



National Productivity Council
(Under Ministry of Commerce & Industry, GoI)
Centre of Excellence for Training in Energy Efficiency (CETEE)
Dr. Ambedkar Institute of Productivity, Chennai.

e-ITEC Training Programme on “Energy Efficiency Practitioner’s Course in Industrial Utilities”

COURSE COVERAGE:

The curriculum for the course is a product of blending experiences of all training and consultancy work of NPC for past thirty years. The course content for the training has been carefully designed considering the need to strengthen energy auditing expertise among the energy professionals to meet the growing demand of the industries. First week will be oriented towards Energy Efficiency in Electrical System and Second week for Thermal Engineering. The approach for energy auditing for various utility systems will be clearly explained, by experienced faculty, starting from the first principles to include things like what data to collect, what to look for during field audit, how to analyse data, and how to report the findings. To further aid in this, a menu of all possible energy conservation options will be presented.

The broad coverage of topics week-wise is as follows:

ELECTRICAL MODULE

Energy Efficiency and Auditing

Introduction, Scope of Energy Audit, Types of Energy Audit, Detailed Energy Audit Methodology, Implementing Energy Efficiency Measures, Detailed Project Report (DPR), Measurement & Verification.

Electrical System

Introduction, Main Components of Electrical System, Load Management, Power Factor, Electricity Tariff, Distribution Transformers, Voltage Drop Survey, Cable Losses, Inverter/UPS, Power Quality, Energy Auditing Approach for Electrical Distribution System and Transformers, ENCON Opportunities in Electrical System, Harmonics and mitigation

Electrical Motors

Introduction, Types of Motors, Selection of an Electrical Motor, Motor Loading, Energy Efficiency Motors, Power Factor Correction for Motors, Avoiding Idle Running of Motors, Efficient Belt Drives, Application of Variable Frequency Drive (VFD), Effect of Power Supply Quality on Motors, Motor

Application in Material Handling, Energy Auditing Approach for Motors, ENCON Opportunities in Motors.

Fan System

Introduction, Types of Fans, Fan Selection, Fan Performance Curve, Fan System Resistance, Curve, Flow Control Devices, Energy Auditing Approach for Fan System, ENCON Opportunities in Fan Systems.

Pumps & Pumping System

Introduction, Pump Performance Curves, System Curve, Pump Performance Assessment, Flow Balance, Control Valve Operation (Throttling), By-pass Valve Operation, Optimum Pipe Sizing, Impeller Trimming, Reducing Number of Stages, Variable Speed Operation, Energy Auditing & Approach for Pumping System, ENCON Opportunities in Pumping System

Compressed Air System

Introduction, Types of Air Compressors, Compressed Air System, Compressed Air Generation, Compressed Air Distribution, Compressed Air End-use, Energy Auditing Approach for Compressed Air System, ENCON Opportunities in Compressed Air System.

Industrial Refrigeration Systems

Introduction, Overview of Typical Industrial Refrigeration System, Performance of Refrigeration System, Examples of Applications in small and medium-sized enterprises (SMEs), Energy Auditing Approach for Refrigeration Systems, ENCON Opportunities in Refrigeration System, Energy Auditing Approach in Ice Plant, ENCON Opportunities in Sea-food Processing Industries.

Air Handling and Distribution System

Introduction, Ducting System Design, Fan Discharge and Inlet System, Filter Losses, Coil Losses, Fan Efficiency, Excess Air Flow, Constant Air Volume (CAV) versus Variable Air Volume (VAV), Air Distribution and Balancing, Fresh Air Control, Energy Auditing Approach in Air Handling & Distribution System, ENCON Opportunities in Air Handling and Distribution System.

Cooling Towers

Introduction, Key Cooling Tower Terms and Definitions, Cooling Tower Performance Indicators, Water Balance and Conservation, Increasing Cycles of Concentration (COC), Cooling Tower Operation at Part Load through Capacity Control, Resetting Condenser Water Temperature, Optimising Condenser Water Flow Rate, Proper Cooling Towers Installation, Checking Condition of Cooling Tower, Improving Water Treatment, Switching off Cooling Tower Fans, Side Stream Filtration, Energy Auditing Approach for Cooling Towers, ENCON Opportunities in Cooling Towers

Lighting System

Introduction, Lighting Terminologies, Types of Lamps, Ballast, Use of Day Lighting, Light, Pipes, Occupancy Sensors, Integration with Renewable Energy, Energy Auditing Approach for Lighting Systems, ENCON Opportunities in Lighting System.

Diesel Generators

Introduction, DG Set Efficiencies, Specific Fuel Consumption, Guidelines for Energy Efficient Operation of DG Set, Energy Audit Approach for DG sets, ENCON Opportunities in DG Sets.

Buildings

Introduction, Energy Performance Index (EPI), BEE Star Programme for Buildings, GRIHA Green Rating System, LEED Rating System, Energy Mapping of Buildings, Energy Auditing Approach for Buildings, ENCON Opportunities in Building systems.

