

ATPF-1095: SYSTEMS CHARGING

Cuyahoga Community College

Viewing: ATPF-1095 : Systems Charging

Board of Trustees:

2015-12-03

Academic Term:

Spring 2019

Subject Code

ATPF - Applied Ind Tech - Pipefitters

Course Number:

1095

Title:

Systems Charging

Catalog Description:

Course covers the charging of refrigerants in vapor and liquid states into air conditioning and heat pump systems and refrigerant oil with systems applications. Also included are the identification and operation of precision instrument for calibrating procedure.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval: admission to Pipefitter's apprenticeship program.

Outcomes

Course Outcome(s):

Describe how refrigerant is charged into systems in vapor and liquid states.

Objective(s):

1. Differentiate between liquid and vapor states and discuss advantages of each.
2. Describe system charging using two different weighing methods.
3. Interpret charging charts for introducing proper refrigerant pressure and temperature requirements.
4. Demonstrate the ability to use a scale and a digital electronic scale for weighing the proper amount of refrigerant.

Course Outcome(s):

Demonstrate the ability to charge air conditioning and heat pump systems.

Objective(s):

1. Differentiate between air conditioning and heat pumps and respective high and low sides.
2. Discuss safety practices used in charging air conditioning and heat pump systems
3. Transfer vapor refrigerant from cylinders into cooling systems safely.
4. Identify refrigerant charging devices and discuss metering operations of refrigerants into suction lines.

Course Outcome(s):

Identify commonly used refrigerants and refrigerant oils and discuss respective applications in the refrigeration industry.

Objective(s):

1. List the various refrigerants and refrigerant oil used to charge and lubricate heating and cooling systems.
2. Explain the differences between mineral and synthetic oil discuss the compatibility of each with respect to refrigerants.

3. Discuss the Environmental Protection Agency's (EPA) regulations as they relate to refrigerants.
 4. Describe methods of recovering refrigerants involving active and passive techniques.
 5. Discuss how the Montreal Protocol was instrumental in establishing guidelines for protecting the environment from ozone depletion.
 6. Identify refrigerant charging devices and discuss metering operations of refrigerants into suction lines.
 7. Differentiate between refrigerant and refrigerant oil.
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Course Outcome(s):

Describe the instruments used in the air conditioning, refrigeration and heating industry and discuss calibrating procedures.

Objective(s):

1. List calibrating instruments and equipment used.
 2. Describe comparison tests for ammeters and voltmeters.
 3. Describe procedures used for checking pressure instruments above and below atmospheric pressure readings.
 4. Demonstrate the ability to calibrate the instruments used in the safe installation of heating and cooling equipment.
 5. Identify refrigerant charging devices and discuss metering operations of refrigerants into suction lines.
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Methods of Evaluation:

1. Quizzes
2. Tests
3. Final exam

Course Content Outline:

1. State of refrigerant
 - a. Vapor
 - i. Preferred method
 - ii. Pulled vacuum
 - iii. Low side pressure
 - iv. Reduced pressure
 - v. Safety precautions
 1. Gentle heat versus open flame
 2. Electric heating blankets
 - vi. Liquid
 1. Liquid lines
 2. King valves
 3. Low pressure controls
 4. Liquid to vapor
 5. Metering
 - vii. Weighing methods
 1. Electronic scales
 2. Dial types
 - viii. Charging charts
 1. Refrigerant pressures
 2. Temperature requirements
 3. Charging curves
 2. Charging systems
 - a. Air conditioning
 - i. Cooling condenser
 - ii. Dehumidifier
 - iii. Cooling only
 - b. Heat pump
 - i. Heating and cooling
 - ii. Reversing valves
 - iii. Cylinder displacement
 - c. Safety practices

- i. Personal protective equipment
 - ii. Fire protection
 - iii. Electrical
- d. Refrigerant transfer
 - i. Cylinder
 - 1. Color check
 - 2. Size
 - 3. High pressure gages
 - ii. Cooling systems
 - 1. Split
 - 2. Conventional
- e. Charging devices
 - i. Charging meter
 - ii. Gage manifold
 - iii. Scale
- f. Metering operation
 - i. Thermal expansion valve
 - ii. Remote bulb controls
 - iii. Thermal readings
 - iv. Service valve safety
- 3. Refrigerants, oil and applications
 - a. Refrigerants versus refrigerant oil
 - i. Refrigerants
 - 1. Heat transfer
 - 2. Cooling element
 - ii. Refrigerant oil
 - 1. Multiple types
 - a. Application
 - b. Environmental conditions
 - c. Compatibility
 - iii. Maintenance
 - iv. Lubrication
 - b. Refrigerants
 - i. Chlorofluorocarbon (CFC)
 - 1. Ozone deplete
 - 2. Commonly used
 - 3. Centrifugal chillers
 - ii. Hydro fluorocarbon (HFC)
 - 1. Environmentally friendly
 - 2. Costly
 - iii. Hydrocarbon
 - c. Oils
 - i. Mineral
 - 1. Refrigerant compatibility
 - 2. Organic
 - ii. Synthetic lubricant
 - 1. Polyol ester
 - 2. Polyalkylene glycol
 - 3. Alternant mineral oil uses
 - d. Environmental Protection Agency (EPA) regulations
 - i. U S Clean Air Act
 - ii. Montreal Protocol
 - iii. Fines
 - 1. Illegal discharge
 - 2. Venting violations
 - 3. De minimus releases
 - e. Refrigerant recovery
 - i. EPA requirements
 - 1. Atmospheric discharge control
 - 2. Refrigerant renewal upgrade

- ii. Active techniques
 - 1. Common use
 - 2. Certified self contained equipment
 - 3. Efficiency
 - 4. Refrigerant suction
- iii. Passive techniques
 - 1. System compressor
 - 2. Cost comparison
- f. Montreal Protocol
 - i. Pre-cursor to EPA
 - ii. Ozone protection
 - iii. Refrigerant production regulations
- 4. Instruments and calibration
 - a. Calibrating instruments
 - i. Temperature measuring
 - ii. Pressure tests
 - iii. Electrical tests
 - iv. Refrigerant leak device
 - v. Flue gas analysis instruments
 - b. Comparison tests/electrical
 - i. Known values versus actual
 - ii. High quality resistors
 - iii. Volt scale check
 - iv. Conduction values
 - v. Tolerances
 - c. Pressure instruments
 - i. Atmospheric gage pressure
 - ii. Open gage manifold
 - iii. Purging
 - iv. Cylinder pressure
 - v. Sunlight effects
 - d. Calibrating instruments
 - i. Procedure
 - ii. Tolerances
 - iii. Trouble shooting
 - iv. Checks

Resources

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

Thomas W. Frankland. *Pipe Trades*. 4th. Glencoe/McGraw-Hill, New York, New York, 1979.

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

Resources Other

http://www.teledyne-hi.com/app_notes/hvac-and-refrigeration.htm

<http://contractingbusiness.com/archive/superheat-and-subcooling-best-ways-ensure-proper->

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