fleet of Gas Turbines (GE Frame 9E x4 and Alstom GT13E2 x3), Steam Turbines (Fuji, Dongfang, Alstom, Doosan Škoda), and associated EHC/hydraulic systems — totaling 18 lubrication and hydraulic fluid systems.

The program covers 18 lubrication systems with volumes ranging from 2 to 100 barrels. Fluids include ISO VG 32 and VG 46 Group II mineral turbine oils, phosphate-ester fire-resistant EHC fluids, and synthetic fire-resistant hydraulic fluids. This RFQ seeks a qualified Vendor for a five (5) year fixed-price service contract covering:

- Complete oil analysis services at an ISO/IEC 17025:2017 accredited laboratory;
- On-site sample collection by certified technicians, including all consumables and logistics;
- Full technical interpretation, Root Cause Analysis (RCA), and engineering support for all abnormal findings;
- A web-based digital reporting and data management platform.

2. SCOPE OF WORK

2.1 Oil Sampling Service

The Vendor SHALL provide a complete on-site oil sampling service — meaning the Vendor's own certified personnel travel to the plant and collect samples from each of the 18 systems per the approved sampling plan (Section 5). Plant personnel are not required to collect samples.

2.1.1 Consumables and Equipment (Vendor-Supplied)

1. Vacuum sample pump and accessories in sufficient quantity for 18-system concurrent collection.
2. Pre-cleaned, Ultra-Clean sample bottles: ≤ 1 particle $>10 \mu\text{m}$ per mL (certificate of cleanliness per batch required). Standard clear HDPE is acceptable for most tests. For MPC varnish potential samples (Test Q-9): amber or opaque HDPE bottles are MANDATORY — UV and light exposure alter oxidation-sensitive degradation products.
3. Disposable single-use polyethylene sampling tubing (1/4 inch outside diameter), changed between every system.
4. Tamper-evident barcoded sample labels, pre-printed with Equipment ID, sampling form, and QR code.
5. Cooler boxes with ice packs maintaining 4–25°C during transport to laboratory.
6. Sealed, crush-resistant courier mailer boxes compliant with IATA P650 (dangerous goods exemption for used oil).
7. Dedicated chemically-compatible tool sets for EHC/FR systems: Viton-sealed fittings, PTFE/Teflon tubing, colour-coded (RED tag = EHC only; BLUE tag = mineral oil only). No cross-use permitted.

2.1.2 Sample Label Mandatory Fields

Every sample bottle label SHALL include the following data. Samples with missing mandatory fields shall be rejected and recollected at Vendor cost:

- Equipment ID and Sample Date
- Oil Brand and Viscosity Grade
- Equipment Hour Meter or Operating Hours since last oil change
- Last Oil Change Date
- Last Top-up Date AND Top-up Volume (litres or barrels) — enter 'None' if no top-up. Volume is mandatory for dilution-corrected trend interpretation; a 10% top-up can reduce MPC by 15–20% and temporarily inflate RULER, creating false oil health signals.
- Oil Temperature at Sampling (°C) — measured at the sample port at moment of collection. Required: cold-oil sampling produces artificially low MPC results and unreliable air-release and water data.
- Machine Load at Sampling (% rated load or MW output)
- Volume of oil purged (mL) before sample collection

2.1.3 Chain of Custody and Transport



8. The Vendor shall maintain a documented chain-of-custody (CoC) record for every batch: technician name and certification ID, collection timestamp per bottle, sample barcode, courier tracking number, laboratory receipt timestamp, and condition verification note.
9. All samples shall be dispatched to the laboratory within 24 hours of collection via tracked courier.
10. The Vendor shall notify the Plant within 4 hours if any sample is delayed, compromised, or lost in transit, and shall reschedule collection at no cost.

2.1.4 Sample Integrity and Rejection Criteria

Samples shall be rejected and recollected at Vendor cost if any of the following conditions apply:

- Collection-to-laboratory-receipt time exceeds 72 hours for particle count or MPC testing;
- Collection-to-receipt exceeds 96 hours for RULER or FTIR without dark, refrigerated (4–10°C) preservation;
- Bottle volume is <50% or >80% of capacity;
- Visible cross-contamination, incorrect bottle type (e.g., clear bottle for MPC), or broken seal;
- Missing or illegible mandatory label fields including oil temperature or top-up volume.

2.1.5 Sampling Cadence and Response Time

11. Response time from Plant scheduling request to Vendor on-site arrival: ≤7 calendar days.
12. Vendor shall propose a fixed quarterly visit calendar for the full 5-year term within 30 days of contract award.
13. The Plant reserves the right to request unscheduled ad-hoc sampling for diagnostic purposes at the agreed unit rates.
14. Bulk storage tanks and dedicated oil top-off transfer containers shall be sampled quarterly alongside the main system sample run.

2.1.6 EHC/Phosphate Ester Safety Protocol

For Equipment #12–13 (phosphate ester EHC systems), the Vendor shall additionally:

- Deploy only technicians with documented phosphate ester MSDS competency training;
- Provide nitrile gloves, chemical splash goggles, and on-site spill containment kits;
- Mandate 100% dedicated, permanently isolated sampling hardware (pumps, adapters, and tools) for EHC systems. These tools must be stored in separate, sealed containers labeled "FOR PHOSPHATE ESTER USE ONLY."
- Never use EHC tools (RED-tagged) for mineral oil systems.

