

STEAM ENGINEERING INSTITUTE

CONTINUING EDUCATION PROGRAM

Course: Heat Rate Optimization

Continuing Education Hours: 24

Workbook "Heat Rate Optimization" by the Steam Engineering Institute.

Assignment: **Follow student study guidelines.** Answer the questions in at the end of each lesson in student's workbook. **At the end of your course send in all of your assignments to your instructor for review.**
You will be notified of where and when to appear for your final examination.
Photo identification is required at final examination.

PUT YOUR NAME AND DATE ON EACH ASSIGNMENT

Course will concentrate on HEAT RATE OPTIMIZATION as it applies to high pressure steam plants.

Lesson 1

Fundamentals of Power Plant Efficiency I (includes video)

Credit hours 4

Review of Boiler, turbine cycle, and plant efficiency; heat rate; the effect on efficiency of: steam pressure and temperatures, exit gas temperature, turbine exhaust pressure, fuel compositions, fuel air mixing, heat loss in H₂O to atmosphere, turbine cycle efficiency, efficiency affected by changing condenser backpressure, gross and plant net heat rate, factors that determine boiler efficiency.

Lesson 2

Fundamentals of Power Plant Efficiency II (includes video)

Credit Hours 4

Mechanical losses; review of: mollier diagrams, heat temperature curves for water (steam); wetness; ideal vs. real expansion; effect on cycle efficiency of: feed water heating, steam pressure, turbine exhaust pressure, adding a reheat cycle, feed water heating.

Lesson 3

Factors affecting Boiler Efficiency (includes video)

Credit Hours 4

The boiler 'system'; fuel quality and preparation; ash fusion temperature; fireside deposits; heat transfer; exit gas temperature; dew point; excess air, CO, unburned carbon; attemperation; air heaters; leakage; flue gas analysis; silica carryover; blowdown.

Lesson 4

Operator Controllable Losses: Boiler (includes video)

Credit Hours 4

Operator awareness, diagnosis and corrective action; control of steam pressure and temperature; exit gas temperature; combustion; furnace conditions; draft pressures; excess air; slagging; deposits; soot blowing.

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Lesson 5

Factors Affecting Turbine Efficiency (includes video)

Credit Hours 4

Steam conditions throughout cycle; changes in steam pressure and temperature; exhaust steam wetness; condenser backpressure; extraction steam; feed water heaters; silica deposits; blade erosion; steam leakage; sliding pressure control. Low reheat temperatures and turbine blade damage, efficiency, and generation. Effects of generator hydrogen pressures. The operator and exhaust leaving-losses. Throttling losses.

Lesson 6

Operator Controllable Losses: Turbine Cycle (includes video)

Credit Hours 4

Condenser performance; terminal temperature difference; cooling water temperature rise; tube deposits and blockage; insufficient CW flow; condenser venting and cleaning; air in leakage, ejectors, vacuum pumps, gland seal systems, expansion joints, control of steam admission; partial/full arc admission. High back pressure problems, start-up temperature limits, temperature ramp rates, turbine blade deposits, generator hydrogen pressures and capability curve.

This course will offer 24 hours of credit for license renewal. An additional four-hour course on MGL Chapter 146 and 522CMR and a two-hour course on feed water are required to receive a thirty-hour certificate for license renewal. Mass. Gen Laws module is included in above costs.