

ATPF-2130: OIL AND HYDRONICS

Cuyahoga Community College

Viewing: ATPF-2130 : Oil and Hydronics

Board of Trustees:

1/30/2025

Academic Term:

Fall 2025

Subject Code

ATPF - Applied Ind Tech - Pipefitters

Course Number:

2130

Title:

Oil and Hydronics

Catalog Description:

Course discusses the types operation of oil and hydronic furnaces including the atomization of fossil fuels and water systems used for the ignition and circulation process. Maintenance procedures for service of the respective systems including oil burning efficiency and damping effects.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval: admission to Pipefitter's apprenticeship program.

Outcomes

Course Outcome(s):

Discuss the operation of oil burners and identify fuels used and the ignition process.

Objective(s):

1. List the different types of oil furnaces.
2. List the different components of oil furnaces.
3. Differentiate between oil, gas and electric furnaces.
4. Discuss the different grades of fossil fuel used in oil furnaces.
5. Explain the process of oil heating furnaces.
6. Discuss the atomization process of converting fossil fuel into vapor.
7. Describe the flow chart for converting fossil fuel into heat.
8. Interpret wiring diagrams associated with fossil fuel heating systems.

Course Outcome(s):

Discuss preventative maintenance procedures used for servicing oil furnaces.

Objective(s):

1. Identify proper flame control and resultant indicators when burner ignition is not maintained.
2. Explain the importance of inspection procedures for furnace nozzles, insulators and chamber interiors.
3. Explain how continuity of oil flow is maintained through the filtration components.
4. Discuss the importance of proper drafting and related consequences for oil heating systems.
5. List problems and causes of unmaintained heating equipment.

Course Outcome(s):

Discuss hydronic heating systems including components, terminal units and respective piping systems.

Objective(s):

1. Explain the process of heat generating and distribution related to hydronic heat.
2. List the different types of hydronic systems and the components common to each.
3. Identify the valves used within hydronic systems and discuss the respective functions of each.
4. Discuss the different terminal units including tube and finned tube units and explain the respective damping effects.
5. Discuss safety concerns with respect to air cushion and diaphragm tanks.
6. Discuss the operation of centrifugal pumps and circulators.

Course Outcome(s):

Demonstrate the ability to perform service and preventative maintenance operations on hydronic furnaces.

Objective(s):

1. Identify common problems and causes related to hydronic heat.
2. List the procedural steps to be followed during service calls.
3. Discuss the effects of trapped air within hydronic systems.
4. List preventative maintenance procedures including checks for leaks, circulation impedance and electrical problems.

Methods of Evaluation:

1. Class participation
2. Quizzes
3. Tests
4. Final exam

Course Content Outline:

1. Oil burners and fuel
 - a. Oil furnace types
 - i. Low-boy
 - ii. Up flow
 - iii. Down flow
 - iv. Horizontal
 - b. Components
 - i. Heat exchangers
 - ii. Oil burner
 - iii. Combustion chamber
 - iv. Blower fan
 - c. Oil, gas and electric
 - i. Energy source
 - ii. Maintenance
 - d. Fuel grades
 - i. Fuel weight
 - ii. Fossil
 - iii. Ignition factor
 - iv. Viscosity
 - v. Flow rate
 - e. Process
 - i. Fuel vaporization
 - ii. Fuel air ratio
 - iii. Combustion rate
 - iv. Heat transfer
 - f. Atomization
 - i. Fuel to vapor
 - ii. Ignition
 - g. Flow chart

- i. Fossil fuel selection
- ii. Vaporization
- iii. Ignition
- iv. Distribution
- h. Wiring diagram
 - i. Primary control unit
 - ii. Blower motor
 - iii. Limit switch
 - iv. Ignition transformer

2. Oil furnace maintenance

- a. Problems and causes
 - i. Noise-equipment shut off
 - ii. No heat-fuel supply
 - iii. Smoke-improper drafting
 - iv. Irregular heat-thermostat
- b. Burner ignition
 - i. Flame control
 - ii. Cleaning
 - iii. Cad cell
- c. Inspection procedures
 - i. Nozzle maintenance
 - ii. Insulator
 - iii. Chamber interior
- d. Filtration components
 - i. Oil flow continuity
 - ii. Filter
- e. Drafting
 - i. Combustion
 - ii. Air contaminates
 - iii. Breeching
 - iv. Temperature differential
 - v. Negative pressure

3. Hydronic heating systems

- a. Process and distribution
 - i. Energy source and water
 - ii. Pipe transmission
 - iii. Sensing elements
- b. Hydronic systems
 - i. One pipe
 - ii. Two-pipe reverse return
 - iii. Series load
 - iv. Radiant panel system
- c. Valves
 - i. Balancing
 - ii. Flow control
 - iii. Check
 - iv. Gate
 - v. Zone control
 - vi. Water regulating
 - vii. Pressure relief
- d. Terminal units
 - i. Radiator
 - ii. Fin tube
- e. Safety
 - i. Valve relief
 - ii. Limit switch
 - iii. Low water cut-off
 - iv. Expansion tank
- f. Centrifugal pumps and circulators

- i. Distribution
- ii. Rotation
- iii. Veins and blades
- 4. Service and maintenance
 - a. Service
 - i. Trapped air-heating process
 - ii. No heat-air flow
 - iii. Pump failure-electrical
 - iv. Irregular heat-wiring faults
 - b. Procedural steps
 - i. Professionalism
 - ii. Punctuality
 - iii. Workmanship
 - c. Trapped air effect
 - i. Noise
 - ii. Circulation
 - iii. Low heat
 - d. Preventative maintenance
 - i. Checks
 - 1. Leaks
 - 2. Impedance
 - 3. Electrical
 - ii. Cleaning
 - iii. Lubrication

Resources

Althouse, Turnquist and Bracciano. *Modern Refrigeration and Air Conditioning*. 21st edition. Goodheart-Willcox Co., South Holland, Illinois, 2019.

R. Jesse Phagan. *Applied Mathematics*. 4th edition. Goodheart-Wilcox Co./Tinley Park, IL, 2010.

United Association Training Department. *HVAC/R Training*. current edition. International Pipe Trades Training Committee, Inc., Washington, D.C, 2022.

Resources Other

Heat Energy Definition. <http://physics.about.com/od/glossary/g/heat.htm>. 2018.

Refrigeration Basics. <http://www.refrigerationbasics.com/1024x768/definitions1.htm>. 2024.

United Association Online Learning Resources. <https://uaolr.org/resource/display/1341> (<https://uaolr.org/resource/display/1341/>). 2024.

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