2.2 Laboratory Analysis

All samples shall be analysed at the Vendor's primary ISO/IEC 17025:2017 accredited laboratory. Where a specific test is performed by an accredited subcontract laboratory, the Vendor retains full contractual liability for all results, turnaround times, and data quality.

2.2.1 Report Turnaround and Alarm Notification

15. Full analytical report: within 7 calendar days of sample receipt.
16. Critical alarm preliminary notification: within 48 hours of sample receipt for any parameter exceeding an Action Required threshold.
17. RCA report when triggered: within 15 calendar days of the alarm event.

2.2.2 Limit Referencing

All results shall be evaluated against:

- OEM engineering limits (GE GEK 32568E, Alstom specifications, applicable OEM service bulletins);
- International standards: ASTM D4378 (steam/gas turbines), ISO 11366, ASTM D8323 (EHC), ASTM D6224, ASTM D4293, ASTM D4378;
- Statistical trend-based control limits: rolling 12-month average $\pm 2\sigma$ (caution) and $\pm 3\sigma$ (action) for each parameter and equipment item;
- Plant-specific baselines established at contract commencement.

2.2.3 ASTM r/R Dispute Resolution Protocol

Before any sample result is declared disputed, the Vendor shall perform a statistical consistency check against the ASTM method precision statement. For any contested value X_1 vs. re-analysis X_2 : if $|X_1 - X_2| \leq r$ (repeatability), the result is consistent within the same lab. If $|X_1 - X_2| > R$ (reproducibility), a split-sample re-analysis at Vendor cost is mandatory. This protocol applies to all 5-year testing and must be completed within 5 working days of written dispute notification.



2.2.4 Internal Analytical Consistency Check

The laboratory shall flag any report batch where a TAN increase is not accompanied by corresponding RULER depletion or RPVOT decline. A TAN increase without antioxidant or oxidation stability movement is statistically suspicious — it may indicate sampling error, lab error, or cross-contamination rather than genuine oil degradation. Such inconsistencies shall be proactively reported with a technical note before the Plant requests clarification.

2.2.5 Sample Hold-Time Compliance

The laboratory shall verify and log that all samples are analysed within method-appropriate hold times:

- Particle Count (ISO 4406): within 48 hours of receipt, or 72 hours if refrigerated at 4–10°C;
- MPC (ASTM D7843): within 48 hours of receipt;
- Water by Karl Fischer: within 72 hours, or 96 hours if refrigerated;
- RULER (ASTM D6971): within 96 hours, stored dark and cool;
- RPVOT (ASTM D2272): within 7 days.

2.2.6 Analytical Methodology Declaration

Within 60 days of contract award, the Vendor shall submit a written Analytical Methodology Declaration specifying and locking for the full 5-year contract duration:

- MPC solvent (petroleum ether or heptane) and incubation time (72h or 120h);
- RULER baseline reference oil for each turbine oil brand and viscosity grade;
- TAN endpoint method: ASTM D664 potentiometric inflection (primary); alternatives permitted only with written correlation data and Plant approval;
- Particle counter technology type and calibration standard (ISO 11171 NIST-traceable reference fluid);
- FTIR baseline correction method and key wavenumber assignments.

Any change to declared methodology requires 30 days written notice to the Plant and Plant's written approval before implementation. A data continuity plan must accompany any change notification. This clause protects 5-year trend integrity — a methodological shift mid-contract makes historical comparisons statistically invalid.

2.3 Technical Support and Root Cause Analysis

Whenever any result triggers 'Action Required' status, or whenever the Plant formally requests an investigation, the Vendor shall provide a documented RCA report within 15 calendar days.

2.3.1 Three-Level RCA Requirement

The RCA shall address all three levels:

18. Technical Level: What chemical or physical mechanism caused the failure? (e.g., oxidation, hydrolysis, micro-dieseling, electrostatic discharge, contamination ingress, thermal degradation.)
19. Equipment/System Level: What design or operational factors enabled the failure? (e.g., reservoir design, return-line configuration, air entrainment source, water ingress pathway, cyclic duty profile, start-stop frequency, part-load operation.)
20. Management-System Level: What monitoring or procedural gap allowed the condition to develop undetected? (e.g., sampling frequency insufficient, alarm limit too permissive, maintenance event not followed by verification sampling.)

2.3.2 Mandatory RCA Content

21. ISO 4406 Band Pattern Analysis: identify which of the three particle size codes (>4 , >6 , $>14 \mu\text{m(c)}$) changed first and fastest, and link the pattern to a contamination category (fine dust ingress / abrasive wear / large wear debris / external ingress).
22. MPC Patch Morphology Classification: differentiate amber/brown oxidation varnish from dark/black carbonaceous patch. If a dark/black patch is observed, energy-driven mechanisms (micro-dieseling, electrostatic discharge, dead-zone hot spots) must be evaluated as primary hypotheses — the black patch is a physics and energy problem, not a classic oxidation chemistry problem. A falling MPC without corrective action may indicate varnish has already plated out onto bearing surfaces and servo valves.
23. Varnish Formation Stage: identify the current stage — (1) oxidation initiation; (2) soluble precursor accumulation; (3) saturation; (4) precipitation; (5) surface deposit formation. Each stage has different corrective actions and different urgency.
24. Top-Up Dilution Assessment: if the system was topped up within 60 days preceding the alarm sample, quantify whether dilution could be masking more severe underlying degradation than results indicate.



25. Corrective Action Plan: immediate actions, short-term mitigations, and long-term design or procedural recommendations, each with estimated lead time and responsible party.
26. Follow-up sampling schedule with confirmed dates to verify corrective action effectiveness.

