5-Day Cement Industry Training Course
In

CEMENT GRINDING COURSE

Dubai - UAE, 16 – 20 Nov. 2026

COURSE LEVEL: INTERMEDIATE

COURSE OVERVIEW:

Cement grinding is the final and most energy-intensive stage of the manufacturing process, where clinker is transformed into the fine powder known as cement. This course defines the mechanical and operational principles of the grinding circuit, focusing on the optimization of particle size distribution to achieve desired strength characteristics. By understanding the interaction between grinding media, separators, and material flow, participants can significantly improve mill productivity.

The scope of this training includes an in-depth analysis of both open and closed-circuit grinding systems. It covers the physics of comminution, the management of mill heat, and the chemistry of grinding aids used to prevent particle agglomeration. Additionally, the course addresses the technical specifications of different cement types and how the grinding process must be adjusted to meet varied market requirements for fineness and setting time.

Coverage includes the operational control of ball mills and the integration of high-efficiency separators to ensure product quality. Participants will learn how to balance the circulating load, monitor mill ventilation, and troubleshoot common grinding issues such as "coating" and "plugging." By the end of this program, attendees will be capable of fine-tuning the grinding process to maximize throughput while minimizing the specific power consumption of the plant.

COURSE OBJECTIVES:

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

- Identify the components and functions of a modern cement grinding circuit.
- Explain the principles of size reduction in ball mills and vertical mills.
- Optimize the ball charge and media distribution for maximum efficiency.
- Adjust separator settings to control cement fineness and Blaine values.
- Monitor and control mill temperature to prevent gypsum dehydration.
- Calculate the circulating load and separator efficiency.
- Implement the use of grinding aids to improve flowability and throughput.
- Manage the grinding of blended cements using additives like slag and fly ash.
- Troubleshoot operational instabilities and mechanical vibrations in the mill.
- Analyze the impact of clinker hardness and temperature on grindability.
- Conduct a mass and heat balance for the grinding system.
- Reduce the specific energy consumption (kWh/t) of the grinding process.

TARGET AUDIENCE:

This course is designed for Mill Operators, Production Engineers, Process Supervisors, and Maintenance Technicians involved in the cement finishing 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: OVERVIEW OF CEMENT GRINDING TECHNOLOGY

- Role of grinding in determining cement quality and performance.
- Evolution of grinding systems from open to closed circuits.
- Key performance indicators (KPIs) in the grinding department.
- Relationship between fineness, water demand, and strength.
- Basic safety rules for operating heavy grinding machinery.

MODULE 2: BALL MILL DESIGN AND OPERATION

- Mechanical structure: shells, trunnions, and drive systems.
- Two-compartment mills: the functions of drying and grinding.
- Understanding "critical speed" and its effect on ball motion.
- Internal ventilation and the role of the mill fan.
- Material transport through diaphragms and discharge screens.

MODULE 3: GRINDING MEDIA MANAGEMENT

- Types and materials of grinding balls: forged versus cast.
- Calculating the optimal ball charge volume (J factor).
- Determining the ball size distribution for primary and secondary stages.
- Measuring wear rates and planning media recharging.
- The impact of ball coating on grinding efficiency.

MODULE 4: HIGH-EFFICIENCY SEPARATORS

- Principles of air classification and particle separation.
- Adjusting rotor speed and air flow to target Blaine values.
- Understanding the Tromp curve and bypass (Short-circuiting).
- Impact of separator efficiency on the circulating load.
- Maintenance of separator vanes and internal liners.

MODULE 5: HEAT MANAGEMENT AND COOLING

- Why mills get hot: converting mechanical energy to heat.
- Controlling the mill exit temperature to protect gypsum.
- Operation of water spray systems inside the mill.
- Cooling the cement using vertical or horizontal cement coolers.
- Preventing the formation of syngenite and "pack set."

MODULE 6: BLENDED CEMENT PRODUCTION

- Grinding clinker with supplementary cementitious materials (SCM).
- Handling moisture in additives like slag and natural pozzolana.
- Separate grinding versus inter-grinding of components.
- Chemical interaction between different minerals during grinding.
- Quality control challenges in blended cement production.

MODULE 7: GRINDING AIDS AND PERFORMANCE ENHANCERS

- Chemical types: alkanolamines, glycols, and surfactants.
- Mechanism of action: reducing surface energy and agglomeration.
- Dosing systems and precision control of additives.
- Impact of grinding aids on cement strength and flowability.
- Cost-benefit analysis of using performance enhancers.

MODULE 8: OPERATIONAL CONTROL AND AUTOMATION

- Controlling the mill feed based on motor power and ear sensors.
- Integrating the mill circuit into the Distributed Control System (DCS).
- Automated sampling and fineness analysis (online Blaine).
- Using "Fuzzy Logic" and AI for grinding optimization.
- Monitoring specific power consumption in real-time.

MODULE 9: MAINTENANCE OF GRINDING EQUIPMENT

- Inspection of mill liners and bolting systems.
- Checking the condition of the girth gear and pinion lubrication.
- Maintenance of high-pressure jacking oil systems.
- Cleaning and repairing dust collectors (bag filters).
- Predicting bearing failure through vibration analysis.

MODULE 10: TROUBLESHOOTING GRINDING ISSUES

- Dealing with "mill flushing" and material surges.
- Identifying the causes of high mill vibrations.
- Solving the problem of coarse particles in the finished product.

- Managing "hot cement" issues in the packing plant.
- Root cause analysis of diaphragm blockages.

MODULE 11: ENERGY EFFICIENCY AND OPTIMIZATION

- Identifying energy losses in the grinding circuit.
- Benefits of upgrading to roller presses or vertical roller mills.
- Optimizing the mill circuit for various cement grades.
- Impact of clinker temperature and storage on grindability.
- Strategies for reducing kWh per ton produced.

MODULE 12: COURSE REVIEW AND FINAL WORKSHOP

- Group exercise: Designing a grinding media charge.
- Review of operational data and optimization strategies.
- Final examination and assessment.
- Open discussion on future grinding technologies.