**Excerpt: Webinar on “Power Plant Chemistry: Practical Insights for Sustained Higher Performance”**

This excerpt highlights our July 26, 2025, webinar on "Power Plant Chemistry: Practical Insights for Sustained Higher Performance." As a CEA-recognized center, we provide chemistry-driven strategies for reliability and efficiency. Catch the full recording on our YouTube channel or enroll in future sessions to safeguard your assets!

**Chemistry's Core Role: The Unsung Hero of Plant Reliability and Efficiency**

Visualize a 660 MW supercritical unit shutting down due to a mere 0.1 µS/cm conductivity spike in feedwater—costing Rs. 2 crores in lost generation from hydrogen damage. In my 40 years, chemistry has been the linchpin: Water/steam parameters dictate asset life, coal/ash traits optimize combustion, lube oil prevents mechanical woes, and cooling water boosts condenser vacuum. Paradigm shifts like supercritical tech, seawater use, and coal blending amplify risks—yet proactive chemistry slashes outages by 30% and emissions while conserving resources.

Chemistry as reliability insurance (prevent scaling/corrosion), efficiency driver (via fuel analysis), and sustainability enabler (effluent compliance). Polls revealed 65% struggle with condenser fouling; we linked deviations to financial hits. If chemistry lapses are undermining your ops, our insights—rooted in real failures—offer prevention.

**Water-Steam Cycle Mastery: Regimes, Parameters, and Protection**

Critical parameters can trigger shutdowns: Condensate Na/SO4/Cl >24 ppb, FW cation conductivity >2 µS/cm (5 min), pH <7.0. Regimes: AVT(R) for copper alloys (ammonia + hydrazine for magnetite/Cu2O layers); AVT(O) sans reducing agents; OT (ammonia + O2) for ultra-pure systems, minimizing FAC. Boiler treatments: PC (TSP + NaOH for pH), CT (NaOH), OT for once-through.

Key impacts: pH (9.2-9.6 AVT) prevents corrosion; DO <10 ppb avoids pitting; silica <10 ppb curbs turbine deposits; iron <10 ppb signals FAC. Hydrazine scavenges O2 but poses toxicity—alternatives like carbohydrazide reduce risks. Preservation: Wet (AVT + hydrazine) for short layoffs; dry (dehumidified air) for long. Case: High silica from raw water led to turbine blade erosion—mitigated via silica analyzers and blowdown optimization.

**Coal, Ash, and Lube Oil: Fueling Efficiency and Reliability**

Coal analysis: Proximate (moisture/ash/VM/FC) guides blending—high ash (Indian coals) spikes erosion; AFT predicts slagging (blend for >1200°C fusion). Ultimate (C/H/N/S/O) aids emission control; GCV ensures heat rate. Ash: High quartz erodes; low AFT causes fouling—additives like MgO mitigate. Case: Blended high-S coal corroded APH/ESP—resolved with limestone dosing.

Lube oil: Monitor TAN (<0.2 mg KOH/g) for acidity, viscosity (ISO VG 46), water (<0.1%), particulates (NAS 7). Degradation from oxidation/contamination causes bearing failures—use antioxidants, filtration. Case: Varnish from thermal stress jammed valves—flushing + additives restored ops.

**Cooling Water: Scaling, Corrosion, and Biofouling Control**

Challenges: Scaling ($CaCO_3$ from evaporation), corrosion (low pH), biofouling (algae/microbes). Treatments: Chlorine (0.2-0.5 ppm residual) for biocides; $H_2SO_4$ for pH 7.5-8.3/alkalinity <300 ppm; dispersants like PBTC/Zinc. Indicators: LSI (>0 scaling, <0 corrosive); RSI (>6 stable). Maximize COC (4-6) for water/chemical savings—e.g., from 4 to 6 saves 3.4M

m³/year (Rs. 7 Cr) + 75L Rs. in chemicals. Monitoring: Coupons for corrosion, ORP for biofouling. Case: High BOD/COD fouled condenser (vacuum drop 2 kPa)—acid dosing + biodispersants regained 1% efficiency.

| Parameter | Normal (Supercritical) | Shutdown Trigger |
|---|---|---|
| FW pH | 8.8-9.0 | <7.0 |
| DO (ppb) | <10 | >20 |
| Silica (ppb) | <10 | >50 |

**Practical Guidelines: Monitoring, Interpretation, and Prevention**

Daily: pH, conductivity, DO, silica, iron—trend for upsets (e.g., condenser leak spikes Na/Cl). Weekly: Full analysis (TDS, hardness). Preservation: Nitrogen blanketing for boilers; oil mist for turbines. O&M: Auto-dosing systems, third-party sampling for accuracy; interpret via action levels (EPRI/VGB guidelines). Case: FAC in economizer from high DO—switched to OT, reduced iron by 80%.

**Exclusive Expert Tips: 40 Years of Chemistry Wisdom**

1. **Blending Mastery:** Compare AFT/VM—avoid >200°C mismatches to prevent slagging; start low ratios.
2. **pH Vigilance:** For AVT, buffer with ammonia; monitor cation conductivity for early acid ingress.
3. **Oil Health:** Quarterly MPC for varnish potential; flush if >30—avert trips.
4. **Cooling Optimization:** Calculate H2SO4 dosing precisely; aim RSI 6-7 for balance.
5. **Failure Forensics:** Post-incident, analyze deposits (XRD/SEM)—often reveals chemistry roots.

These have extended asset life by 20% in blended-coal plants.

**Why STEAG India? Your Partner in Power Chemistry Excellence**

As a Government of India-recognized training hub, STEAG India blends global expertise (from our German roots) with Indian realities. Our webinars attract participants across PAN India from prestigious organizations and Institutes.

Similar webinars with interactive Q&A sessions will be arranged in the future. Please participate—we'll also repeat some topics with the latest updates. We look forward to your overwhelming participation!

STEAG India: Chemistry-Driven, Performance Assured.