2.3.3 On-Site Response for Critical GT/EHC Alarms

For any Action Required result affecting a Gas Turbine lube system (Eq. 1–7) or EHC system (Eq. 12–13), the Vendor shall dispatch the designated Senior Oil Analysis Engineer to site within 5 working days to review sampling technique, verify port selection, and provide immediate mitigation guidance.

2.3.4 Senior Technical Contact

The Vendor shall assign a dedicated Senior Oil Analysis Engineer as the primary technical contact. Required qualifications: MLA Level III (ISO 18436-4 Category III) OR STLE CLS (Certified Lubrication Specialist) OR STLE OMA-II (Oil Monitoring Analyst II). MLE (Machinery Lubrication Engineer) or ICML IA (Lubrication Analyst) is highly preferred. This engineer shall respond to technical queries within one (1) working day.

2.4 Digital Platform

The Vendor shall provide a web-based Oil Analysis Management Platform with the following capabilities. A working demonstration login shall be provided with the bid submission.

2.4.1 Core Platform Features (Mandatory)

- Equipment and sample point registration with barcoded label printing;
- Sample lifecycle tracking: collection, dispatch, receipt, and results dates;
- Results displayed in PDF and Microsoft Excel export formats;
- Trend charts for every parameter for every equipment item — rolling 24-month and full contract period views;
- Configurable alarm limits per parameter per equipment item, with automatic colour-coded flagging (Green/Amber/Red);
- Side-by-side comparison between equipment of the same type;
- Statistical summary reports: rolling average, standard deviation, alarm frequency per equipment item;
- Statistical Process Control (SPC) charts: $\pm 2\sigma$ (caution) and $\pm 3\sigma$ (action) bands per parameter, with rate-of-change indicator;
- Immutable audit trail for all data entries, result modifications, and alarm acknowledgments with user ID and timestamp.

2.4.2 Data Ownership and Export

- All data generated under this contract is the exclusive property of Al-Samra Power Plant;
- Full historical data export in CSV, Excel, and PDF within 10 business days on request at any time;
- Upon contract expiry or termination, the Vendor shall deliver the complete data archive within 10 days and provide a certificate of data deletion from Vendor systems within 30 days.

2.4.3 Integration and Security (Preferred)

- Role-based access control (RBAC) with separate Plant and Vendor permission levels;
- Encrypted data storage (AES-256 or equivalent);
- Platform availability $\geq 99\%$ per calendar month.

A temporary login for platform demonstration shall be provided during the bid evaluation stage.



3. EQUIPMENT LIST AND FLUID REGISTER

The following 18 lubrication systems are covered under this contract. The Vendor shall register each system as a separate equipment item in the digital platform.

#	System ID	Turbine OEM / Make	Country	Current Oil Brand	Fluid Type	Oil Volume
1	GT1 Lube Oil	GE Frame 9E	USA	TOTAL PRESLIA 32	ISO VG 32 Mineral	60 barrels
2	GT2 Lube Oil	GE Frame 9E	USA	TOTAL PRESLIA 32	ISO VG 32 Mineral	60 barrels
3	GT3 Lube Oil	GE Frame 9E	France	TOTAL PRESLIA 32	ISO VG 32 Mineral	60 barrels
4	GT4 Lube Oil	GE Frame 9E	France	TOTAL PRESLIA 32	ISO VG 32 Mineral	60 barrels
5	GT5 Lube Oil	Alstom GT13E2	Switzerland	TOTAL PRESLIA GT 46	ISO VG 46 Mineral	100 barrels
6	GT6 Lube Oil	Alstom GT13E2	Switzerland	SHELL TURBO S4 GX 46	ISO VG 46 Mineral	100 barrels
7	GT7 Lube Oil	Alstom GT13E2	Switzerland	TOTAL PRESLIA GT 46	ISO VG 46 Mineral	100 barrels
8	ST1 Lube Oil	Fuji Electric	Japan	MOBIL DTE 746	ISO VG 46 Mineral	65 barrels
9	ST2 Lube Oil	Dongfang LNZK100	China	MOBIL DTE 746	ISO VG 46 Mineral	60 barrels
10	ST3 Lube Oil	Alstom	Switzerland	TOTAL PRESLIA 46	ISO VG 46 Mineral	50 barrels
11	ST4 Lube Oil	Doosan Škoda Power	Czech Rep.	SHELL TURBO T 32	ISO VG 32 Mineral	50 barrels
12	STG1 EH (EHC)	KOWA Corp.	Japan	CEPSA FUNDICOL 46	Phosphate Ester FR VG 46	4 barrels
13	STG2 EH (EHC)	DFSTW	China	CEPSA FUNDICOL 46	Phosphate Ester FR VG 46	5 barrels
14	STG4 HPH	ARGO HYTOS	Czech Rep.	ROLOIL Estin S 68	Synthetic FR VG 68	2.5 barrels
15	STG4 Bypass HPU	MCC Hydraulic	China	QUAKER QUINTOLUBRIC 888-46	Synthetic FR VG 46	2 barrels
16	Diverter Damper 5	Bachmann	USA	Shell EcoSafe FR-46	Synthetic FR VG 46	2.5 barrels
17	Diverter Damper 6	Bachmann	USA	Shell EcoSafe FR-46	Synthetic FR VG 46	2.5 barrels
18	Diverter Damper 7	HYDAC	Germany	Shell Tellus S2 M 46	ISO VG 46 Mineral	2.5 barrels

FR = Fire Resistant fluid. Equipment items 12–17 require the additional fire-resistant oil test panel (see Section 6.4). Oil volumes and brands shall be verified by the Vendor at the initial site visit.



