

ISET-2460: APPLIED BOILER TECHNOLOGY

Cuyahoga Community College

Viewing: ISET-2460 : Applied Boiler Technology

Board of Trustees:

January 2023

Academic Term:

Fall 2023

Subject Code

ISET - Integrated Systems Engineering

Course Number:

2460

Title:

Applied Boiler Technology

Catalog Description:

The focus of this course will be the applications of steam and hot water boilers, water chillers, steam and hydronic heating and cooling systems. This course is the prerequisite for the State of Ohio approved Low Pressure Operators Exam Preparatory class. Extensive guided instruction and practice provided.

Credit Hour(s):

2

Lecture Hour(s):

1

Lab Hour(s):

2

Requisites

Prerequisite and Corequisite

ISET-1460 Fundamental Boiler Technology, or departmental approval.

Outcomes

Course Outcome(s):

Install, maintain, and repair high pressure boiler systems.

Objective(s):

- a. Explain high pressure Boiler Design Applications.
- b. Define a steam cycle.
- c. Describe Utility boilers, industrial boilers, and co-generation.
- d. Discuss Furnace design for high pressure boilers.
- e. Discuss Control devices.
- f. Differentiate between various Boiler Construction types.
- g. Identify Materials used for high pressure boilers.
- h. Explain Heating surfaces and capacity.
 - i. Identify Types of stress for boiler construction.
 - j. Discuss Boiler openings and fittings.
- k. Describe High Pressure Boiler operations.
 - l. Identify start-up & shut down procedures.
- m. Differentiate between normal & abnormal operations.
- n. Discuss Water supplies.
- o. Review water conditioning.
- p. Calculate Boiler horsepower.

- q. Explain Repair & evaluation of boiler conditions.
- r. Demonstrate repair & evaluation of boiler conditions.
- s. Apply troubleshooting procedures for boiler systems.

Course Outcome(s):

Identify and determine appropriate repairs for Boiler Indicators and monitoring Devices.

Objective(s):

- a. Discuss overpressure.
- b. Recognize water level & measurement.
- c. Explain and demonstrate blow down systems.
- d. Review pump indicators.
- e. Identify and explain environmental controls.

Course Outcome(s):

Identify and select proper boiler auxiliary support equipment in installation, repair, and maintenance of boiler systems.

Objective(s):

- a. Identify steam traps and separators.
- b. List lubrication types.
- c. Apply preventive maintenance procedures.

Course Outcome(s):

Select and apply appropriate combustion equipment and fuels.

Objective(s):

- a. Categorize different fuels.
- b. Define rate of combustion.
- c. Calculate rate of combustion for different fuels.
- d. Identify Control and monitoring devices.
- e. List Safety devices.
- f. Apply safety devices per OSHA and local ordinances.
- g. Explain Natural & mechanical drafts.

Course Outcome(s):

Identify and apply safety and licensing standards according to OSHA and the State of Ohio regarding high pressure boiler systems.

Objective(s):

- a. Review Ohio Laws and Regulations.
- b. Apply lock-out/tag-out procedures.
- c. Identify flammable materials.

Methods of Evaluation:

- a. Completion of homework assignment
- b. Written and/or verbal quizzes covering homework and in class demonstrations
- c. Demonstration of application of theories and methods
- d. Final exam

Course Content Outline:

- a. CONCEPTS
 - i. Combustion
 - ii. Fuel characteristics
 - iii. Thermodynamics
 - iv. Work and energy
 - v. Boiler Horsepower relationship
 - vi. Convection (drafts)
 - vii. Control circuitry
 - viii. Safety devices
 - ix. Instrumentation
 - x. Meters
 - xi. Steam traps and separators
 - xii. OSHA and State Safety (codes)
 - xiii. Flowcharting
 - xiv. Troubleshooting
 - xv. Hand tools
 - xvi. Lubrication types and applications
 - xvii. Low and high-pressure boiler design
 - xviii. High-pressure Piping systems
 - xix. High-Pressure Materials
 - xx. Preventive maintenance procedures
 - xxi. Measurement systems (U.S. Customary & Metric)
- b. SKILLS
 - i. Evaluate boiler conditions
 - ii. Install, repair, and maintain different boiler types
 - iii. Calculate boiler horsepower ratings
 - iv. Installing wire for circuits
 - v. Reading instrumentation (meters)
 - vi. Troubleshooting (fundamentals)
 - vii. Creating troubleshooting flow charts
 - viii. Communication skills
 - ix. Safety rule application
 - x. Customer Service
 - xi. Interpreting schematics and drawings
 - xii. Interpreting Ohio Laws and regulations
 - xiii. Interpreting National Electric Code (NEC)
 - xiv. Locating additional resources for materials & troubleshooting
 - xv. Interpreting drawings & schematics that are dimensions in U.S customary & metric units.
 - xvi. Identifying measuring and hand tools for specific jobs.
 - xvii. Discussing proper fastening techniques.
 - xviii. Apply Maintenance procedures
 - xix. Apply lubrication
 - xx. Inspection and evaluation of system
- c. ISSUES
 - i. Networking
 - ii. Safe installations
 - iii. Design for future growth
 - iv. Taking concept and applying it
 - v. Troubleshooting
 - vi. Inability to identify problem
 - vii. Environmental considerations (EPA)

Resources

Steingress, Frederick M. *Low Pressure Boilers*. 3rd ed. American Technical Publishing, Homewood, Ill., 2022.

Steingress, Frederick M. *Low Pressure Boilers Workbook*. 2nd ed. American Technical Publishing, Homewood, Ill., 2018.

Killinger, Jerry and Killinger, LaDonna. *Heating and Cooling Essentials*. 2nd ed. Goodheart-Wilcox Publishing, Columbus, Oh, 2018.

Resources Other

- a. Amatrol Software

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