ATPF-1145: REFRIGERATION TRANSPORT AND PROBLEM SOLVING

Cuyahoga Community College

Viewing: ATPF-1145 : Refrigeration Transport and Problem Solving

Board of Trustees:
2015-12-03

Academic Term:
Spring 2019

Subject Code
ATPF - Applied Ind Tech - Pipefitters

Course Number:
1145

Title:
Refrigeration Transport and Problem Solving

Catalog Description:
Advanced course desribing the refrigeration processes employed in the transportation of frozen and perishable goods using various vehicles of transport. Included are typical operating conditions for commercial refrigeration and troubleshooting common problems.

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 various types of refrigeration transportation systems and describe the different methods employed to maintain temperature and product quality.

Objective(s):
1. List the different systems used for the transportation of frozen and perishable goods.
2. Discuss the environmental factors that are considered during interstate transport.
3. Explain the method of piping liquid nitrogen through manifolds to storage areas.
4. Describe the cold plate method of refrigeration and explain how sodium chloride brine is used.
5. Discuss the effects of crystallization on cold plates and charging requirements.

Course Outcome(s):
Describe mechanical refrigeration systems including extra low temperature and cascade systems used for truck, railway and marine refrigeration.

Objective(s):
1. Discuss the need for anti-corrosive materials, including cupronickel, used in marine condensers exposed to salt water
2. Explain single and two stage compression used in extra low temperature refrigeration.
3. Explain the operation of engine driven compressors controlled thermostatically or clutch driven.
4. Discuss the importance of proper insulation with respect to heat infiltration during low temperature refrigeration.
5. Explain how cascade systems use two or three stages of refrigeration to reach maximum efficiency.
6. Identify the different refrigerants used in cascade systems and explain the function of each.

Course Outcome(s):

Analyze and troubleshoot problems commonly found in different temperature applications and typical operating conditions for equipment and systems

Objective(s):

1. Evaluate problem situations common to refrigeration systems.
2. List the problem areas found in various temperature applications.
3. Differentiate between operating conditions and equipment failure.
4. Describe the procedures followed while performing compressor vacuum tests.
5. Differentiate between closed loop and running tests.

Course Outcome(s):

Demonstrate the ability to correct common problems found in refrigeration equipment.

Objective(s):

1. List the different commercial refrigeration equipment common to stationary and mobile systems.
2. Identify the different problems common to refrigeration.
3. Discuss solutions to various cooler malfunctions.
4. Analyze and develop solutions to problems relative to freezer applications.
5. Demonstrate the ability to resolve mechanical and electrical refrigeration problems.
6. Demonstrate the ability to effectively and professionally communicate with customers regarding refrigeration problems and make recommendations for resolving equipment breakdown including solutions and cost estimates.

Methods of Evaluation:

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

Course Content Outline:

1. Systems and Transports
    a. Goods
        i. Perishable
        ii. Frozen
        iii. Other
    b. Systems
        i. Trucking
        ii. Rail
        iii. Air
        iv. Marine
        v. Cascade
    c. Environmental factors
        i. Warm regions
        ii. Cold regions
        iii. Transitional transport
    d. Methods
        i. Cold plate
        ii. Nitrogen distribution manifold
        iii. Electrical condensing
    e. Crystalization efforts
        i. Cold plate
        ii. Eutectic solution
            1. Sodium chloride
            2. Calcium chloride
            3. Corrosive effects
2. Mechanical refrigeration system
    a. Types
        i. Engine driven
        ii. Cascade

b. Engine driven compressor
    i. Thermostatically controlled
    ii. Clutch driven
    iii. Coil locations
c. Cascade
    i. Stages
        1. Refrigerant stage I R-13
        2. Refrigerant stage II R-22
    ii. Low temperature systems
    iii. Independent operations
    iv. Multiple refrigerants
d. Marine condensors
    i. Operating conditions
    ii. Temperature
    iii. Evaporators
        1. Forced draft
        2. Plate
        3. Bare tube
    iv. Corrosive effects
        1. Cupronickel protection
        2. Salt water damage
e. Single and two stage compression
    i. Low temperature refrigeration
    ii. Compression rations

3. Troubleshooting problems
    a. Systems
        i. Temperature applications
        ii. Operating conditions
    b. Problem evaluation
        i. Improper cooling
        ii. Electrical
        iii. Mechanical
    c. Temperature problems
        i. Thermostat
        ii. Low refrigerant
        iii. Cleaning issues
        iv. Mechanical
    d. Operating conditions versus equipment failure
    e. Compressor vacuum tests
        i. Bench tests
        ii. Equipment readiness
        iii. Vacuum pressure check
        iv. Front seating valves
        v. High side/low side readings
    f. Closed loop test
        i. Leak identification
        ii. Compressor capability
        iii. Compressor performance
        iv. Valve configuration
        v. Electrical issues
4. Problem solutions
    a. Customer service
        i. Personal appearance
        ii. Communication
        iii. Respect for property
        iv. Housekeeping and safety
    b. Refrigeration equipment
        i. Coolers
        ii. Ice storage boxes

iii. Freezers
iv. Dairy case

c. Solutions
i. Electrical mechanical
ii. Refrigerants
iii. Equipments/part replacement

Resources

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

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

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

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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