

ATPF-1807: SPECIAL TOPICS: CHILLED WATER SYSTEMS

Cuyahoga Community College

Viewing: ATPF-1807 : Special Topics: Chilled Water Systems

Academic Term:

Fall 2026

Subject Code

ATPF - Applied Ind Tech - Pipefitters

Course Number:

1807

Title:

Special Topics: Chilled Water Systems

Catalog Description:

Course covers compression cycle and absorption chillers used in the refrigeration process, specific terminology and the operation of the respective components. In addition, the purpose and operation of reciprocating, scroll, rotary screw and centrifugal compressors are included. Also presented are direct expansion and flooded evaporators, water and air cooled condensers, thermostatic expansion valves metering devices and purge units.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval: admission to apprenticeship program.

Outcomes

Course Outcome(s):

Discuss the purpose and operation of chillers

Objective(s):

1. Define special terms used with compression cycle chillers
2. Explain the need for cylinder unloading and variable frequency drives
3. Identify different compression chillers
4. List the different types of expansion devices
5. Review the safety concerns with handling refrigerants

Course Outcome(s):

Discuss the condenser in the chilled water process

Objective(s):

1. List the components condensers
2. Explain how the condenser operates
3. Identify the various condenser stages
4. Discuss the subcooling circuit
5. Explain air cooled and water cooled condenser

Course Outcome(s):

Describe the operation of the absorption chiller

Objective(s):

1. Explain how the solution inside the absorption system works
2. Differentiate between absorption and compression cycle chillers
3. Describe how circulating pumps operate
4. Explain the capacity control and crystallization affect the absorption chiller
5. Discuss the purpose of the heat exchanger and the absorption chiller

Course Outcome(s):

Discuss the motors and drives for the compression cycle chillers

Objective(s):

1. Describe part winding start
2. Explain autotransformer start
3. Discuss electronic starters
4. Differentiate between mechanical overload protection and Electronic solid-state overload protection

Methods of Evaluation:

1. Attendance
2. Participation
3. Assignments
4. Exams/quizzes

Course Content Outline:

1. Chiller systems
 - a. Chillers
 - i. Reciprocating
 - ii. Scroll
 - iii. Screw
 - iv. Centrifugal
 - v. Capacity
 - vi. Short cycling
 - vii. Cylinder unloading
 - viii. Variable frequency drives
 - b. Scroll compressor
 - i. Positive displacement compressor
 - ii. Efficiency
 - iii. Low noise level
 - c. Rotary Screw Compressor
 - i. Large volumes of refrigerant
 - ii. Compressor range
 - iii. Semi-hermetic
 - iv. Open-type compressors
 - d. Centrifugal Compressors
 - i. Centrifugal force
 - ii. Gear box
 - iii. Head pressure
 - e. Evaporators
 - i. High pressure
 - ii. Heat exchanger
 - iii. Direct expansion
 - iv. Flooded evaporator

1. Condensers
 - a. High Pressure Chiller Condenser
 - i. Heat transfer
 - ii. Air cooled
 - iii. Water cooled
 - iv. Heat recovery
 - b. Water cooled condenser
 - i. Shell and tube
 - ii. Water tube
 - iii. Refrigerant shell
 - iv. Hot gas
 - v. Liquid refrigerant
 - c. Air cooled condenser
 - i. Copper tube and aluminum fin
 - ii. Multiple fans
 - iii. Head pressure control
 - iv. Low maintenance
 - d. Condenser subcooling
 - i. Water temperature
 - ii. Cooling capacity
 - iii. Head pressure control
 - iv. Bypass valve
2. Absorption Chillers
 - a. Operation of absorption chiller
 - i. Heat source
 - ii. Piping connections
 - iii. Chilled water
 - iv. Condenser water
 - v. Steam or hot water piping
 - vi. Direct fired chiller
1. Absorption Chiller cycle
 - a. Water as a refrigerant
 - b. Salt solution
 - c. Boil water at a lower temperature
 - d. Lithium bromide
2. Absorption Evaporator section
 - a. Metered water
 - b. Pressure drop
 - c. Heat absorption
3. Absorber section
 - a. Diluted lithium bromide
 - b. Weak solution
4. Concentrator and condenser section
 - a. Boiling solution
 - b. Steam or hot water
1. Motors and Drives
 - a. Open Type Compressor
 - i. Air cooled
 - ii. Exhaust System
 - iii. Shaft Seal
 - b. Suction cooled compressor
 - i. Hermetic
 - ii. Semi-hermetic
 - c. Compressor starter
 - i. Amperage
 - ii. Part-Winding
 - iii. Autotransformer
 - iv. Electronic start
 - d. Wye-Delta