Energy Management System (EnMS): ISO 50001:2011

Introduction, Top Management Commitment and Involvement, Scope and Boundaries, Energy Policy, Resources, Energy Planning, Energy Objectives, Targets, and Action Plans, Implementation and Operation, Checking, Management Review.

THERMAL MODULE

Boiler System

Introduction, Boiler Efficiency, Boiler System Energy Savings, Thermic Fluid Heaters, Energy Auditing Approach for Boiler and Thermic Fluid Heater System, ENCON Opportunities in Boiler System, ENCON Opportunities in Thermic Fluid Heaters.

Industrial Furnaces

Introduction, Fuel-fired Furnaces, Induction Furnaces, Electric Arc Furnaces, Furnace Application, Energy Auditing Approach for Industrial Furnaces, ENCON Opportunities in Oil-fired Furnaces, ENCON Opportunities in Induction and Arc Furnaces, ENCON Opportunities in Steel Rerolling Mill.

Steam System

Introduction, Steam Survey, Surface Heat Loss, Steam Leaks, Steam Losses through Steam Traps, Condensate Recovery, Blowdown Heat Loss, Heat Recovery from Flash Steam, Energy Auditing Approach for Steam Systems, ENCON Opportunities in Steam System.

Waste Heat Recovery

Introduction, Waste Heat Sources, Overview of Waste Heat Recovery Technologies, Examples of Waste Heat Recovery Applications, Energy Auditing Approach for Waste Recovery Assessment.

Industrial Drying

Introduction, Types of Dryers, Energy Saving Opportunities in Drying, Economic Benefits of Heat Recovery, Tea Drying, Factors Affecting Tea Drying Efficiency, Performance Assessment of Dryers, ENCON Opportunities in Industrial Drying.

Heat Exchanger

Heat Transfer Basics, Heat Exchangers, Types, Condensers, Distillation Towers, Evaporators, Multiple Effect Evaporators, Performance Assessment of Heat Exchangers, Good Practices in Heat Exchangers, Pinch Analysis

Cogeneration

Introduction, CHP Configuration, CHP Applications, Components of CHP, Choice of Fuel, CHP Technology Types, CHP Metrics, Cogeneration Feasibility Study.

Water Audit and Conservation

Introduction, Water Auditing Step-by-Step, Water Auditing Approach, Water Conservation Options.

Renewable Energy Technologies

Introduction, Wind Energy Technology Overview, Small Hydro Power (SHP), Photovoltaic Power System, Solar Water Heating Systems, Biofuels.

Monitoring & Verification

Introduction, Purpose, Certification, Guidelines for Verification Process, Process of Verification.

Energy Data and Analytics

Purpose and Background, Energy Efficiency Performance Indicators for Industries, Benchmarking, Plant Energy Efficiency Data Analytics, Energy Information Management and Analytical Systems and Case studies



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 (27th September to 8th October excluding Saturday & Sunday)**

Technical Session Schedule Week- I(ELECTRICAL MODULE)

Date/Day	10:00 - 11.00		11.15-12.15	12.15-13.00		14.00-15.15		15.30 - 17.00
Day 1	ENERGY AUDITING	B R E A K	ELECTRICAL SYSTEMS ELECTRICAL MOTORS & HARMONICS		B R E A K	ELECTRICAL SYSTEMS ELECTRICAL MOTORS & HARMONICS	B R E A K	FAN SYSTEM
Day 2	PUMPS & PUMPING SYSTEM		PUMPS & PUMPING SYSTEM			COMPRESSED AIR SYSTEMS		CASE STUDIES
Day 3	INDUSTRIAL REFRIGERATION SYSTEMS		AIR HANDLING AND DISTRIBUTION SYSTEM			COOLING TOWERS		COOLING TOWERS
Day 4	LIGHTING SYSTEM		LIGHTING SYSTEM			DG SETS		ENERGY AUDIT MEASUREMENTS
Day 5	ENERGY MANAGEMENT SYSTEM (EnMS) ISO 50001:2011		BUILDINGS			CASE STUDIES		QUIZ

Technical Session Schedule Week- II (THERMAL MODULE)

Date/Day	10:00 - 11.00		11.15-12.15	12.15-13.00		14.00-15.15		15.30 - 17.00
Day 6	COMBUSTION MODULE	B R E A K	BOILER SYSTEM		B R E A K	BOILER SYSTEM	B R E A K	INDUSTRIAL FURNACES
Day 7	INDUSTRIAL FURNACES		STEAM SYSTEMS			STEAM SYSTEMS		CASE STUDIES
Day 8	WASTE HEAT RECOVERY		INDUSTRIAL DRYING			HEAT EXCHANGERS		COGENERATION
Day 9	WATER AUDIT AND CONSERVATION		RENEWABLE ENERGY TECHNOLOGIES			RENEWABLE ENERGY TECHNOLOGIES		MONITORING & VERIFICATION
Day 10	ENERGY DATA AND ANALYTICS		CASE STUDIES			QUIZ		SUMMING-UP & CLOSING SESSION