ISET-1460: FUNDAMENTAL BOILER TECHNOLOGY

Cuyahoga Community College

Viewing: ISET-1460 : Fundamental Boiler Technology

Board of Trustees:
January 2023

Academic Term:
Fall 2023

Subject Code
ISET - Integrated Systems Engineering

Course Number:
1460

Title:
Fundamental Boiler Technology

Catalog Description:
Concepts and fundamental skills associated with the operation and maintenance of steam boilers. Topics include an overview of steam boilers and boiler operation, basic boiler processes, boiler construction and material properties, boiler operating and maintenance procedures, combustion theory and fuels, efficiency, and codes and standards. Safety codes and procedures, preventive maintenance and basic troubleshooting techniques will also be covered. Extensive guided instruction and practice provided.

Credit Hour(s):
3

Lecture Hour(s):
2

Lab Hour(s):
2

Requisites

Prerequisite and Corequisite
None.

Outcomes

Course Outcome(s):
A. Install, repair, and maintain low-pressure boiler systems.

Objective(s):

a. Explain the principles of boiler technology.
b. Describe the combustion properties of different fuels.
c. Discuss the idea of efficiency.
d. Identify and demonstrate troubleshooting and maintenance procedures.
e. Explain heat transfer.
f. Discuss the history of boilers.
g. Identify boiler terminology.
h. Discuss steam principles
i. Identify boiler types and applications
j. Recognize and apply OSHA safety standards
k. Locate local and national installation Codes and Standards
l. Explain the principles of combustion
m. Identify types of materials for combustion

Course Outcome(s):

B. Categorize and select appropriate valves and vents for boiler systems.

Objective(s):

a. Identify the types of boiler valves and vents.
b. Identify valves and vents for different boiler applications.
c. Analyze operational controls.
d. Interpret flow diagrams.
e. Sketch flow diagrams.

Course Outcome(s):

C. Explain water systems for low-pressure boilers to internal/external customers.

Objective(s):

a. Recognize feed water and make-up water.
b. Explain water treatment.
c. Identify pumps and their applications.
d. Identify control systems for pumps.
e. Discuss preventive maintenance.
f. Describe Boiler Operator licensing.

Methods of Evaluation:

a. Completion of homework assignment
b. Written and 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. Terminology
    ii. Principles of Combustion
    iii. Thermodynamics Principles
    iv. Fuel combustion properties
    v. Work and energy
    vi. Convection and heat transfer
    vii. Boiler types and components (values, vents, storage, recovery, gas, oil)
    viii. Instrumentation
    ix. Meters
    x. OSHA Safety Standards (codes)
    xi. Flowcharting
    xii. Troubleshooting
    xiii. Hand tools
    xiv. Piping systems
    xv. Materials
    xvi. State and local ordinances and procedures for boiler installations and maintenance
    xvii. Measurement systems (U.S. Customary & Metric)
b. SKILLS
    i. Installing wire for circuits
    ii. Reading instrumentation (meters)
    iii. Troubleshooting (fundamentals)
    iv. Creating troubleshooting flow charts
    v. Communication skills
    vi. Safety rule application
    vii. Customer Service

viii. Interpreting schematics and drawings
ix. Interpreting National Electric Code (NEC)
x. Locating additional resources for materials & troubleshooting
xi. Interpreting drawings & schematics that are dimensions in U.S customary & metric units.
xii. Identifying measuring and hand tools for specific jobs.
xiii. Discussing proper fastening techniques.
xiv. Applying Maintenance procedures

c. ISSUES
i. Networking
ii. Safe installations
iii. Efficiency
iv. Taking a concept and applying it
v. Troubleshooting
vi. Inability to identify the problem
vii. EPA (Environmental Protection Agency)

Resources

Steingress, Frederick M. *Low Pressure Boilers*. 2th ed. American Technical Publishing, Homewood, Ill., 2022.

Steingress, Frederick M. *Low Pressure Boilers Workbook*. 2nd ed. American Technical Publishing, Homewood, Ill., 2020.

Killinger, Jerry and LaDonna. *Heating and Cooling Essentials*. 3rd ed. Goodheart-Wilcox Publishing, 2019.

Resources Other

a. Amatrol Software

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