4. VENDOR QUALIFICATION REQUIREMENTS

The following requirements are MANDATORY. Non-compliance with any mandatory requirement shall result in automatic disqualification of the bid. Vendors shall provide certified copies of all documents.

Req #	Requirement	Evidence Required
Q-1	Laboratory ISO/IEC 17025:2017 accreditation — scope must explicitly include all tests requested in Section 6.	Valid accreditation certificate + scope document
Q-2	All requested test methods (ASTM, ISO, DIN) must fall within the accredited scope. Where a test is not in scope, the Vendor must clearly state which accredited sub-laboratory or partner laboratory will perform it and provide that entity's accreditation.	Scope of Accreditation document
Q-3	Technical Lead assigned to this contract must hold a valid MLA Level III (ISO 18436-4, Category III) or equivalent STLE CLS or OMA-II certification.	Certified copies of certificates with expiry dates
Q-4	Sampling technicians performing on-site collection must hold minimum MLA Level I or MLT Level I certification, or demonstrate equivalent documented competency through employer qualification records.	Certificates or competency records
Q-5	Minimum three (3) years of active experience in turbine lube oil analysis (gas and/or steam turbines). Provide at least two (2) reference letters from power utility clients.	Client reference letters
Q-6	Web-based digital platform for results management as described in Section 2.4. A working demo login must be provided with the bid.	Demo login credentials
Q-7	Report turnaround time: ≤ 7 calendar days from sample receipt for standard report; ≤ 48 hours for critical alarm preliminary notification.	Statement of commitment
Q-8	Sample collection response time: ≤ 7 calendar days from scheduling request to on-site collection.	Statement of commitment
Q-9	Fixed pricing for the entire five-year contract duration with no price escalation for any standard test or supplementary service.	Statement of commitment
Q-10	Experience with phosphate ester (EHC) and synthetic fire-resistant oil analysis. ASTM D8323 or D4293 in accredited scope.	Scope document
Q-11	Participation in inter-laboratory proficiency testing schemes (e.g., ASTM, CCRL, or equivalent) with acceptable results in the last two cycles.	Proficiency test certificates
Q-12	Experience with ASTM D7843 MPC (Membrane Patch Colorimetry) varnish potential testing and RULER antioxidant depletion analysis.	Sample report examples
Q-13	Technical Lead holds MLE (Machinery Lubrication Engineer) or ICML IA (Lubrication Analyst) certification in addition to the Level III minimum	Certificate copy
Q-14	Commitment to Analytical Methodology Declaration (Appendix A) submitted within 60 days of contract award, locking MPC solvent, incubation time, RULER reference oils, TAN method, and particle counter calibration standard for the full 5-year contract. And commitment that any change requires 30 days written notice + Plant approval.	Statement of commitment



5. OIL SAMPLING LOCATION MATRIX

The sampling locations below are specified in accordance with ASTM D4378, and the fundamental principle of maximising data density — sampling downstream of all wearing components and upstream of all filters. The Vendor SHALL conduct an initial site survey within 30 days of contract award to verify and confirm all locations. Any recommended changes to sample port hardware shall be documented and submitted to the Plant for approval.

Eq. #	System	Sampling Location, Procedure, and Tools	Min. Frequency
1-4	GT1-GT4 Lube Oil (GE Frame 9E)	Primary: Bearing return drain header immediately before the oil tank — composite of all journal bearing drains, upstream of reservoir (upstream of any in-line filter or centrifuge). Maximises wear debris data density. Secondary (on alarm only): Individual bearing housing drain lines via portable vacuum sampler and minimess fitting at the bearing drain port. Tool: Installed drain-line minimess valve + probe-on vacuum sampler. Sample at return-line elbow (turbulence ensures particle suspension). Note: Sample with unit at rated load, oil at normal operating temperature $\geq 110^{\circ}\text{F}$ (43°C). Purge ≥ 200 mL before collecting 100 mL final sample. Record oil temperature at port.	Quarterly
5-7	GT5-GT7 Lube Oil (Alstom GT13E2)	Primary: Turbine bearing return header sample port — minimess valve on return line elbow, upstream of duplex filter. Captures composite bearing and governor wear debris before filtration. Secondary: Individual bearing drain via ball valve + stainless steel standpipe (troubleshooting only). Tool: Probe-on vacuum sampler or minimess syringe. Note: Alstom GT13E2 has high-temperature centre bearing; ensure oil is at operating temperature $\geq 125^{\circ}\text{F}$ (52°C) before sampling. High-temp centre bearing is the primary wear debris source in this machine type.	Quarterly
8-11	ST1-ST4 Lube Oil (Steam Turbines)	Primary: Return line from governor/bearing area, upstream of lube oil cooler return to tank — captures governor, HP and LP journal bearing wear debris. Locate port on return-line elbow. Secondary: Governor bearing individual drain (troubleshooting only). Tool: Installed minimess valve on return header elbow; vacuum sampler. Note: Sample at full-load operation, oil temp $\geq 110^{\circ}\text{F}$. Steam turbine oils are the highest water-ingress risk systems (gland seal steam); monitor moisture with particular attention. Include visual cloud check at sample collection.	Quarterly
12-13	STG1 & STG2 EH (Phosphate Ester EHC)	Primary: Return line to EHC reservoir, upstream of the return-line filter — highest data density for servo-valve wear debris and phosphate ester acid degradation products. Secondary: Reservoir bottom drain (sludge and water stratification check only — not for primary analysis). Tool: Minimess valve on pressurised return line; Viton-sealed chemically compatible sampler. PTFE or PE tubing ONLY. Note: Dedicated EHC tools only (RED tag). Phosphate ester is toxic — nitrile gloves, chemical splash goggles, and spill kit mandatory. Never use mineral oil tools. MPC samples in amber/opaque HDPE bottles.	Quarterly
14-17	STG4 HPH, STG4 Bypass HPU, Diverter Dampers 5 & 6 (Synthetic FR Hydraulic)	Primary: Pressurised return line upstream of filter — sample from elbow at low-pressure return zone. Secondary: Reservoir mid-level using drop-tube vacuum sampler if no return port is accessible (last resort — see General Rules). Tool: Minimess valve on return-line elbow; standard vacuum sampler with compatible tubing. Note: Synthetic FR fluids require dedicated sampling tools. Separate 50 mL sample in glass bottle required for electrical conductivity tests (FR-5). MPC samples in amber/opaque HDPE bottles.	Quarterly
18	Diverter Damper 7 (Mineral Hydraulic, HYDAC)	Primary: Return line upstream of filter — existing minimess or installed ball valve sample port. Tool: Standard vacuum sampler.	Quarterly



