Cement Plant Operations Course: Raw Mix, Kiln Burning, Clinker Cooling and Cement Grinding

4 – 15 July 2027
Riyadh - KAFD district five-star



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Introduction:

Cement plant operations, covering raw mix, kiln burning, clinker cooling and cement grinding, is a 2-week course for process, production, quality and maintenance engineering teams in cement plants that ends with a Kiln Line Performance Audit and Optimisation Plan for a case plant. Plants lose clinker output and margin when kiln feed chemistry drifts, cyclones block, rings and red spots force kiln stops and mills overgrind, pushing heat and power per tonne above target. Nominees already run or support kiln and mill sections and learn through inspection walkthroughs built on real line data. CoreConcept Training Center delivers this cement plant operations course.

Course Objectives:

- Design and correct raw mixes using lime saturation factor, silica modulus and alumina modulus targets and burnability results
- Diagnose preheater, precalciner and burning zone behaviour from gas analysis, pressure profiles and clinker phase data
- Resolve kiln rings, unstable coating, red spots and repeated kiln stops with documented operating responses
- Optimise grate cooler recuperation, fuel substitution and burner settings to reduce specific thermal energy per tonne of clinker
- Control ball mill and vertical roller mill circuits and blended cement quality against EN 197-1 and ASTM C150 cement types
- Audit a kiln line against heat, power, run factor and emission indicators and rank optimisation projects

Target Audience:

- Process engineering teams responsible for kiln line stability, heat balance and raw mix control
- Production teams that run raw mills, kilns, coolers and cement mills on shift
- Quality control and laboratory teams responsible for raw meal, clinker and cement chemistry and testing
- Mechanical and electrical maintenance teams that support kiln, cooler and mill reliability
- Technical services and energy teams that track plant KPIs and lead improvement projects

Course Outline:

Day 1: Cement Manufacturing Chain, Quarrying and Raw Material Baseline

- Dry Process Flowsheet From Quarry to Cement Dispatch
- Limestone, Clay, Shale and Corrective Additive Characterisation
- Quarry Face Blending and Drill Blast Grade Control
- Crusher Selection and Prehomogenisation Stockpile Stacking Methods
- Plant Mass Balance From Raw Material to Clinker Factor

Day 2: Raw Mix Design, Chemical Moduli and Raw Milling

- Lime Saturation Factor Targets and Free Lime Prediction
- Silica Modulus and Alumina Modulus Effects on Burnability
- Raw Mix Proportioning Spreadsheet With Four Component Solving
- Vertical Roller Raw Mill Drying and Separator Settings
- Raw Meal Fineness Residue Targets and Burnability Testing

Day 3: Homogenisation, Preheater Cyclones and Precalciner Systems

- Blending Silo Homogenisation Factor and Kiln Feed Variability
- Online Cross Belt Analyser and Raw Mix Control Loops
- Cyclone Preheater Stage Temperatures, Pressures and Separation Efficiency
- Precalciner Fuel Split, Tertiary Air and Calcination Degree
- Cyclone Blockage Causes and Air Cannon Cleaning Strategy

Day 4: Clinker Chemistry, Mineralogy and Burning Zone Control

- Alite, Belite, C3A and C4AF Formation Temperature Sequence
- Bogue Calculation of Potential Clinker Phase Composition
- Clinker Microscopy for Burning and Cooling History Diagnosis
- Sulphur, Alkali and Chloride Volatile Cycles and Bypass Use
- Kiln Inlet Oxygen, CO and NOx Burning Indicators

Day 5: Guided Case Study on Kiln Feed Stability and Clinker Quality

- Case Kiln Line Data Pack With Feed Chemistry Trends
- Raw Mix Correction Proposal Using Moduli and Burnability Results
- Preheater Pressure Profile Review and Blockage Risk Ranking
- Free Lime and Litre Weight Deviation Root Cause Tree
- Week One Kiln Feed Stability Findings Briefing

Day 6: Kiln Troubleshooting, Kiln Stops and Clinker Cooling

- Kiln Ring, Snowman and Ball Formation Mechanisms and Removal
- Coating Stability Control Using Shell Scanner Temperature Profiles
- Red Spot Response Procedure and Shell Cooling Fan Use
- Kiln Stop and Restart Sequence With Heat-Up Limits
- Grate Cooler Air Distribution, Bed Depth and Secondary Air Recovery

