ATPF-1045: MOTOR CONTROLS & TROUBLESHOOTING

Cuyahoga Community College

Viewing: ATPF-1045 : Motor Controls & Troubleshooting

Board of Trustees:
2015-12-03

Academic Term:
Spring 2019

Subject Code
ATPF - Applied Ind Tech - Pipefitters

Course Number:
1045

Title:
Motor Controls & Troubleshooting

Catalog Description:
Basic electric motor course used for servicing refrigeration equipment. Course covers motor components and operation, safety considerations for restarting and servicing motors. Also included is a discussion of various electrical and mechanical problems that may cause motor malfunction.

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 the differences between a relay, a contactor and a motor starter.

Objective(s):
1. Explain the function of a relay with respect to an electric motor.
2. Discuss the function of a contactor and describe how it controls various currents that run through the motor.
3. Establish parameters of the amperage used for proper motor operation.
4. Differentiate between a relay and an electric motor starter.

Course Outcome(s):
Describe the conditions that must be considered when resetting safety devices used to restart electric motors.

Objective(s):
1. Discuss conditions that would result restarting a refrigeration motor.
2. List safety procedures that are followed to avoid personal injury and equipment damage.
3. List the types of Personal Protective Equipment (PPE) that is required when restarting motors and describe the inherent dangers of working with electricity.
4. Describe the devices that are used to protect a motor from overload conditions.
5. Differentiate between magnetic overloads and temperature sensing devices.

Course Outcome(s):
Describe electrical problems in electric motors and discuss troubleshooting procedures.

Objective(s):

1. List common wiring faults that can result in motor failure.
2. Describe how open windings in a motor can cause failures.
3. Explain how shorted motor windings can be determined by measurable resistance.
4. Describe a capacitor check out procedure.
5. Analyze electrical problems in motors by assessing field conditions.

Course Outcome(s):

Identify various mechanical problems in electric motors.

Objective(s):

1. Discuss the effects of grit and dirt on a bearing assembly and discuss the importance of lubrication for proper motor operation.
2. List the various components that make up drive assemblies.
3. Explain the problems that develop in motors due to over tightening and under tightening drive belts.
4. Explain the consequences of improper pulley alignment and discuss the resulting damage to drive belts and shafts.
5. Demonstrate the ability to disassemble drive assemblies for motor maintenance.

Methods of Evaluation:

1. Quizzes
2. Tests
3. Final exam

Course Content Outline:

1. Motor controls
    a. Relay
        i. Components
            1. Contacts
            2. Magnetic coil
        ii. Disposable features
        iii. Function
            1. Starting
            2. Stopping
        iv. Contactor
            1. Contacts
                a. Movable
                b. Stationary
            2. Operation
            3. Functions
                a. Compressor start up
                b. Crankcase heat
                c. Current control
        v. Starter
            1. Overload protection
            2. Magnetic pull
            3. Voltmeter checks
        vi. Amperage parameters
            1. Current ratings
            2. Protection
2. Restarting motors
    a. Cause
        i. Heat
        ii. Current overload
        iii. Loose connections
        iv. Service
    b. Safety procedures
        i. Lock out
        ii. Tag out
        iii. Tool calibration
    c. Personal Protective Equipment

        i. Face shield
        ii. Gloves
        iii. Cotton wear
        iv. Footwear
        v. Hearing protection
    d. Protective devices
        i. Internal
            1. Thermally activated discs
            2. Inherent
            3. Impedance protection
        ii. External
            1. Current break
            2. Built-in devices
            3. Trip points
            4. Contactor circuit
            5. Capacitance reserves
    e. Magnetic overloads
        i. Heat protected
        ii. Accuracy
    f. Temperature sensing device
        i. Bimetal
        ii. Over current conditions
        iii. Excessive arcing protection
3. Electrical problems
    a. Wiring faults
        i. Lose connections
        ii. Worn insulation
    b. Open windings
        i. Run winding
        ii. Start winding
        iii. Low resistance
        iv. Ohmmeter
    c. Capacitor checkout
        i. Safety
            1. Insulated tools
            2. Personal Protective Equipment
            3. Charge bleeding
        ii. Capacitor identification
        iii. Meter
4. Mechanical problems
    a. Grit and dirt
        i. Bearing wear
        ii. Drive attachment
        iii. Lubrication
    b. Drive assemblies
        i. Motor
        ii. Shaft
        iii. Pulley
        iv. Coupling
        v. Bearings
        vi. Belts
    c. Drive belts
        i. Over tightening
            1. Motor failure
            2. Bearing wear
            3. Belt life
        ii. Under tightened
    d. Pulley alignment

   i. Bearings
   ii. Shafts
   iii. Procedure
e. Motor maintenance
   i. Pulley installation
   ii. Proper tools
   iii. Lubrication
   iv. Belt inspection
   v. Windings check

Resources

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

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

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

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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