

5-Day Cement Industry Training Course In

CYCLONE BLOCKAGE

Dubai - UAE, 18 – 22 May 2026

COURSE LEVEL: INTERMEDIATE

COURSE OVERVIEW:

Cyclone blockages represent one of the most severe operational disruptions in the cement manufacturing process, often leading to immediate kiln shutdowns and significant safety risks. This course defines the mechanical and chemical mechanisms that cause material build-up and eventual obstruction within the preheater tower cyclones. By focusing on the science of material flow and volatile recirculations, participants will learn how to detect and prevent these critical failures.

The scope of this training covers the entire preheater circuit, identifying the "hot spots" where blockages are most likely to occur, such as the bottom stages and the riser ducts. It explores the role of bypass systems, air cannons, and technical cleaning methods used to manage material accumulation. Furthermore, the course addresses the vital safety protocols required when dealing with pressurized hot material and the risks of "flushing" during blockage removal.

Coverage includes detailed modules on pressure drop monitoring, temperature analysis, and the chemical triggers—such as high sulfur or chlorine—that lead to sticky material. Through case studies of real-world incidents, participants will learn to differentiate between minor build-ups and critical blockages. Attendees will develop the skills necessary to implement proactive cleaning schedules and to manage the safe recovery of the preheater tower after an obstruction occurs.

COURSE OBJECTIVES:

After completion of this course, the participants will be able to:

- Describe the design and function of cyclones within the preheater tower.
- Identify the primary chemical causes of material stickiness and build-up.
- Monitor pressure drops and temperatures to detect early blockage signs.
- Explain the role of the chlorine and sulfur bypass in preventing blockages.
- Operate air cannons and acoustic cleaners for effective material removal.
- Implement safe procedures for manual poking and cleaning of cyclones.
- Analyze the impact of fuel quality and combustion on build-up rates.
- Identify the risks of hot material "flushes" and implement safety zones.
- Use gas analyzer data to predict volatile-induced plugging.
- Evaluate the structural and thermal stresses caused by blockages.
- Coordinate with maintenance teams for refractory repairs in blocked areas.
- Develop a preventive maintenance plan for the preheater tower.

TARGET AUDIENCE:

This course is intended for Kiln Operators, Process Engineers, Production Supervisors, Field Technicians, and Safety Officers.

TRAINING COURSE METHODOLOGY:

A highly interactive combination of lectures, discussion sessions, and case studies will be employed to maximize the transfer of information, knowledge, and experience. The course will be intensive, practical, and highly interactive. The sessions will start by raising the most relevant questions and motivating everybody to find the right answers. The attendants will also be encouraged to raise more of their questions and to share in developing the right answers using their analysis and experience. There will also be some indoor experiential activities to enhance the learning experience. Course material will be provided in PowerPoint, with necessary animations, learning videos, and general discussions.

The course participants shall be evaluated before, during, and at the end of the course.

COURSE CERTIFICATE:

National Consultant Centre for Training LLC (NCC) will issue an Attendance Certificate to all participants completing a minimum of 80% of the total attendance time requirement.

COURSE OUTLINE / COURSE CONTENT:**MODULE 1: PREHEATER TOWER ARCHITECTURE**

- Principles of gas-solids separation in cyclones.
- Design variations: 4-stage, 5-stage, and 6-stage towers.
- Key components: Riser ducts, dip tubes, and splash plates.
- Material flow paths and heat exchange efficiency.
- Safety hazards associated with preheater operations.

MODULE 2: CHEMICAL DRIVERS OF PLUGGING

- The role of Alkalies, Sulfur, and Chlorine in material adhesion.
- Formation of Spurrite and other low-melting-point compounds.
- Impact of raw meal chemistry on "sticky" temperature ranges.
- Volatile recirculations and the "Enrichment Factor."
- Analyzing meal and dust samples for blockage risk.

MODULE 3: COMBUSTION AND BUILD-UP RELATIONSHIP

- Impact of reducing conditions on material build-up.
- Role of the calciner burner and secondary combustion.
- Effect of fuel ash composition on cyclone wall coatings.
- Managing the "CO" and "O₂" levels at the kiln inlet.
- Burner flame shape and its impact on the riser duct.

MODULE 4: DETECTION AND INSTRUMENTATION

- Using pressure transmitters to identify flow restrictions.
- Interpreting temperature deviations in cyclone outlets.
- Acoustic sensors and their role in detecting build-ups.
- Interpreting DCS trends for "hanging" and "slipping" material.
- Visual inspection techniques through viewing ports.

MODULE 5: THE ROLE OF AIR CANNONS AND CLEANING SYSTEMS

- Working principles and positioning of pneumatic air cannons.
- Sequence control and timing for optimal cleaning.
- Maintenance of solenoid valves and air pressure regulators.
- High-pressure water cleaning (Hydro-blasting) techniques.
- Acoustic cleaners and vibration-based removal systems.

MODULE 6: BYPASS SYSTEMS AND VOLATILE CONTROL

- Design and operation of the Chlorine Bypass.
- Quenching chamber mechanics and dust removal.
- Impact of bypass efficiency on preheater availability.
- Managing the disposal of bypass dust.
- Economic trade-offs of bypass operations.

MODULE 7: SAFETY PROTOCOLS FOR BLOCKAGE CLEARANCE

- Personal Protective Equipment (PPE) for hot material handling.
- Risks of "Material Flushes" and explosive pressure release.
- Establishing exclusion zones and communication protocols.
- Lockout Tagout (LOTO) for preheater cleaning equipment.
- Emergency response and first aid for thermal burns.

MODULE 8: MANUAL CLEANING AND POKING PROCEDURES

- Safe use of poking rods and compressed air lances.
- Identification of "hot points" and stable build-ups.
- Communication between field staff and the control room.
- Managing the flow of cleared material into the kiln.
- Documenting cleaning frequency and location.

MODULE 9: REFRACTORY AND MECHANICAL INTEGRITY

- Impact of build-ups on refractory lining wear.
- Thermal expansion and mechanical stress on cyclone shells.
- Inspecting dip tubes and splash plates for damage.
- Refractory selection for high-build-up zones (Anti-stick).
- Structural integrity of the preheater tower during blockages.

MODULE 10: CASE STUDIES AND INCIDENT ANALYSIS

- Review of major preheater blockage incidents.
- Lessons learned from "flushing" events.
- Analyzing the cost of downtime and lost production.

- Identifying the "Red Flags" that were missed in historical cases.
- Group exercise: Developing a blockage response plan.

MODULE 11: OPERATIONAL STRATEGIES FOR PREVENTION

- Establishing a "Process-Based" cleaning schedule.
- Optimizing the calcination degree to prevent riser build-up.
- Managing raw meal consistency and burnability indices.
- Implementing "Expert System" rules for blockage prevention.
- Role of the process chemist in preventing build-ups.

MODULE 12: COURSE ASSESSMENT AND FINAL REVIEW

- Final examination on cyclone blockage detection and management.
- Review of key safety and operational take-aways.
- Feedback on course content and delivery.
- Future trends in preheater design and anti-clogging.
- Closing remarks and certificate distribution.