Day 7: Coal, Alternative Fuels, Burner Management and Heat Recovery

- Coal Mill Inerting, Fineness Targets and Fire Risk Control
- Petcoke and Coal Blend Effects on Flame and Sulphur
- Refuse Derived Fuel, Tyres and Biomass Substitution Rate Planning
- Multichannel Burner Momentum, Swirl and Flame Shape Adjustment
- Waste Heat Recovery Power Generation From Preheater and Cooler Gases

Day 8: Cement Grinding Circuits, Blended Cements and Quality Control

- Ball Mill Chamber Media Grading and Diaphragm Inspection
- Vertical Roller Cement Mill Grinding Bed and Vibration Control
- High Efficiency Separator Tromp Curve and Mill Exit Temperature
- EN 197-1 and ASTM C150 Cement Types and Blended Constituents
- Blaine Fineness, XRF Analysis and Strength Control Charts

Day 9: Energy, Emissions, Maintenance Interfaces and Plant KPIs

- Kiln Heat Balance and Specific Thermal Energy per Tonne
- Section Specific Power Consumption From Crusher to Packer
- Kiln Stack Dust, NOx and SO2 Monitoring Overview
- Refractory Campaign Length and Kiln Mechanical Alignment Interfaces
- Kiln Run Factor, Clinker Factor and Plant Benchmarking Dashboard

Day 10: Inspection Walkthrough and Kiln Line Performance Audit

- Kiln Line Walkthrough Against Process and Mechanical Audit Checklist
- Case Plant Heat and Power Gap Analysis Against Benchmarks
- Clinker Quality and Kiln Stop History Loss Tree
- Optimisation Project Ranking by Savings and Implementation Effort
- Kiln Line Performance Audit and Optimisation Plan Completion

Skills You Will Gain:

- Raw Mix Proportioning
- Preheater and Precalciner Diagnosis
- Clinker Phase Interpretation
- Kiln Upset Response
- Clinker Cooler Optimisation
- Alternative Fuel Substitution
- Grinding Circuit Control
- Cement Plant Heat Balancing

Why Attend This Course:

- Deliver a Kiln Line Performance Audit and Optimisation Plan for a case plant to the plant manager and the technical director for approval
- Decide raw mix corrections, burner and cooler settings and fuel substitution rates using moduli, gas analysis and heat balance evidence
- Avoid unplanned kiln stops, off-specification clinker and excess heat and power per tonne that erode plant margin
- Share raw mix spreadsheets, kiln upset response sheets, heat balance templates and KPI dashboards with process and production colleagues

Conclusion:

Back at work, the participant gives the plant manager and the technical director a Kiln Line Performance Audit and Optimisation Plan that sets the heat and power gaps, the main causes of kiln stops and quality deviations, and a ranked list of optimisation projects. Management uses it to approve process changes, fuel substitution steps and maintenance budgets, while shift teams use its response sheets during upsets. After the first quarter of operation under the plan, the unit should review kiln run factor, specific heat consumption, clinker factor and cement strength trends.

Frequently Asked Questions FAQ:

What should participants know before a cement plant operations course on kiln burning and cement grinding?

Participants should already work in a cement plant process, production, quality or maintenance role and read DCS trends and laboratory results. Bringing recent kiln feed chemistry, heat consumption and kiln stop records helps them apply the walkthroughs and the audit to their own line.

How does a cement plant operations course differ from a refractory maintenance or concrete technology course?

It follows the whole cement process chain, from raw mix design and kiln burning to cooling, fuels and cement grinding, and optimises it as one line. Refractory courses cover lining installation and repair, and concrete courses cover mix design and site placement of concrete.

Why do cement plant operations depend on lime saturation factor and the silica and alumina moduli?

These moduli set how easily the raw meal burns, how much liquid phase forms and how much alite the clinker contains. Holding them steady keeps free lime, coating and heat consumption under control and avoids rings, dusty kilns and weak cement.

What do participants take back from the cement plant operations course?

Participants take back a Kiln Line Performance Audit and Optimisation Plan for a case plant, with a raw mix spreadsheet, preheater pressure profile review, kiln upset response sheets, a heat and power balance and a KPI benchmarking dashboard they can adapt to their own line.