5-Day Cement Industry Training Course
In

ALTERNATIVE FUELS AND WASTE TO ENERGY IN CEMENT

Dubai - UAE, 15 – 19 June 2026

COURSE LEVEL: ADVANCED

COURSE OVERVIEW:

Alternative fuels and waste-to-energy in the cement industry is the strategic integration of non-traditional combustible materials into the kiln system to replace conventional fossil fuels. This course defines the technical, environmental, and economic parameters required to transform a cement plant into a "Circular Economy" hub. It establishes a comprehensive framework for co-processing diverse waste streams—ranging from municipal refuse to industrial hazardous waste—while maintaining clinker quality and emission standards.

The scope of this training involves the detailed engineering of fuel preparation, dosing, and injection systems for solids, liquids, and gases. It covers the chemical impact of "Alternative Fuels" (AF) on the clinker mineralogy and the "Volatile Cycles" within the kiln, specifically the management of chlorides and sulfur. Furthermore, the course addresses the logistical challenges of waste sourcing, the regulatory landscape for permits, and the social license to operate when using waste materials as energy.

Coverage includes detailed modules on "Substitution Rates" (TSR), the design of specialized pre-calciner burners, and the environmental monitoring of trace elements and dioxins. Participants will explore the role of "Refuse Derived Fuel" (RDF), scrap tires, and biomass in reducing the plant's carbon footprint and energy costs. Through the study of heat balance adjustments and kiln stability management, attendees will gain the expertise required to maximize waste utilization and achieve sustainable "Green Cement" production.

COURSE OBJECTIVES:

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

- Identify and categorize potential waste streams for "Co-processing" in cement kilns.
- Calculate the "Thermal Substitution Rate" (TSR) and its impact on fuel costs.
- Understand the chemical composition of RDF, TDF, and hazardous waste.
- Optimize the "Burning Zone" and "Pre-calciner" for alternative fuel combustion.
- Manage the impact of "Alternative Fuel Ash" on clinker chemistry (LSF, SR, AR).
- Implement effective "Logistics and Storage" solutions for waste materials.
- Design and maintain AF "Feeding and Dosing" systems for high reliability.
- Monitor and control "Emissions" (NOx, SOx, VOCs, Heavy Metals) during AF use.
- Analyze the effect of "Chlorine Ingress" on kiln blockages and bypass needs.

- Perform a "Financial Feasibility Study" for an Alternative Fuel investment.
- Understand the "Regulatory Framework" and permits required for waste handling.
- Develop a "Stakeholder Engagement Plan" for social acceptance of AF.

TARGET AUDIENCE:

This course is intended for Alternative Fuel Managers, Environmental Engineers, Process Engineers, Production Managers, and Technical Directors.

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: THE CIRCULAR ECONOMY AND CEMENT

- Fundamentals of the "Circular Economy" and "Waste Hierarchy."
- Advantages of "Co-processing" over traditional incineration.
- Global trends in alternative fuel use in the cement sector.
- Impact of "Carbon Taxes" on the business case for AF.
- Understanding the "Gate Fee" vs. "Purchase Price" economics.

MODULE 2: CHARACTERIZATION OF ALTERNATIVE FUELS

- Physical and chemical properties: Net Calorific Value (NCV) and Moisture.
- Biomass fuels: Agricultural waste, Rice husks, and Wood chips.
- Processed waste: RDF (Refuse Derived Fuel) and SRF (Solid Recovered Fuel).
- "Tire Derived Fuel" (TDF): Shredded vs. Whole tire feeding.
- Liquid waste: Used oils, solvents, and chemical sludge.

MODULE 3: COMBUSTION KINETICS AND KILN STABILITY

- Comparing the "Combustion Profiles" of AF vs. Coal and Petcoke.
- Impact of "Particle Size" and "Moisture" on flame temperature.
- Managing the "Oxygen Demand" and excess air for high substitution rates.

- Role of the "Main Burner" and "Calciner Burner" in AF utilization.
- Adjusting "Residence Time" for complete combustion.

MODULE 4: IMPACT ON CLINKER CHEMISTRY AND MINERALOGY

- Influence of "AF Ash" on the LSF and liquid phase percentage.
- Monitoring "Minor Elements" (P2O5, MgO, Zinc) in the clinker.
- Impact of "Reducing Conditions" on clinker color and quality.
- Adjusting the "Raw Mix Design" to compensate for AF chemical input.
- Maintaining "Free Lime" and strength targets during high TSR.

MODULE 5: HANDLING THE VOLATILE CYCLES (CL, S, ALK)

- The role of "Chlorine" in preheater blockages and ring formation.
- Managing "Sulfur/Alkali" ratios in the presence of AF.
- Technical requirements for a "Chlorine Bypass" system.
- Cleaning and maintenance of "Build-ups" caused by volatiles.
- Impact of volatiles on "Refractory Life" and "Anchor" corrosion.

MODULE 6: AF FEEDING AND DOSING TECHNOLOGY

- Unloading and storage systems for bulk solids and liquids.
- Precision "Weigh-feeders" and "Flow-meters" for AF dosing.
- "Pneumatic vs. Mechanical" transport of alternative fuels.
- Double-flap valves and air-lock systems for kiln injection.
- Maintenance and fire protection for AF handling equipment.

MODULE 7: PRE-CALCINER OPTIMIZATION FOR AF

- Redesigning calciners for "Slow Burning" alternative fuels.
- Role of "Pre-combustion Chambers" and "Hot-disc" reactors.
- Managing the "Tertiary Air" distribution for AF.
- Impact of AF on "NOx Reduction" (Primary vs. Secondary air).
- Troubleshooting "CO Surges" and unburnt carbon in the preheater.

MODULE 8: ENVIRONMENTAL MONITORING AND COMPLIANCE

- Continuous Emission Monitoring Systems (CEMS) for AF.
- Monitoring "Dioxins and Furans" (PCDD/F) and Heavy Metals.
- Ensuring the "Destruction and Removal Efficiency" (DRE) of waste.
- Managing the "Carbon Footprint" (Scope 1 emissions) reduction.
- Reporting and compliance with the "Stockholm Convention."

MODULE 9: FEASIBILITY AND PROJECT MANAGEMENT

- Conducting a "Market Survey" for waste availability.
- Technical "Gap Analysis" for the existing kiln line.
- ROI and Payback analysis: CAPEX vs. OPEX savings.
- Developing a "Fuel Mix Strategy" for different plant seasons.
- Risk management: Sourcing, Quality, and Operational risks.

MODULE 10: SOCIAL LICENSE AND REGULATORY AFFAIRS

- Managing the "Public Perception" of waste burning.
- Stakeholder engagement: Local communities and NGOs.
- Navigating the "Environmental Impact Assessment" (EIA) process.
- Health and Safety (H&S) protocols for handling hazardous waste.
- Course wrap-up and "Alternative Fuel" implementation roadmap.