ATPF-2130: OIL AND HYDRONICS

Cuyahoga Community College

Viewing: ATPF-2130 : Oil and Hydronics

Academic Term:
Spring 2019

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.
        v. 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

United Association Training Department. *HVAC/R Training.* current edition. International Pipe Trades Training Committee, Inc., Washington, D.C., 2006.

Althouse, Turnquist and Bracciano. *Modern Refrigeration and Air Conditioning.* 4th edition. Goodheart-Willcox Co., South Holland, Illinois, 1979.

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

Resources Other

http://www.free-ed.net/sweethaven/MechTech/Refrigeration/coursemain.asp?lesNum=4&modNum=1

http://physics.about.com/od/glossary/g/heat.htm

http://www.refrigerationbasics.com/1024x768/definitions1.htm

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