



Fossil Fuels – Daily Program

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Day 1

Welcome and Presentation of:

- Electrical Energy (present situation and expectations), demand, production and consumption all over the world.
- The Units and physical laws related to the generation of Electrical Energy.
- Conversions of the various energies i.e. Chemical Energy into Thermal Energy, Thermal Energy into Mechanical Energy, and Mechanical Energy into Electrical Energy.
- Various means for the production of Electrical Energy (production sources).

Fossil Fuels

- a) Generalities
- b) Coal's origins
- c) Various Qualities of Coal
- d) Analysis of different types of coal
- e) Conclusions of the coal analysis's results
- f) Fuel Oil origins
- g) Fuel Oil Analysis
- h) Conclusions of the Fuel Oil analysis
- i) Natural Gas origins
- j) Natural Gas analysis
- k) Conclusions of the Natural Gas analysis

Fossil Fuels Fired Power Plants

- a) Generalities
- b) Various types of Fossil Fuel Fired Power Plant
- c) Explanation of Elementary Systems in a Power Plant

Day 2

Coal-Fired Power Plant

Coal Handling

- a) Unloading
- b) Storage piling with problems of rain (moisture) and sun (fire)
- c) Fire Fighting System and water spraying on a coal storage place
- d) Coal Reclaim
- e) Coal Transport to Calibration, Crushing and iron free
- f) Coal Calibration, crushing and iron free
- g) Calibrated and Iron free Coal Transport to the coal bunker
- h) Analysis of the coal into bunker before burning



Coal-Fired Steam Generator

Main Structure Construction

Feed water/Steam H.P Pipes Construction

Secondary Structure Construction

Casing and Furnace Construction

Coal and Air Cycle

- a) Coal feeders from bunkers to Pulverizers
- b) Coal Pulverizers action
- c) Fire Protection of Pulverizers
- d) Co² storage for Co² injection into Pulverizers
- e) Pulverized Coal and Air Cycle on Steam Generator
- f) Forced Draft
- g) Rotary Air Heater
- h) Combustion Air to Wind boxes
- i) Primary Air Fan
- j) Temperature Control of the Primary Air
- k) Primary Air Inlet to Pulverizers
- l) Pulverized Coal going from Pulverizers to Coal Burners with forced primary air
- m) Auxiliary Air Heater for starting
- n) Induced Draft Fan
- o) Flue Gas stream route

Feed Water/Steam cycle

- a) Feed Water De-aerator tank
- b) Feed Water Pumps
- c) Low Pressure Heater of Feed Water
- d) High Pressure Heater of Feed Water
- e) Feed Water enters bottom header of the Economizer
- f) Feed Water from outlet Header of Economizer to Boiler Drum
- g) Feed Water from Boiler Drum to inlet Header of the Furnace Waterwall
- h) Mixture Steam-Water going from the Furnace to the Boiler Drum and Steam/Water separators
- i) Steam-free water going from the Steam/Water separators to the Primary Heater and after passing through the spray at temperature before entering to the secondary Super Heater
- j) High Pressure and Temperature Steam going directly from outlet Secondary Super Heater to the control Valve on the High Pressure Body of the Steam Turbine
- k) Low Pressure and Temperature Steam Outlet of the High Pressure Body going to the Re-heater Inlet
- l) Low Pressure and High Temperature outlet of the Re-heater going to inlet of the Intermediate Body of the Steam Turbine
- m) Control and regulation of the Coal-Fired Steam Generator
- n) Heat Balance of the Feed Water/Steam Cycle

Ash Cycle

- a) Slag collection on the Furnace bottom
- b) Slag Transport to storage
- c) Ash Precipitators functioning



- d) Field collecting coarse Ashes
- e) Field Collecting Fly Ashes
- f) Ash evacuation
- g) Ash Storage or recycling
- h) Quantity of Ashes going to stack
- i) Ash Environmental effects

Start up of a Coal-Fired Steam Generator

- a) Start up with Auxiliary Steam Production
- b) Auxiliary Air Heater
- c) Start up System variable pressure furnace
- d) Start up System Constant pressure Furnace

Steam Generator Security

- a) High Pressure By-Pass usefulness
- b) Safety Relief Valves
- c) Control and regulation of the boiler

Steam Turbine Principle

- a) Lubrication System (lift up, turn gear)
- b) Lubrication Oil Treatment
- c) Control Fluid System
- d) Steam Inlet at High Pressure Body
- e) Steam Reheating System
- f) Steam inlet at Intermediate Pressure Body
- g) Steam Inlet at Low Pressure Body
- h) Condenser of Steam Turbine Exhaust
- i) Condenser Vacuum System
- j) Condenser's Make Up and discharge system
- k) Condensing Water Extraction Pumps
- l) Condensing water going from the Condenser bottom to the Feed water de-aerator tank
- m) Main water cooling System of the Condenser
- n) Condenser Tube Cleaning System
- o) Turbine Steam Drains System
- p) Closed Water Cooling System
- q) Turbine Governing System
- r) Turbine Security Systems
- s) Turbine fast cooling

Efficiency of a Coal-Fired Power Plant

Auxiliary Utilities Consumption

Availability of the Power Plant

Conclusion, Questions and Answers session