Note: ISO VG 46 mineral hydraulic fluid. High contamination sensitivity — particle count and MPC are the primary monitoring parameters. Sample at operating temperature; purge ≥ 100 mL before collection.

General Rules — Applicable to All 18 Systems

- Samples SHALL ALWAYS be taken with equipment running at normal load and operating temperature.
- Samples SHALL ALWAYS be taken UPSTREAM of filters and DOWNSTREAM of lubricating components.
- Dead-leg volume SHALL ALWAYS be purged (minimum 5–10 $\times$ the dead volume of the valve, adaptor, and tubing) before collecting the final sample. Record purge volume on label.
- Sample bottles SHALL NOT be filled above 2/3 of capacity. For high-viscosity oils (>ISO VG 100), fill to maximum 50%.
- Mineral oil tools SHALL NEVER contact EHC/FR fluid systems. Dedicated, colour-coded tool sets required.
- Minimes valve or ball valve with standpipe is strongly preferred over drop-tube vacuum sampling for all systems.
- MPC varnish samples MUST be collected in amber or opaque HDPE bottles. Standard clear bottles are not acceptable.
- Oil temperature at the sample port must be measured and recorded at the moment of collection.

Chain of Custody and Transport Rules

- Samples sealed in tamper-evident bags with pre-printed barcoded labels immediately after collection.
- Cooler boxes maintain 4–25°C during transport to laboratory.
- Courier provides track-and-trace with delivery confirmation and temperature log where required.
- Vendor notifies Plant within 4 hours of any sample delay, compromise, or loss in transit, and reschedules collection at no cost.



6. TEST LEVELS AND ANALYTICAL REQUIREMENTS

Test Levels are structured in four Levels. Each higher Level is cumulative — it includes all lower-Level tests. Prices shall be quoted both individually per test AND as bundle prices per complete Level per sample. The frequency schedule matrix (Attachment B) defines which Level applies to each equipment item at each quarterly sampling event.

Baseline Governance: 'New oil' baseline for RPVOT, RULER, MPC, TAN, and viscosity shall be established from the exact batch in service at contract commencement. After any oil change or brand change, or after any top-up exceeding 10% of system volume, the Vendor shall establish a fresh baseline within 30 days at no additional cost, and recalculate all percentage-based alarm thresholds.

6.1 Level 1 — Quarterly Test Level (Every 3 Months, All Systems)

These tests form the routine monitoring foundation. They shall be performed on every sample from every system at each quarterly collection event. Tests Q-12 is conditionally triggered as noted

Test #	Parameter	Method	Alarm / Limit	Unit
Q-1	Kinematic Viscosity @ 40°C	ASTM D445 / ISO 3104	±10% of ISO VG grade midpoint	cSt @ 40°C
Q-2	Kinematic Viscosity @ 100°C	ASTM D445 / ISO 3104	Report & trend	cSt @ 100°C
Q-3	Elemental Spectroscopy (Wear, Contamination & Additive metals)	ASTM D5185 (ICP)	Per OEM & ASTM D4378 limits	ppm
Q-4	Total Acid Number (TAN)	ASTM D664 is the mandatory primary method. ASTM D974 or ISO 6618 are permitted only with prior written correlation data to D664. (D974 is NOT permitted as the sole reported TAN value)	≤0.3 mg KOH/g increase over new oil OR per OEM limit ADDITIONAL: Rate-of-change alarm if TAN increases >0.05 mg KOH/g between consecutive quarterly samples.	mg KOH/g
Q-5	Water by Karl Fischer	ASTM D6304 Method C / ASTM D7546 / ISO 12937	Mineral oil: ≤200 ppm; EHC phosphate ester: Normal <300 ppm; Caution 300–500 ppm; Action Required >500 ppm (requires engineering justification)	ppm
Q-6	Particle Count (ISO Code)	ISO 4406:99 / ISO 11500	Per OEM — typically ≤16/14/11 for GT lube; ≤17/15/12 for hydraulics	ISO 4406 code
Q-7	Colour	ASTM D1500	Report & trend; flag if >2 grades above new oil	ASTM No.
Q-8	Foaming Tendency and Stability (Seq I, II, III)	ASTM D892 / ISO 6247	Seq I: 50/0 mL; Seq II: 100/0; Seq III: 50/0	mL foam/mL settled
Q-9	MPC Varnish Potential Rating (MPC + X-MPC + R-index)	ASTM D7843 + QSASM colorimetry	GT lube oil & EHC (Eq. 1–13): ≤15 Normal; 15–25 Caution; >25 Action Required. Auxiliary systems (Eq. 14–18): ≤25 Normal; 25–40 Caution; >40 Action Required.	Dimensionless - Report must include: ΔE, ΔL, Δa, Δb individually; - patch photograph at ≥300 dpi; - patch weight (mg deposit mass); - morphology description (uniform stain / dark center / ring pattern / black specks / mixed / clean);



