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

5-Day Cement Industry Training Course
In

FUELS IN THE CEMENT INDUSTRY

Dubai - UAE, 19 – 23 Oct. 2026

COURSE LEVEL: INTERMEDIATE

COURSE OVERVIEW:

The selection and management of fuels are critical for the thermal efficiency, environmental compliance, and cost-competitiveness of a cement plant. This course defines the various types of fuels used in the pyro-processing system, ranging from traditional fossil fuels like coal and petcoke to a wide array of alternative fuels. By understanding the combustion characteristics of each fuel type, participants will learn how to optimize the kiln's thermal performance.

The scope of this training involves a detailed analysis of fuel preparation, dosing, and combustion kinetics within the rotary kiln and calciner. It covers the technical challenges of handling solid, liquid, and gaseous fuels, including moisture control, fineness requirements, and storage safety. Furthermore, the course addresses the growing importance of "Co-processing," where industrial and municipal wastes are utilized as energy sources, contributing to a circular economy.

Coverage includes modules on the chemical impact of fuel ash on clinker quality, the management of emissions (CO2, NOx, SOx), and the safety protocols for handling volatile materials. Through case studies and process simulations, participants will learn how to balance the fuel mix to achieve the desired clinker mineralogy while minimizing energy costs. Attendees will gain the technical expertise required to lead fuel transition projects and manage the complex logistics of modern fuel supply chains.

COURSE OBJECTIVES:

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

- Classify the different types of fuels used in the cement industry.
- Analyze the proximate and ultimate analysis of coal and petcoke.
- Understand the "Net Calorific Value" (NCV) and its impact on heat consumption.
- Describe the operation of coal grinding and dosing systems.
- Evaluate the technical feasibility of alternative fuels (RDF, Tires, Biomass).
- Manage the "Substitution Rate" and its impact on kiln stability.
- Understand the chemistry of fuel combustion and flame temperature.
- Analyze the impact of fuel ash on the clinker chemical moduli.
- Implement safety measures for the storage of coal and hazardous waste fuels.
- Monitor and control emissions resulting from different fuel types.
- Optimize the burner settings for different fuel calorific values.
- Develop a strategic fuel procurement and quality control plan.

TARGET AUDIENCE:

This course is intended for Kiln Operators, Fuel Engineers, Process Engineers, Procurement Managers, and Environmental Specialists.

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: FUNDAMENTALS OF COMBUSTION

- The "Fire Triangle": Fuel, Oxygen, and Heat.
- Stoichiometric air requirements for different fuels.
- Combustion kinetics: Ignition, residence time, and turbulence.
- Understanding heat transfer: Radiation, convection, and conduction.
- Impact of combustion efficiency on specific heat consumption.

MODULE 2: TRADITIONAL FOSSIL FUELS: COAL AND PETCOKE

- Origin and classification of coal (Lignite to Anthracite).
- Characteristics of Petcoke: High sulfur and low volatiles.
- Proximate analysis: Moisture, ash, volatiles, and fixed carbon.
- Ultimate analysis: Carbon, Hydrogen, Nitrogen, Sulfur, and Oxygen.
- Grindability index (HGI) and its impact on mill capacity.

MODULE 3: COAL GRINDING AND DOSING SYSTEMS

- Operation of the coal mill: VRM vs. Ball Mill for fuel.
- Drying and grinding coal in an inert atmosphere.
- Fine coal storage: Preventing spontaneous combustion.
- High-precision dosing: Gravimetric feeders and pneumatic transport.
- Safety systems: CO monitoring and N2 purging in coal plants.

MODULE 4: LIQUID AND GASEOUS FUELS

- Heavy Fuel Oil (HFO) and Diesel: Storage and atomization.
- Natural Gas: Burner design and safety requirements.
- Comparing the flame characteristics of gas, oil, and coal.
- Economic and environmental trade-offs of liquid fuels.
- Handling LPG and other pressurized gaseous fuels.

MODULE 5: ALTERNATIVE FUELS (AF) AND CO-PROCESSING

- Definition and categories of Alternative Fuels.
- Refuse Derived Fuel (RDF) and Solid Recovered Fuel (SRF).
- Biomass fuels: Agricultural waste, wood chips, and husks.
- Hazardous waste as fuel: Solvents, oils, and chemical waste.
- Benefits of high-temperature co-processing in cement kilns.

MODULE 6: TIRES AS AN ENERGY SOURCE

- Whole tires vs. shredded tires (TDF).
- Feeding mechanisms: Mid-kiln valves vs. calciner feeding.
- Impact of tire ash (Steel and Zinc) on clinker mineralogy.
- Environmental benefits of tire recycling in the kiln.
- Logistics and storage challenges for tire-derived fuel.

MODULE 7: FUEL ASH AND CLINKER CHEMISTRY

- Incorporating fuel ash into the raw material balance.
- Impact of ash on the Lime Saturation Factor (LSF).
- Effect of sulfur-rich fuels on the alkali-sulfur balance.
- Managing "Rings" and "Build-ups" caused by fuel ash.
- Quality control of clinker when using high-ash fuels.

MODULE 8: BURNER TECHNOLOGY FOR MULTI-FUEL USE

- Design of the multi-channel kiln burner.
- Adjusting axial and radial air for flame stabilization.
- Managing the "Primary Air" momentum for alternative fuels.
- Calciner burners: Optimizing burnout in the riser duct.
- Troubleshooting burner blockages and wear.

MODULE 9: EMISSIONS AND ENVIRONMENTAL IMPACT

- Greenhouse gases: CO2 emissions from different fuels.
- NOx formation: Thermal NOx vs. Fuel NOx.
- SOx emissions and the role of the kiln as a "Scrubber."
- Monitoring heavy metals and dioxins when using waste fuels.
- Compliance with the Industrial Emissions Directive (IED).

MODULE 10: FUEL LOGISTICS AND STORAGE SAFETY

- Fire and explosion hazards in fuel storage areas.
- ATEX and hazardous area classification for fuel handling.

- Managing spontaneous combustion in coal stockpiles.
- Spill containment and environmental safety for liquid fuels.
- Logistics of alternative fuel supply: Quality and consistency.

MODULE 11: THE ECONOMICS OF FUEL SELECTION

- Calculating the "Cost per Million Kcal."
- Impact of carbon taxes on fuel strategy.
- Investment requirements for alternative fuel infrastructure.
- Evaluating the "Gate Fee" income for waste fuels.
- Long-term fuel security and price volatility management.

MODULE 12: FUTURE TRENDS AND FINAL ASSESSMENT

- Hydrogen as a fuel for the cement kiln of the future.
- Carbon Capture, Utilization, and Storage (CCUS) technologies.
- Electrification of the pyro-processing system.
- Final exam on fuel properties and combustion.
- Closing remarks and awarding of certificates.