

## 5-Day Cement Industry Training Course In

# AN INTRODUCTION TO CEMENT MANUFACTURING (SITE VISIT)

Cairo - Egypt, 16 – 20 Nov. 2026

**COURSE LEVEL: BASIC TO INTERMEDIATE**

### COURSE OVERVIEW:

An Introduction to Cement Manufacturing provides a foundational understanding of one of the world's most essential construction materials. This course defines the chemical and physical transformation of raw materials into high-quality hydraulic cement. It introduces the fundamental concepts of calcination and clinkering, explaining how limestone and clay are processed at extreme temperatures to create the binding properties necessary for modern infrastructure.

The scope of this training covers the entire production chain, beginning with quarrying and raw material preparation and concluding with cement grinding and dispatch. It explores the diverse machinery involved, including crushers, raw mills, rotary kilns, and cement mills. Additionally, the course introduces the critical role of quality control laboratories and the environmental measures taken to ensure sustainable and compliant industrial operations.

Coverage includes an overview of the different types of cement, such as Portland and blended cements, and their specific applications in the construction industry. The course also addresses the importance of energy efficiency and safety in a heavy industrial setting. By combining classroom theory with a structured site visit, participants will gain a clear perspective on how large-scale equipment and complex chemical reactions are synchronized to produce a consistent and reliable product.

### COURSE OBJECTIVES:

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

- Describe the primary raw materials used in cement production and their functions.
- Explain the chemical reactions that occur during the calcination and clinkering process.
- Identify the main components of a modern cement plant and their roles.
- Differentiate between the dry and wet processes of cement manufacturing.
- Summarize the steps involved in quarrying and raw material crushing.
- Understand the importance of raw meal homogenization for kiln stability.
- Describe the operation and function of the rotary kiln and preheater.
- Explain the cooling process and its effect on clinker mineralogy.
- Identify the additives used in cement grinding to achieve specific properties.
- List the key quality parameters tested in the laboratory for cement compliance.
- Recognize the safety hazards associated with a cement manufacturing environment.

- Appreciate the environmental controls used to manage dust and gas emissions.

### TARGET AUDIENCE:

This course is ideal for New Employees in the cement industry, Graduate Engineers, Administrative Staff, Sales and Marketing Personnel, and Non-Technical Managers who require a broad understanding of the manufacturing process.

### 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 AND HISTORY OF CEMENT

- Definition of hydraulic cement and its historical development.
- The role of cement in modern construction and infrastructure.
- Overview of global cement production and consumption trends.
- Basic terminology used in the cement industry.
- The difference between cement, concrete, and mortar.

#### MODULE 2: RAW MATERIALS AND QUARRYING

- Sources of calcium: limestone, chalk, and marl.
- Sources of silica, alumina, and iron: clay, shale, and sand.
- Quarrying techniques: blasting, drilling, and hauling.
- Primary and secondary crushing operations.
- Stockpiling and pre-blending for chemical consistency.

#### MODULE 3: RAW MEAL PREPARATION AND GRINDING

- Introduction to vertical roller mills and ball mills.
- The importance of fineness in raw meal for chemical reactivity.
- Drying and grinding processes in a single operation.
- Homogenization silos and their role in stabilizing the process.

- Sampling and analysis of raw meal composition.

#### MODULE 4: THE PREHEATER AND CALCINER SYSTEM

- Understanding the heat exchange process in cyclone stages.
- The chemistry of decarbonization (calcination).
- The role of the pre-calciner in increasing kiln capacity.
- Managing gas flow and pressure within the preheater tower.
- Energy efficiency benefits of modern preheater designs.

#### MODULE 5: THE ROTARY KILN OPERATION

- Mechanical components: tires, rollers, and drive systems.
- The internal zones of the kiln: transition, sintering, and cooling.
- Reaching high temperatures: the role of the main burner.
- Formation of clinker minerals (C3S, C2S, C3A, C4AF).
- Monitoring kiln performance through shell temperature and gas analysis.

#### MODULE 6: CLINKER COOLING AND STORAGE

- The function of the grate cooler in heat recovery.
- Impact of cooling rates on clinker quality and grindability.
- Secondary and tertiary air recovery for combustion.
- Clinker transport systems and storage hall management.
- Handling "hot clinker" and safety considerations.

#### MODULE 7: CEMENT GRINDING AND ADDITIVES

- Grinding clinker with gypsum to control setting time.
- Use of supplementary cementitious materials (slag, fly ash, limestone).
- Types of grinding circuits: open circuit versus closed circuit.
- Operation of high-efficiency separators for particle size control.
- Using grinding aids to improve mill throughput.

#### MODULE 8: CEMENT TYPES AND APPLICATIONS

- Classification of cement according to EN and ASTM standards.
- Ordinary Portland Cement (OPC) versus Portland Pozzolana Cement (PPC).
- Special cements: sulfate resistant, low heat, and white cement.
- Choosing the right cement for specific construction environments.
- Future trends: green cement and low-carbon binders.

#### MODULE 9: QUALITY CONTROL AND LABORATORY TESTING

- Importance of chemical analysis (XRF) and mineralogical analysis (XRD).
- Physical testing: fineness, setting time, and soundness.
- Strength testing of mortar cubes at 2, 7, and 28 days.
- Quality management systems and ISO certification.
- Statistical process control in cement manufacturing.

#### MODULE 10: ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

- Dust collection systems: bag filters and electrostatic precipitators.
- Managing gas emissions (NOx, SOx, and CO2).
- Water management and waste recycling within the plant.
- Noise and vibration control in proximity to residential areas.
- The industry's roadmap to "Net Zero" emissions.

#### MODULE 11: SITE VISIT: PLANT WALKTHROUGH

- Guided observation of the quarry and crushing unit.
- Viewing the raw mill and homogenization silos.
- Walkthrough of the kiln area and central control room.
- Inspection of the cement grinding and packing plant.
- Review of laboratory facilities and safety protocols.

#### MODULE 12: PLANT SAFETY AND COURSE CONCLUSION

- General safety rules and hazards in a cement plant.
- Lock-out Tag-out (LOTO) and confined space entry.
- Working at heights and around moving machinery.
- Course summary and final discussion.
- Distribution of participation certificates.