

Course Module

Overall Programme

<i>Date</i>	<i>Activity</i>
First Day	Lectures
2nd, 3rd & 4th Day	Energy survey & findings of the energy audits
Final Day	Report & Presentation

Lecture Programme

- Present Energy scenario – National and tea industry, Introduction to Energy, Energy cost and Energy Accounting.
- Energy conservation Approach and practical ways of energy conservation.
- Energy saving opportunities – in respect to electrical energy.
- Energy saving opportunities – in respect to Thermal energy.
- Energy Auditing and Implementation of an Energy Management programme
- Introduction of rest of the Programme

Lecture Resource persons

NAME	PROFESSIONAL QUALIFICATIONS
Mr.M.M.R.Pathmasiri	B.Sc. Eng.(Hons), M.Eng,C.Eng.,MIE(SL)
Mr.Ananda Namal	B.Sc. Eng.(Hons), M.Eng,C.Eng.,MIE(SL)
Mr.Ronald Comestor	B.Sc. Eng. MBA,C.Eng.,MIE(SL)
Mr.Gamini Senanayake	B.Sc. Eng.(Hons), MBA,C.Eng.,MIE(SL)
Mr.Chamila Jayasekara	B.Sc. Eng, M.Eng,,AMIE(SL)
Mr.Sanath Kithsiri	B.Sc. Eng.(Hons), MSc.,AMIE(SL)

Energy Audit Programme

Group	Main Task
1	Study on electricity supply and tea weathering
2	Study on roller room (Rolling, Roller breaking and fermentation)
3	Study on sorting, grading and packing
4	Study on furnace and tea drying

Detailed programme for Energy Audit

Group 1: Electricity supply and tea weathering

Measurements

- Logging of main electrical parameters in main feeder points
- Checking of the status of capacitor banks if available
- Generator test (if a generator available)
- Measurements of electrical parameters of weathering blowers
- Measurements of thermal parameters (Dry bulb and wet bulb temperature, flow rates , pressure level)
- Weight of raw and weathered leaf
- Measurement in electrical usage in other equipments in the weathering section such as tea conveyor and ventilation fans
- Measurements of moisture contents of raw and weathered leaves
- Study of lightings in the weathering section

Data Collection

- Monthly electricity bills
- Name plate data of machineries at weathering section
- Process parameters to be practiced in weathering

Thorough Inspection

- Status of switch gears
- Air leaks air pockets
- Work practices

Evening

Study in furnace and dryer area

Data Analysis, Calculation and Report Preparation

- Analysis of recorded incoming electrical data and establishing daily electrical energy load curve
- Identification of demand management options based on this curve if any.
- Calculation of overall specific electrical energy consumption of the factory
- Calculation of specific energy consumption of weathering process
- Calculation of specific thermal energy consumption of weathering process if dedicated thermal energy is used for weathering
- Calculation of power factor improvement if any
- Calculation of energy saving and economics of identified energy conservation options
- Report preparatio

Group 2: Rolling, roller braking and fermentation

Measurements

- Logging of electrical parameters in a full cycle of a rolling machine
- Measurements of electrical parameters in the machineries in the rolling section
- Study of rolling process – time for different pressure setting, weight
- Dry bulb and wet bulb temperature of fermentation area
- Study of lightings of the rolling section
- Weight of tea leaves charged in to first sets of rollers per batch and batch time
- Weight of dhools charged in to other rollers per batch and batch time
- Out put weight rate (top and bottom separately) of dhools from each roller breakers
- Moisture content of fermented tea

Data Collection

- Monthly purchased tea leaves data
- Name plate data of machineries in rolling section
- Process parameters (process time, ambient temperature and RH, roller programmes etc.) practiced in rolling and fermentation

Thorough Inspection

- Status of switch gears
- Status of power transmission – belt drives
- Work practices

Evening

Study in furnace and dryer area

Data Analysis, Calculation and Report Preparation

- Calculation of specific electrical energy consumption of the rolling process and roller breaking
- Establishing of electrical energy balance of the factory
- Analysis of tariff options
- Calculation of energy saving and economics of identified energy conservation options
- Report preparation

Group 3: Sorting, grading and packing

Measurements

- Measurements of electrical parameters in the machineries in the sorting, grading and packing section
- Operating production capacities of each machines (in each outlet separately)
- Moisture content of packed tea
- Study of lightings and ventilation in this section

Data Collection

- Monthly made tea data
- Name plate data of machineries in this section
- Operating hours of each plant in this section

Thorough Inspection

- Status of switch gears
- Status of power transmission – belt drives
- Work practices

Evening

Study in furnace and dryer area

Data Analysis, Calculation and Report Preparation

- Calculation of specific electrical energy consumption of sorting, grading and packing
- Establishing process flow diagram of tea manufacturing in respect to energy flow
- Calculation of energy saving and economics of identified energy conservation options
- Report preparation

Group 4: Furnace and drying

Measurements

- Flue gas analysis of furnace

- Fuel consumption rate
- Temperature logging of ambient air, dryer intake and outlet air
- Air flow rates
- Surface temperature and areas
- Dry bulb and wet bulb temperature of air
- Measurement of electrical parameters of electrical loads connected to furnace and dryer (in different damper conditions)
- Moisture content of dhools, fired tea and fire wood
- Mass of fired tea/dhool input to drier
- Study of lightings of the firing section and outdoor lighting

Data Collection

- Monthly fuel consumption data
- Name plate data of machineries in firing section
- Process parameters (process time, drier inlet/outlet temperature, moisture content of fired tea etc.) practiced in drying

Thorough Inspection

- Status of switch gears
- Status of power transmission – belt drives
- Status of fire tubes in the furnace
- Firewood storage
- Dryer trays
- Work practices

Evening

Study in furnace and dryer area

Data Analysis, Calculation and Report Preparation

- Calculation of specific thermal and electrical energy consumption of tea firing
- Establishing energy balances of furnace and dryers

- Establishing overall energy balance of the factory (share of thermal energy and electrical energy)
- Calculation of energy saving and economics of identified energy conservation options
- Report preparation