				- comparison note with previous patch for same equipment.
Q-10	PQ Index (Ferrous Debris)	ASTM or Supplier method (DR ferrography/PQ)	Trend-based; flag if step-change >20%	Dimensionless
Q-11	Water Separability (Demulsibility)	ASTM D1401	Pass (≤ 37 mL emulsion after 40 min) Flag if emulsion volume exceeds baseline by >5 mL.	Report mL water / mL oil / mL emulsion at 10, 20, and 40 min intervals.
Q-12	Air Release @ 50°C quarterly for GT systems (Eq. 1-7) ONLY	ASTM D3427	≤ 5 min acceptable; >7 min Action Required.	Minutes when MPC >20 or foam rated Caution or worse. Poor air release enables micro-dieseling and bearing film instability.

6.2 Level 2 — Additional Semi-Annual Tests (Every 6 Months)

These tests supplement the Quarterly Level and are performed in addition to all Level 1 tests at the Q2 and Q4 collection events (or Q1 and Q3 for mid-year scheduling). Test SA-5 apply only to the specified equipment groups.

Test #	Parameter	Method	Alarm / Limit	Unit
SA-1	FTIR Indexing Spectrum Analysis	ASTM E2412	Oxidation, Nitration, Sulfation, Glycol, Fuel Dilution, Soot, ZDDP/Phenol/Amine depletion. Flag if $>0.15 \text{ A}\cdot\text{cm}^{-1}$ oxidation increase	Absorbance units ($\text{A}\cdot\text{cm}^{-1}$)
SA-2	RPVOT (Oxidation Stability)	ASTM D2272	$\geq 75\%$ of baseline Normal; 50–75% Caution (increase frequency); 25–50% Action Required (plan intervention); <25% EMERGENCY	minutes
			≤ 5 minutes (ISO VG 32/46)	
SA-3	Air Release @ 50°C	ASTM D3427	NOTE: Quarterly trigger added for GT systems with active MPC/foam Caution flags (see Q-12).	minutes
SA-4	Demulsibility after Steam Treatment	DIN 51589 or ASTM D2711	Pass per OEM specification	mL water/emulsion
SA-5	RULER Amine % and Phenolic % ALL GT SYSTEMS (Eq. 1–7)	ASTM D6971	$\geq 60\%$ of new oil Normal; 40–60% Caution (increase to quarterly); <40% Action Required; <25% EMERGENCY. Both amine and phenolic reported separately. Flag >20% difference in depletion rates between the two species.	% remaining relative to new oil

6.3 Level 3 — Additional Annual Tests (Once per Year)

These tests are performed once per year, in addition to all Level 1 and Level 2 tests at the annual comprehensive inspection sample event.



Test #	Parameter	Method	Alarm / Limit	Unit
AN-1	Rust Prevention Characteristics	ASTM D665 Method B	Pass (no rust)	Pass / Fail
AN-2	Wear Particle Characterization (Analytical Ferrography)	ASTM D7684-10 / D7690 / D7596	Full morphology analysis: particle types, size, severity ranking	Qualitative + Quantitative report include 1-Quantitative Concentration & Size Evaluation 2- Standardized Classification Matrix 3- High-Resolution Photomicrograph Note: Triggered automatically if PQ Index shows step-change >20% OR if particle count exceeds ISO 18/16/13. Vendor shall provide photomicrographs and severity index.
AN-3	Sludging and Corrosion Tendencies (Dry TOST)	ASTM D7873 or ASTM D4310	Report vs new oil baseline; flag if sludge >200 mg/kg	mg/kg
AN-4	Filterability (In-Service)	ISO 13357-2	Pass ($\leq$ pressure differential limit per OEM)	Pass/Fail

6.4 Additional Panel for Fire-Resistant Fluids (Equipment #12–17)

These tests apply to all FR fluid systems in addition to the Level 1–3 Level. Frequency: Quarterly for Eq. 12–13 (phosphate ester EHC). Semi-Annual for Eq. 14–17 (synthetic FR hydraulic).

Test #	Parameter	Method	Alarm / Limit	Unit
FR-1	Chlorine Content (Total)	ASTM D4929	≤ 100 ppm increase over new oil	ppm
FR-2	Inorganic Chlorine	Supplier method	Report & trend	ppm
FR-3	Phosphoric Acid Content	Supplier method	Report & trend	mg/L
FR-4	Electrical Volume Resistivity	ASTM D1169	≥ 100 MOhm.m Normal; 50–100 MOhm.m Caution; < 50 MOhm.m Action.	MOhm.m Test temperature MUST be recorded with every result. A 5°C difference can change resistivity by 30–50% in phosphate ester fluids.
FR-5	Electrical Conductivity	ASTM D2624	Per OEM limit	pS/m
FR-6	Mineral Oil Content (Total) Only Quarterly for phosphate ester systems (Eq. 12–13)	ISO 10370 or equivalent	$\leq 1\%$ mineral oil, plus event-triggered after any cross-fluid maintenance activity	%
FR-7	Phenol Content by LSV Only Semi-Annual for phosphate ester systems (Eq. 14–17)	ASTM D6971 LSV or equivalent	Trend-based. Flag if phenol index increases $> 20\%$ vs previous semi-annual result	LSV index or mg/L

6.5 Supplementary, New Oil Receipt, and Auxiliary Fluid Panels



The test lists within this section are executed on an ad-hoc, unit-rate basis upon written request by the Plant, as established under **Section 8.1, Item 7**. They are divided into two distinct functional categories.

