مركز المستشار الوطني للتدريب
National Consultant Centre For Training
YOUR GATE TO HANDS-ON TRAINING

5-Day Cement Industry Training Course
In

CLINKER GRINDING, MILLING AND SEPARATION CYCLE TECHNIQUES (SITE VISIT)

Cairo - Egypt, 13 – 17 July 2026

COURSE LEVEL: ADVANCED

COURSE OVERVIEW:

The final stage of cement production—clinker grinding—is a sophisticated mechanical cycle that determines the product's ultimate fineness and reactivity. This course defines the technical parameters of the grinding, milling, and separation cycle, focusing on the integration of high-pressure grinding rolls and high-efficiency classifiers. By mastering the cycle techniques, participants will learn how to produce high-quality cement with minimal energy expenditure.

The scope of this training is deeply focused on the operational synergy of the grinding circuit. It covers the physics of particle separation, the management of the circulating load, and the optimization of mill internal ventilation. Furthermore, the course addresses the technical nuances of producing multi-grade cements and the adjustments required in the separation cycle to achieve specific particle size distributions.

Coverage includes the maintenance of grinding media, the calibration of high-efficiency separators, and the use of automated control loops to stabilize the grinding cycle. Through a technical site visit to the grinding department, participants will analyze the performance of the mill and separator in real-time. Attendees will gain the advanced skills required to troubleshoot circuit instabilities and to implement cycle modifications that enhance both product quality and plant productivity.

COURSE OBJECTIVES:

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

- Analyze the performance of the grinding and separation cycle as a closed loop.
- Optimize the "Circulating Load Ratio" to improve mill efficiency.
- Calibrate third-generation separators for precise particle size control.
- Explain the impact of the "Separator Tromp Curve" on cement quality.
- Manage the interaction between the Roller Press and the Ball Mill.
- Optimize mill ventilation and gas-to-material ratios.
- Adjust the grinding cycle for different cement grades (OPC vs. Blended).
- Use the "Rosin-Rammler" diagram to evaluate particle size distribution.
- Implement control strategies to stabilize the mill feed and separation air.
- Diagnose the causes of "Short-circuiting" in the separation cycle.
- Reduce the specific power consumption of the grinding and separation department.
- Monitor the wear and tear of internal cycle components.

TARGET AUDIENCE:

This course is intended for Process Engineers, Mill Operators, Maintenance Supervisors, and Technical Managers responsible for the cement grinding department.

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: THE GRINDING AND SEPARATION CYCLE

- Principles of closed-circuit vs. open-circuit grinding.
- Definition of the "Circulating Load" and its impact on capacity.
- The relationship between grinding energy and particle fineness.
- Overview of modern grinding circuit configurations.
- Safety hazards in high-speed grinding and separation units.

MODULE 2: BALL MILL MILLING TECHNIQUES

- Optimizing the "L/D" ratio of the mill compartments.
- Design and maintenance of the "Classifying Liners."
- Management of the "Intermediate Diaphragm" for material flow.
- Calculating the optimal mill speed and critical speed.
- Impact of "Ball Coating" on milling efficiency and its prevention.

MODULE 3: HIGH-EFFICIENCY SEPARATION TECHNIQUES

- Evolution of separators: from mechanical to 3rd generation air classifiers.
- The function of the rotor, guide vanes, and separation air.
- Adjusting the "Cut Point" for different cement types.
- Understanding the "Bypass" and its effect on the Blaine value.
- Maintenance and inspection of separator internals.

MODULE 4: ROLLER PRESS AND PRE-GRINDING CYCLES

- Integrating the Roller Press into the grinding circuit.
- Operation of the "V-Separator" for de-agglomeration.
- Managing the hydraulic pressure for optimal clinker cracking.
- Wear patterns on roller surfaces and hard-facing techniques.
- Energy savings achieved through pre-grinding cycles.

MODULE 5: PARTICLE SIZE DISTRIBUTION (PSD) MANAGEMENT

- Why PSD is more important than the Blaine value.
- Using the Rosin-Rammler-Sperling-Bennett (RRSB) plot.
- Impact of the "Slope" (n-value) on cement strength and workability.
- Techniques for "Narrowing" or "Widening" the distribution.
- Automated online particle size analyzers (PSA).

MODULE 6: MILL VENTILATION AND GAS FLOW

- The role of the mill fan in material transport and cooling.
- Managing the "Air-to-Material" ratio (kg/kg).
- Impact of "False Air" on separator efficiency and power.
- Dust collection: Bag filter vs. ESP in the grinding cycle.
- Troubleshooting pressure drops across the mill and separator.

MODULE 7: OPERATIONAL STABILIZATION AND CONTROL

- Controlling the mill feed based on "Electronic Ear" technology.
- Balancing the "New Feed" and "Reject" streams.
- Integrating "Expert Systems" for autonomous mill control.
- PID loop tuning for separator speed and air flow.
- Monitoring specific power consumption (kWh/ton).

MODULE 8: CEMENT COOLING AND PRODUCT MANAGEMENT

- Handling "Hot Cement" and its impact on the separation cycle.
- Operation of cement coolers: vertical vs. horizontal types.
- Managing the addition of Gypsum and Additives in the cycle.
- Prevention of "Pack-Set" in silos and dispatch units.
- Transitioning between cement grades within the cycle.

MODULE 9: MAINTENANCE OF THE GRINDING CYCLE

- Inspection of mill trunnion bearings and girth gears.
- Checking the separator rotor balance and vane wear.
- Maintenance of the bucket elevator and air slides.
- Lubrication requirements for high-torque grinding drives.
- Predicting failures through vibration and oil analysis.

MODULE 10: TROUBLESHOOTING CYCLE INSTABILITIES

- Dealing with "Mill Flushing" and surges in the reject line.
- Root cause analysis of coarse particles in the finished product.

- Solving the problem of high vibration in separators.
- Addressing thermal instabilities and gypsum dehydration.
- Emergency response to cycle equipment failure.

MODULE 11: SITE VISIT: CIRCUIT PERFORMANCE ANALYSIS

- Walkthrough of the grinding hall and separation tower.
- Observing the DCS trends for the grinding and separation loops.
- Review of the particle size analysis in the QC lab.
- Inspection of the Roller Press and V-Separator units.
- Discussion with the Process Engineer on cycle optimization.

MODULE 12: COURSE CONCLUSION AND FINAL ASSESSMENT

- Case study: Optimizing a grinding cycle for a new cement grade.
- Final exam on advanced milling and separation techniques.
- Summary of key takeaways for cycle efficiency.
- Feedback and course evaluation.