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

5-Day Cement Industry Training Course
In

ENERGY EFFICIENCY MANAGEMENT AND SAVING IN CEMENT INDUSTRY

Dubai - UAE, 13 – 17 July 2026

COURSE LEVEL: ADVANCED

COURSE OVERVIEW:

Energy efficiency management in the cement industry is the strategic implementation of technical and operational measures designed to minimize specific heat and power consumption throughout the production lifecycle. This course defines the thermodynamic and electrical benchmarks that characterize a world class manufacturing facility, focusing on the reduction of gigajoules per ton of clinker. It establishes a rigorous framework for identifying energy leaks and optimizing the conversion of fuel and electricity into high quality cement.

The scope of this training involves a deep dive into the energy intensive stages of clinkerization and grinding, which together account for the vast majority of a plant's operating costs. It covers the deployment of Waste Heat Recovery (WHR) systems, the optimization of combustion efficiency, and the management of high efficiency variable frequency drives. Furthermore, the course addresses the integration of ISO 50001 energy management standards to ensure that efficiency gains are sustained through continuous monitoring and auditing.

Coverage includes detailed modules on thermal balance calculations, the impact of false air on fan power, and the selection of low energy grinding media. Participants will explore the latest innovations in pre-calciner design and the use of chemical grinding aids to lower the specific power consumption of finished cement. Through the study of real time energy dashboards and heat exchange optimization, attendees will gain the expertise required to significantly lower the carbon footprint and operational expenditure of the plant.

COURSE OBJECTIVES:

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

- Perform a comprehensive thermal and electrical energy audit of a cement plant.
- Calculate the specific heat consumption of the kiln system in kcal/kg of clinker.
- Identify and quantify energy losses due to radiation, convection, and false air.
- Optimize the clinker cooler for maximum heat recovery to the secondary and tertiary air.
- Evaluate the technical and economic feasibility of Waste Heat Recovery (WHR) systems.
- Implement ISO 50001 energy management protocols within the industrial environment.
- Reduce specific power consumption (kWh/ton) in raw and cement grinding circuits.
- Analyze the impact of alternative fuels on the thermal efficiency of the pyro-process.
- Optimize the performance of high pressure fans through variable frequency drives (VFDs).

- Utilize energy dashboards for real time monitoring of Key Performance Indicators.
- Implement low pressure drop cyclone designs in the preheater tower.
- Develop a long term energy saving roadmap for a multi-line cement facility.

TARGET AUDIENCE:

This course is intended for Energy Managers, Process Engineers, Production Managers, Technical Directors, and Electrical Engineers.

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: THERMODYNAMICS OF THE CEMENT PROCESS

- Fundamentals of the theoretical heat of clinker formation.
- Understanding exothermic and endothermic reactions in the kiln.
- Mass and energy balance across the pyro-processing line.
- Impact of raw meal moisture on specific heat consumption.
- Energy benchmarks for modern dry process kilns.

MODULE 2: KILN THERMAL EFFICIENCY AND HEAT RECOVERY

- Optimizing the preheater stages for maximum gas-material heat exchange.
- Managing the cooler efficiency and heat recovery factor.
- Impact of secondary and tertiary air temperatures on fuel savings.
- Reducing kiln shell radiation losses through refractory selection.
- Troubleshooting high exit gas temperatures in the preheater.

MODULE 3: ELECTRICAL POWER OPTIMIZATION

- Strategies for reducing kWh/ton in vertical and ball mills.
- Impact of recirculating loads on grinding energy efficiency.
- Managing the power factor and peak load demand in the plant.

- Energy saving potential of high efficiency motors and VFDs.
- Reducing the pressure drop in ducting and bag filter systems.

MODULE 4: WASTE HEAT RECOVERY (WHR) TECHNOLOGY

- Principles of Organic Rankine Cycle (ORC) vs. Steam Rankine Cycle.
- Designing heat exchangers for kiln exhaust and cooler air.
- Calculating the potential power generation from waste heat.
- Operational challenges and maintenance of WHR power plants.
- Economic analysis: Payback period and Internal Rate of Return (IRR).

MODULE 5: COMBUSTION EFFICIENCY AND FUEL SAVINGS

- Optimizing the main burner flame for concentrated heat transfer.
- Impact of primary air percentage on specific heat consumption.
- Managing the combustion of alternative fuels and biomass.
- Role of oxygen enrichment in increasing kiln thermal efficiency.
- Controlling excess air to minimize heat loss in exhaust gases.

MODULE 6: FALSE AIR MANAGEMENT AND FAN POWER

- Impact of air ingress on ID fan power and kiln stability.
- Identifying false air sources in the preheater and mill circuits.
- Techniques for sealing kiln inlets, outlets, and duct flanges.
- Measuring and monitoring the "Air In-leakage" percentage.
- Cost-benefit analysis of systematic sealing programs.

MODULE 7: GRINDING TECHNOLOGY AND ENERGY REDUCTION

- Comparative energy efficiency of VRMs vs. Ball Mills.
- Role of high efficiency separators in reducing bypass and over-grinding.
- Impact of grinding media size distribution on power consumption.
- Use of chemical grinding aids to improve mill throughput and efficiency.
- Optimizing the drying capacity of mills using waste heat.

MODULE 8: ISO 50001 AND ENERGY MANAGEMENT SYSTEMS

- Establishing an Energy Policy and Baseline for the cement plant.
- Developing Energy Performance Indicators (EnPIs) for each department.
- Implementing internal energy audits and corrective actions.
- Role of the Energy Team in driving cultural change.
- Documentation and reporting requirements for ISO certification.

MODULE 9: COMPRESSED AIR AND AUXILIARY SYSTEMS

- Energy efficiency in large industrial compressor stations.
- Detecting and repairing leaks in the pneumatic transport network.
- Optimizing the pressure settings for bag filter pulsing.
- Reducing energy consumption in lighting and HVAC systems.
- Energy efficient management of water pumping and cooling towers.

MODULE 10: DIGITALIZATION AND REAL TIME ENERGY MONITORING

- Implementing Smart Meters and automated data collection.
- Use of "Advanced Process Control" (APC) for energy stabilization.
- Building visual energy dashboards for operators and management.
- Predicting energy consumption trends using machine learning.
- Integrating energy data into the plant-wide DCS and ERP systems.