6.5.1 Part A: New Oil Receipt & Baseline Quality Assurance Panel

Whenever a new batch of lubricant is delivered to the plant, or when a fresh baseline must be established following an oil change, this panel shall be utilized to verify that the fluid meets product datasheet specifications and is clean enough for deployment. This panel shall consist of set of quality verification tests. Results shall be compared against the applicable Product Data Sheet (PDS) and OEM new-oil specifications. Alarm limits for in-service monitoring shall subsequently be established from this verified baseline.

Note: For RPVOT and RULER tests, the cost of analyzing a new-oil baseline sample from the same batch shall be included in the unit price of the respective test — no additional charge is permitted.

6.5.2 Part B: Auxiliary Plant Equipment & Internal Combustion Engine Panel

This panel explicitly governs condition monitoring for all balance-of-plant (BOP) rotating machinery and auxiliary assets across the site. This includes, but is not limited to: **high-pressure boiler feed pumps, cooling water pumps, fuel oil transfer pumps, reciprocating/screw compressors, cooling tower gearboxes, turning gear drives, and diesel engine crankcases.**

Samples from these assets shall be processed using the routine Level 1 test Level (Viscosity, Elemental Spectroscopy, Moisture, Particle Count, and PQ Index), supplemented by the specialized parameters below when triggered by operational hours or abnormal wear signals.

Test #	Parameter	Method	Application / Testing Trigger	Unit
SUP-1	Viscosity Index	ASTM D2270	Report	Dimensionless
SUP-2	Specific Gravity (15/15°C)	ASTM D1298	Report	Dimensionless
SUP-3	Flash Point (COC)	ASTM D92	Confirm $\geq$ minimum per grade	°C
SUP-4	Pour Point	ASTM D97	Confirm $\leq$ minimum per grade	°C
SUP-5	Copper Corrosion	ASTM D130	$\leq 1B$ (100°C, 3h)	ASTM rating
SUP-6	Filterability (new)	ISO 13357-1	Pass ($\leq$ pressure differential limit per OEM)	Pass/Fail
SUP-7	Compatibility Test	ASTM D7155-20	Mandatory if changing oil brands. No sediment or phase separation permitted when mixed with the in-service fluid.	Pass/Fail The methods are grouped into four tiers of testing types: Tier 1: Visual Screening and Physical Property Evaluation (Immediate) Tier 2: Thermal Storage Aging & Sedimentation Evaluation (Baking Phase) Tier 3: Interfacial & Surface Performance Degradation Panel Tier 4: Long-Term Oxidation Stability Synergy Tracking
SUP-8	Total Base Number	ASTM D2896	Mandatory for Diesel Engine Crankcases Only.	mg KOH/g
SUP-9	Soot, Nitration, & Fuel Dilution	ASTM E2412 (FTIR)	Mandatory for Diesel Engine Crankcases Only.	%

7. REPORTING REQUIREMENTS

Each batch report shall be issued in both PDF and Microsoft Excel (XLSX) formats and shall include the following sections in the order listed:

Report Section Structure

1. Executive Summary: one-page colour-coded traffic-light table (Green/Amber/Red) summarising every parameter for every equipment item sampled in the batch. Include batch statistics: number of Action Required flags, number of Caution flags, and any pending RCAs.
2. Equipment-Level Report (one per system): full tabulated results with applicable limits, status flag, 24-month trend chart, and preliminary diagnostic note for any Amber or Red result.
3. Statistical Process Control Appendix: for each parameter on each equipment item — rolling 12-month average and standard deviation, control chart with $\pm 2\sigma$ (caution) and $\pm 3\sigma$ (action) bands, and rate-of-change indicator.
4. Internal Consistency Check Note: proactive technical note flagging any batch result where TAN increases without corresponding RULER depletion or RPVOT decline, or where particle count increases without PQ Index movement. Include the analyst's interpretation before the Plant requests clarification.
5. MPC Varnish Report (per equipment): patch photograph at ≥ 300 dpi, ΔE , ΔL , Δa , Δb values individually, MPC numeric value, X-MPC, R-index ($MPC + 5 \times X-MPC$), morphology classification (uniform stain / dark centre / ring pattern / black specks / mixed / clean), comparison note with previous patch for same equipment.
6. FTIR Spectrum Report (Semi-Annual): full graphical spectrum with annotated wavenumber peaks at all monitored positions.
7. RULER Antioxidant Report (Semi-Annual, GT systems): depletion curve graphic for amine and phenolic species vs. new-oil baseline; percentage remaining for each; flag if species depletion rates differ $>20\%$.
8. Wear Particle Report (Annual or triggered): analytical ferrogram photomicrographs (minimum 4, at $\times 100$ and $\times 400$ magnification), particle classification table, severity index, and recommended action.
9. RCA Report (when triggered): full three-level RCA as specified in Section 2.3, with follow-up sampling schedule.
10. Annual Summary Report (issued within 30 days of each contract anniversary): rolled-up statistics for all equipment and all parameters, trend analysis, oil change recommendations, sampling optimisation suggestions, and programme KPI performance table.

