ATPF-1085: REFRIGERATION AND REFRIGERANTS

Cuyahoga Community College

Viewing: ATPF-1085 : Refrigeration and Refrigerants

Board of Trustees:
2015-12-03

Academic Term:
Spring 2019

Subject Code
ATPF - Applied Ind Tech - Pipefitters

Course Number:
1085

Title:
Refrigeration and Refrigerants

Catalog Description:
Introduction to the refrigeration process including relationships between pressure and boiling points and vaporization and cooling coils. Also covers refrigeration cycles, plotting and interpretation of pressure/enthalpy charts.

Credit Hour(s):
2

Lecture Hour(s):
2

Requisites

Prerequisite and Corequisite
Departmental approval: admission to Pipefitter's apprenticeship program.

Outcomes

Course Outcome(s):
Identify the terms related to refrigeration and discuss the applications to the commercial heating and cooling industry.

Objective(s):
1. Define the terms used in refrigeration.
2. List the different applications of refrigeration in commercial use.
3. Discuss the need for refrigeration in the preservation of food.
4. Explain heat transfer as it relates to refrigeration equipment.
5. Identify different types of refrigeration equipment.

Course Outcome(s):
Discuss the refrigeration process including heat transfer, heat pumping and various refrigerants that are used.

Objective(s):
1. List various refrigerants and discuss the applications to refrigeration.
2. Explain the process of moving heat from an area of low temperature to a medium with higher temperature.
3. Describe the heat pumping process.
4. Explain pressure-temperature relationships as they correlate to boiling points of refrigerants.
5. Explain the purpose of refrigerants and discuss the process of changing vapor to liquids.

Course Outcome(s):
Discuss the refrigeration components and explain how they interact with each other.

Objective(s):

1. List the components of a refrigeration system.
2. Explain how a condenser converts gas into a liquid.
3. Explain how a compressor changes a low pressure refrigerant to a vapor.
4. Discuss the function of an evaporator with the metering devices.
5. Describe the critical functions of the metering device as they relate to sub-cooled liquids.
6. Compare the cooling process with dehumidification and discuss the similarities and differences.

Course Outcome(s):

Discuss how refrigeration plotting enthalpy charts are used to maintain peak performance of cooling equipment and the refrigeration process.

Objective(s):

1. Discuss critical points and the saturated liquid line displayed on pressure/enthalpy diagrams.
2. Explain how enthalpy plots are used to identify sub-cooled and superheated regions in an evaporator.
3. Describe how lines of constant specific volume and pressure are used to maintain optimum cooling cycles.
4. Explain the characteristics of flash gas and describe its ability to sub cool the surrounding environment.
5. Demonstrate the ability to plot various refrigeration cycles using different refrigerants.

Methods of Evaluation:

1. Quizzes
2. Tests
3. Final exam

Course Content Outline:

1. Terms and abbreviations
    a. Refrigeration
        i. Cryogenics
        ii. Tons of refrigeration
        iii. Refrigerants
    b. Commercial applications
        i. Comfort cooling
        ii. Process cooling
        iii. Industrial cooling
    c. Food preservation
        i. Spoilage
        ii. Bacteria growth
        iii. Frozen versus fresh
    d. Heat transfer
        i. Thermodynamics
        ii. Directional flow
        iii. Temperature levels
    e. Equipment
        i. Insulators
        ii. Refrigerator
        iii. Coils Evaporator
        iv. Condenser
2. Refrigeration process
    a. Heat
        i. High temperature
        ii. Low temperature
        iii. British Thermal Unit (BTU)
    b. Heat pump
        i. Mechanism
        ii. Box temperature
        iii. Heat removal
    c. Pressure- temperature
        i. Boiling point
        ii. Vapor pressure

iii. Barometric pressure
iv. Freezing temperatures

d. Refrigerants
i. Purpose
1. Heat transfer
2. Sub- cooling
3. Super heat
ii. Process
1. Liquid-vapor
2. Thermodynamics
iii. Types
1. Chlorofluorocarbons
2. Hydrochlorofluorocarbons
3. Hydrofluorocarbons
iv. Applications

3. Refrigeration components
a. Compressor
i. Scroll
ii. Reciprocating
b. Condensing coil
i. Fan cooled
ii. Water cooled
iii. Water cooled
iv. Vaporization
c. Expansion devices
i. Thermal
ii. Manual
iii. Automatic
iv. Super heat
d. Evaporator and metering device
i. Dehumidifier
ii. Saturation point
iii. Critical functions
e. Cooling processes

4. Refrigeration plotting
a. Enthalpy charts
i. Refrigeration process
ii. Cooling equipment
b. Critical points
i. Saturated liquid line display
ii. Saturated vapor
iii. Pressure/enthalpy diagrams
c. Specific volume
i. Optimum cooling cycles
ii. Isothermal bars
iii. Net refrigeration effect
d. Flash gas
i. Characteristics
1. Pressure changes
2. Refrigeration vaporization
3. Environmental sub-cooling
ii. Plotting cycles

Resources

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

Thomas W. Frankland. *Pipe Trades.* current. Glencoe/McGraw-Hill, New York, New York, 1969.

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

R. Jesse Phagan. *Applied Mathematics.* {ts '2015-04-07 00:00:00'}.

Resources Other

1. http://www.free-ed.net/sweethaven/MechTech/Refrigeration/coursemain.asp?lesNum=4&modNum=1
2. http://physics.about.com/od/glossary/g/heat.htm
3. http://www.refrigerationbasics.com/1024x768/definitions1.htm

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