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

5-Day Cement Industry Training Course
In

EQUIPMENT AND PROCESS FUNCTIONS (SITE VISIT)

Cairo - Egypt, 26 – 30 Oct. 2026

COURSE LEVEL: BASIC

COURSE OVERVIEW:

Understanding the relationship between physical equipment and chemical processes is fundamental for any professional entering the cement industry. This course defines the mechanical functions of every major asset in the plant and how these functions contribute to the transformation of raw materials into finished cement. By bridging the gap between theory and physical reality, participants will gain a holistic view of the integrated manufacturing chain.

The scope of this training involves a sequential analysis of the plant layout, from the primary crusher and raw material storage to the packing and dispatch units. It covers the mechanical principles of material transport, the thermal functions of the kiln system, and the grinding mechanisms of the milling departments. Furthermore, the course addresses the role of auxiliary systems such as bag filters, fans, and weighing equipment in maintaining process stability.

Coverage includes the terminology used by plant operators, the safety zones associated with different equipment types, and the basics of process flow diagrams (PFDs). Through a guided site visit, participants will observe the scale and operation of industrial machinery, allowing them to visualize the process stages discussed in the classroom. Attendees will leave with a clear understanding of "how it works" and the vital role each piece of equipment plays in the success of the plant.

COURSE OBJECTIVES:

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

- Identify all major equipment components in a modern cement plant.
- Explain the process function of the primary and secondary crushers.
- Describe how raw material homogenization is achieved in the silos.
- Understand the function of the preheater cyclones and the calciner.
- Explain the role of the rotary kiln in clinker mineral formation.
- Identify different types of clinker coolers and their cooling mechanisms.
- Describe the mechanical operation of Ball Mills and Vertical Roller Mills.
- Understand the function of high-efficiency separators in the grinding cycle.
- Identify the various material transport systems (conveyors, elevators, air slides).
- Explain how dust is captured and recycled using bag filters and ESPs.
- Recognize the function of the packing machines and bulk loading systems.
- Relate process flow diagrams to the physical assets seen on-site.

TARGET AUDIENCE:

This course is intended for New Employees, Graduate Trainees, Administrative Staff, Procurement Officers, and Non-Technical Managers.

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: INTRODUCTION TO CEMENT MANUFACTURING

- Overview of the "Dry Process" vs. "Wet Process."
- The chemical journey: From Limestone to Calcium Silicates.
- Basic safety inductions for visiting industrial sites.
- Introduction to the Plant Process Flow Diagram.
- Understanding the "24/7" nature of cement production.

MODULE 2: RAW MATERIAL EXTRACTION AND CRUSHING

- Function of the quarry equipment: Drills and excavators.
- The primary crusher: Transforming rocks into pebbles.
- Screening and secondary crushing for size control.
- Safety hazards in the crushing and quarrying areas.
- Dust suppression functions in the primary stages.

MODULE 3: MATERIAL HANDLING AND STORAGE

- Belt conveyors: The "highways" of the cement plant.
- Function of stackers and reclaimers in the pre-blending yard.
- Bucket elevators and their role in vertical transport.
- Air slides and pneumatic transport for fine powders.
- Silo storage and extraction mechanisms.

MODULE 4: THE RAW GRINDING PROCESS

- Function of the Raw Mill: Achieving chemical fineness.
- Vertical Roller Mill (VRM) components: Table, rollers, and classifier.
- Drying functions: Using kiln waste heat in the mill.
- Managing the "Reject" circuit and recirculating load.
- Role of the raw meal blending silo.

MODULE 5: THE PREHEATER TOWER FUNCTIONS

- Cyclones as heat exchangers and dust separators.
- The calciner: Starting the chemical decomposition of limestone.
- Riser ducts and the "Goose Neck" function.
- Meal pipes and splash plates: Distributing material in gas.
- Detecting and preventing blockages in the tower.

MODULE 6: THE ROTARY KILN: THE HEART OF THE PLANT

- Mechanical function: Rotation, slope, and material movement.
- The burner pipe: Creating the "Sintering Zone."
- Refractory lining: Protecting the shell from extreme heat.
- Kiln seals: Preventing "False Air" ingress.
- The clinker formation process: From liquid phase to crystals.

MODULE 7: CLINKER COOLING AND STORAGE

- Function of the grate cooler: Rapid quenching of clinker.
- Heat recovery: Secondary and tertiary air functions.
- Clinker crushers (Clinker Breakers) and their role.
- Deep bucket conveyors for hot clinker transport.
- Clinker silos and the management of intermediate stock.

MODULE 8: CEMENT GRINDING AND ADDITIVES

- The Ball Mill: Grinding media and internal diaphragms.
- Function of gypsum and additives (Slag, Fly Ash, Limestone).
- High-efficiency separators: Selecting the final product.
- Cement cooling: Protecting the product and the silos.
- Water spray systems for internal mill cooling.

MODULE 9: DUST CONTROL AND AIR QUALITY

- Function of the Bag Filter: Fabric filtration principles.
- Electrostatic Precipitators (ESP): Ionization and collection.
- Main Stack: Monitoring emissions and gas flow.
- Recycling captured dust back into the process.
- Maintaining a clean and dust-free plant environment.

MODULE 10: PACKING AND DISPATCH FUNCTIONS

- Rotary packers: Automating the bagging process.
- Palletizers and shrink-wrap systems for transport.
- Bulk loading spouts for tankers and rail cars.

- Weighbridges: Ensuring accurate commercial delivery.
- Warehouse management and inventory functions.

MODULE 11: SITE VISIT: GUIDED PLANT TOUR

- Walking the process flow from the crusher to the silo.
- Observing the preheater tower and kiln in operation.
- Viewing the Central Control Room (CCR) and operator interface.
- Inspecting the grinding mills and packing plant.
- Q and A session with department heads on the field.

MODULE 12: COURSE WRAP-UP AND EVALUATION

- Review of the equipment-process relationship.
- Final knowledge quiz and terminology check.
- Group discussion on the site visit observations.
- Course feedback and continuous improvement.