- i. Star-delta
- ii. Six lead motor
- iii. Speed
- e. Electronic Starters
 - i. Soft start
 - ii. Reduced voltage

Religious Accommodation

Before reviewing the course schedule, students should carefully review the following religious accommodation policy and other required instructional policies:

Religious Accommodation:

Students seeking an accommodation for absences permitted under Ohio's Testing Your Faith Act must provide the instructor with written notice of the specific dates for which the student requires an accommodation and must do so not later than fourteen (14) days after the first day of instruction. Please submit requests for accommodations at this link: <https://portal2.tri-c.edu/ReligiousAccommodation/ReligiousAccommodationForm>. Students with questions about their religious accommodations under Ohio's Testing Your Faith Act may contact the College's Office of General Counsel and Legal Services by phone at 216.987.4856 or via email at legal@tri-c.edu.

Other Required Instructional Policies:

<https://www.tri-c.edu/student-resources/curriculum/documents/syllabus-part-b.pdf>

Weekly Schedule

	Topics
Week 1	Chilled Water Basics Compressors Cylinder unloading Variable Frequency Drives Shop
Week 2	Chilled Water Basics Compressors Cylinder unloading Variable Frequency Drives Shop
Week 3	Condensers Heat Transfer Air cooled and water cooled condensers Condenser subcooling Shop
Week 4	Condensers Heat Transfer Air cooled and water cooled condensers Condenser subcooling Shop
Week 5	Absorption Chillers Operation and maintenance Various piping connections Absorption cycle Shop
Week 6	Absorption Chillers Operation and maintenance Various piping connections Absorption cycle Shop

Week 7	Absorption Chillers cont. Using water as a refrigerant Salt water solution Water metering Shop
Week 8	Absorption Chillers cont. Using water as a refrigerant Salt water solution Water metering Shop
Week 9	Absorption Chillers cont. Lithium bromide solution Diluted or weakened solutions Heat source Steam and Hot water Shop
Week 10	Absorption Chillers cont. Lithium bromide solution Diluted or weakened solutions Heat source Steam and Hot water Shop
Week 11	Compressors Air cooled Water cooled Suction cooled Shop
Week 12	Compressors Air cooled Water cooled Suction cooled Shop
Week 13	Compressor Starters Electronic start Soft start Amperage Shop
Week 14	Compressor Starters Electronic start Soft start Amperage Shop
Week 15	Review
Week 16	Assessment

The Course Schedule is subject to change due to pedagogical needs, instructor discretion, parts of term, and unexpected events.

Required/Recommended Readings

Instructor-provided materials

Resources for the Instructor

Frankland, Thomas W. . *Pipe Trades Manual*. McGraw-Hill, 1969.

Andrew D. Althouse, Carl H. Turnquist, A.F. Bracciano, D.C. Bracciano, and G.M. Bracciano. *Modern Refrigeration and Air Conditioning*. 22nd. Goodheart-Wilcox, 2025.

United Association Training Departmen. *HVAC/R Training Manual* . Annapolis, MD: United Association Training Department, www.ua.org/training

Additional Resources for the Instructor

<http://surna.com/water-chilled-systems-work/>

<https://www.youtube.com/watch?v=Uy7ynX9Q1gw> (<https://www.youtube.com/watch/?v=Uy7ynX9Q1gw>)

<http://www.airconditioning-systems.com/chilled-water-air-conditioning.html>

www.ua.org (<https://catalog.tri-c.edu/www.ua.org>)

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