Reports shall be written in English. Arabic executive action item summaries are welcomed and contribute to the Level C evaluation score (Req. C-2) but are not mandatory for contract compliance.



8. COMMERCIAL AND CONTRACTUAL TERMS

8.1 Pricing

1. Unit prices shall be quoted in JOD per test (excluding shipping) and per complete sampling visit.
2. Bundle prices shall be provided for each sampling Level (Quarterly, Semi-Annual, Annual) per sample, clearly showing the individual test prices that comprise the bundle.
3. Shipping cost per pack (per kg) shall be quoted separately.
4. All prices include 16% Sales Tax (or shall be quoted net with tax stated separately).
5. Prices shall remain fixed for the entire five (5) year duration. No price escalation clause is acceptable.
6. Any test not quoted but subsequently required shall be priced at a separately agreed rate using the unit pricing structure established in the contract.
7. **Additional Equipment / Oil Analysis at Same Contract Price**
SEPCO may request analysis and/or sampling of any other oil for any equipment, including but not limited to pumps, compressors, gearboxes, engines, hydraulic systems, auxiliary systems, and similar plant equipment, at any time during the contract period. Such additional oils/equipment shall be tested using the same applicable test Level, reporting requirements, turnaround times, technical support obligations, and the same contracted unit prices/bundle prices agreed under this RFQ, with no additional surcharge except for any separately quoted shipping/logistics cost where applicable.

8.2 Contract Duration and Renewal

The contract shall have an initial term of five (5) years from the date of award. It shall renew automatically on an annual basis unless either party provides written notice of non-renewal at least thirty (30) calendar days before the contract anniversary date.

8.3 Data Ownership and Post-Contract Obligations

- All raw data, trend files, reports, and platform content are the exclusive property of Al-Samra Power Plant.
- Full data export (CSV, Excel, PDF) shall be provided within 10 business days on request at any time during the contract.
- On contract expiry or termination: complete data archive delivered within 10 days; certificate of data deletion from Vendor systems within 30 days.

8.4 Bid Submission Requirements

The Vendor's submission shall include:

8. Completed Technical Compliance Sheet.
9. Copies of all accreditation and certification documents.
10. Sample analytical report(s) demonstrating report quality for turbine lube oil and for a fire-resistant fluid.
11. Demo login credentials for the digital platform.
12. Two (2) client reference letters from power utility accounts.
13. CV of the proposed Senior Oil Analysis Engineer.



APPENDIX A — ANALYTICAL METHODOLOGY DECLARATION TEMPLATE

The Vendor shall complete and submit a final version of this declaration within 60 days of contract award. The methodology and parameters below shall remain fixed for the full 5-year contract duration unless the Plant grants written approval for a change with a minimum 30 days' notice.

Parameter	Declared Method / Value	Applicable Systems
MPC Test Solvent (petroleum ether grade or heptane)	[VENDOR TO COMPLETE]	All systems
MPC Incubation Time (72 hours or 120 hours)	[VENDOR TO COMPLETE]	All systems
MPC Incubation Temperature (°C)	[VENDOR TO COMPLETE]	All systems
TAN Endpoint Method (ASTM D664 potentiometric — state inflection or half-neutralisation)	[VENDOR TO COMPLETE]	All systems
Particle Counter Technology (laser optical / pore blockage / other — state instrument make and model)	[VENDOR TO COMPLETE]	All systems
Particle Counter Calibration Standard (state ISO 11171 NIST-traceable reference fluid or equivalent)	[VENDOR TO COMPLETE]	All systems
FTIR Baseline Correction Method	[VENDOR TO COMPLETE]	All systems
RULER Reference Oil — TOTAL PRESLIA 32 (ISO VG 32)	[VENDOR TO COMPLETE — Batch/Lot reference]	Eq. 1–4, 11
RULER Reference Oil — TOTAL PRESLIA GT 46 / PRESLIA 46 (ISO VG 46)	[VENDOR TO COMPLETE — Batch/Lot reference]	Eq. 5, 7, 10
RULER Reference Oil — SHELL TURBO S4 GX 46 (ISO VG 46)	[VENDOR TO COMPLETE — Batch/Lot reference]	Eq. 6
RULER Reference Oil — MOBIL DTE 746 (ISO VG 46)	[VENDOR TO COMPLETE — Batch/Lot reference]	Eq. 8, 9
RULER Reference Oil — SHELL TURBO T 32 (ISO VG 32)	[VENDOR TO COMPLETE — Batch/Lot reference]	Eq. 11
PQ Index / Ferrous Debris Method (instrument make, model, and measurement unit)	[VENDOR TO COMPLETE]	All systems
Phenol Content Method for EHC (ASTM D6971 LSV or validated equivalent — state instrument)	[VENDOR TO COMPLETE]	Eq. 12–13
Mineral Oil Contamination Method for EHC (GEK 46357E or validated equivalent)	[VENDOR TO COMPLETE]	Eq. 12–13
ICP-OES Instrument Make and Model	[VENDOR TO COMPLETE]	All systems
Karl Fischer Method (Volumetric D1744 or Coulometric D6304 — state primary method)	[VENDOR TO COMPLETE]	All systems

Signed by Vendor's Technical Director / Quality Manager:

