ME 405 Basic Air Conditioning System Laboratory

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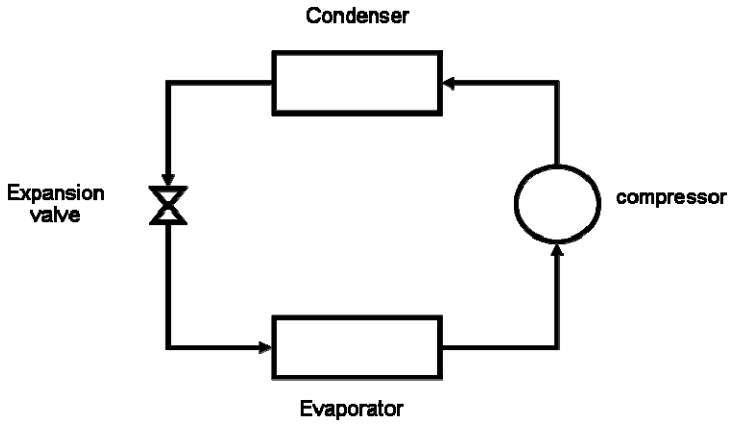
Objectives

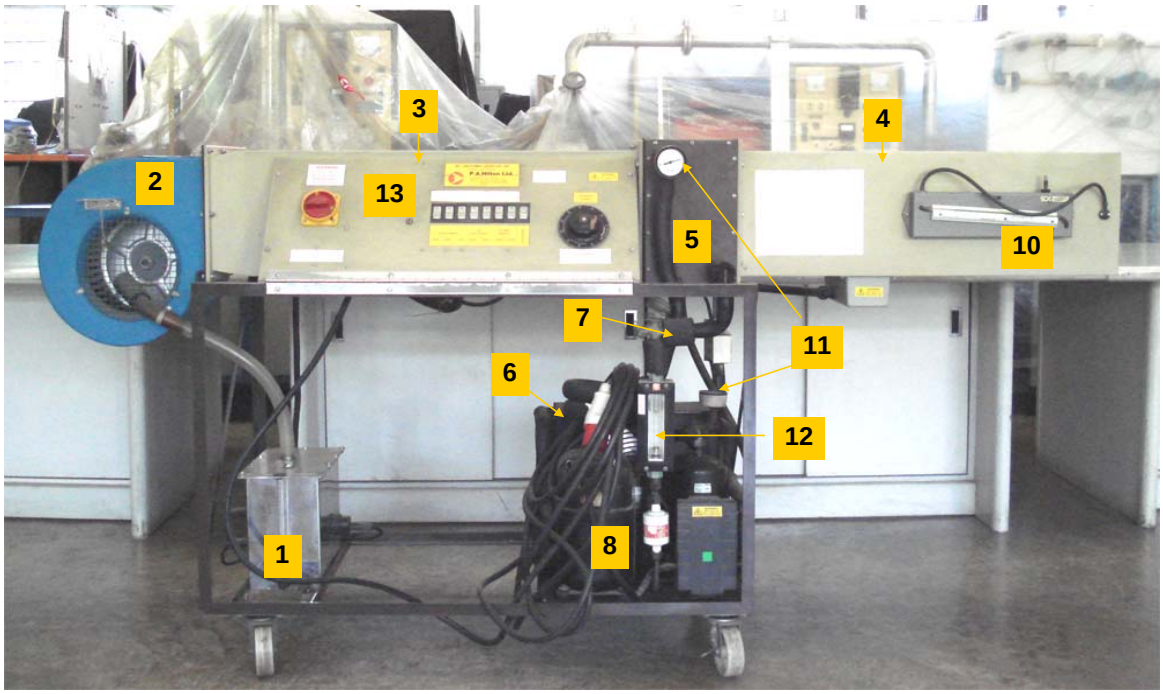
1. Find the properties of air from pyschrometric chart
2. Find the properties of refrigerant from P – h diagram and tables
3. Learn the operations of components in an air conditioning system
4. Understand how to control the air conditions

Basic principle of refrigeration and air conditioning systems



Apparatus of the test rig

1. Boiler
2. Blower
3. Pre-heater
4. After-heater
5. Evaporator
6. Condenser
7. Expansion valve
8. Compressor
9. Wet bulb and dry bulb thermometers
10. Inclined manometer
11. Pressure gauges
12. Flow meter
13. Controller
    a. Main switch
    b. Water heater
    c. Air pre-heater
    d. Air after-heater
    e. Compressor switch
    f. Inverter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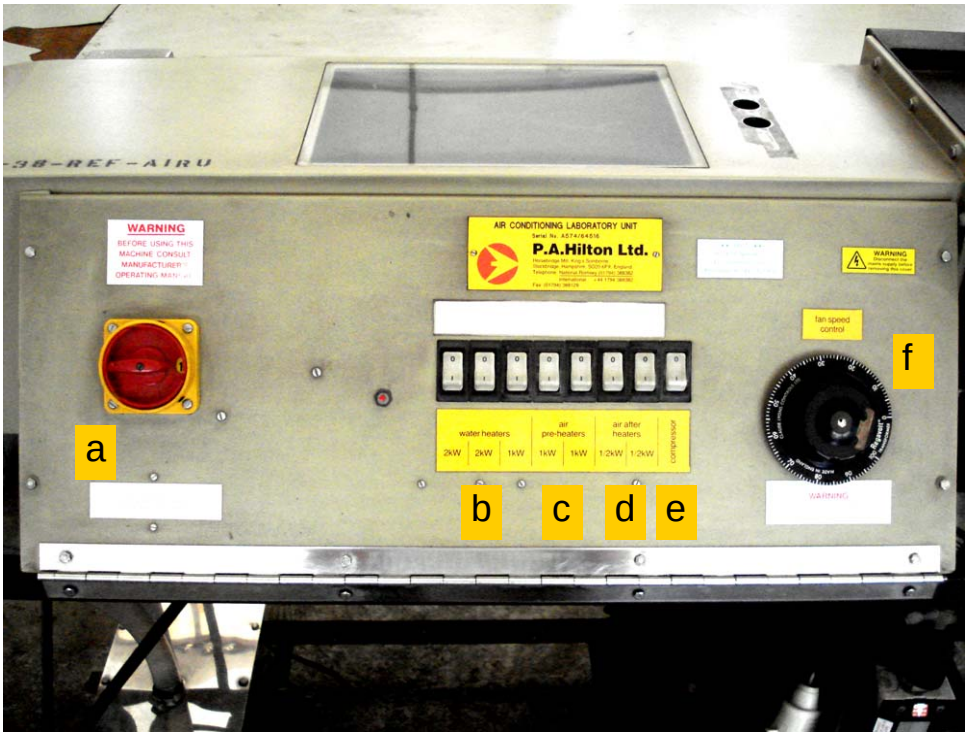

WARNING
AIR CONDITIONING LABORATORY UNIT
P.A.Hilton Ltd.
water heaters
air pre-heaters
air after heaters
compressor
fan speed control
a
b
c
d
e
f

Experimental procedure

1. Inspect all equipments before testing and set the level of water in beaker for condensation
2. For test 1, Measure the temperature of air before turning on main switch
3. For test 2, Turn on main switch and adjust inverter in order to find air speeds and then record temperatures, pressures, mass flow at various air speeds
4. For test 3, turn on compressor, and repeat conditions as same as procedure 3, and record time and volume of condensating water in the beaker
5. For test 4, select pre-heater or after-heater condition and repeat procedure 3 with turning on compressor.

Analysis

1. Convert air speeds into m/s
2. Plot the air conditions into psychrometric chart
3. Plot the states of refrigerant into P – h diagram
4. Compute energy transfer between air and refrigerant in various conditions

Problems and discussions

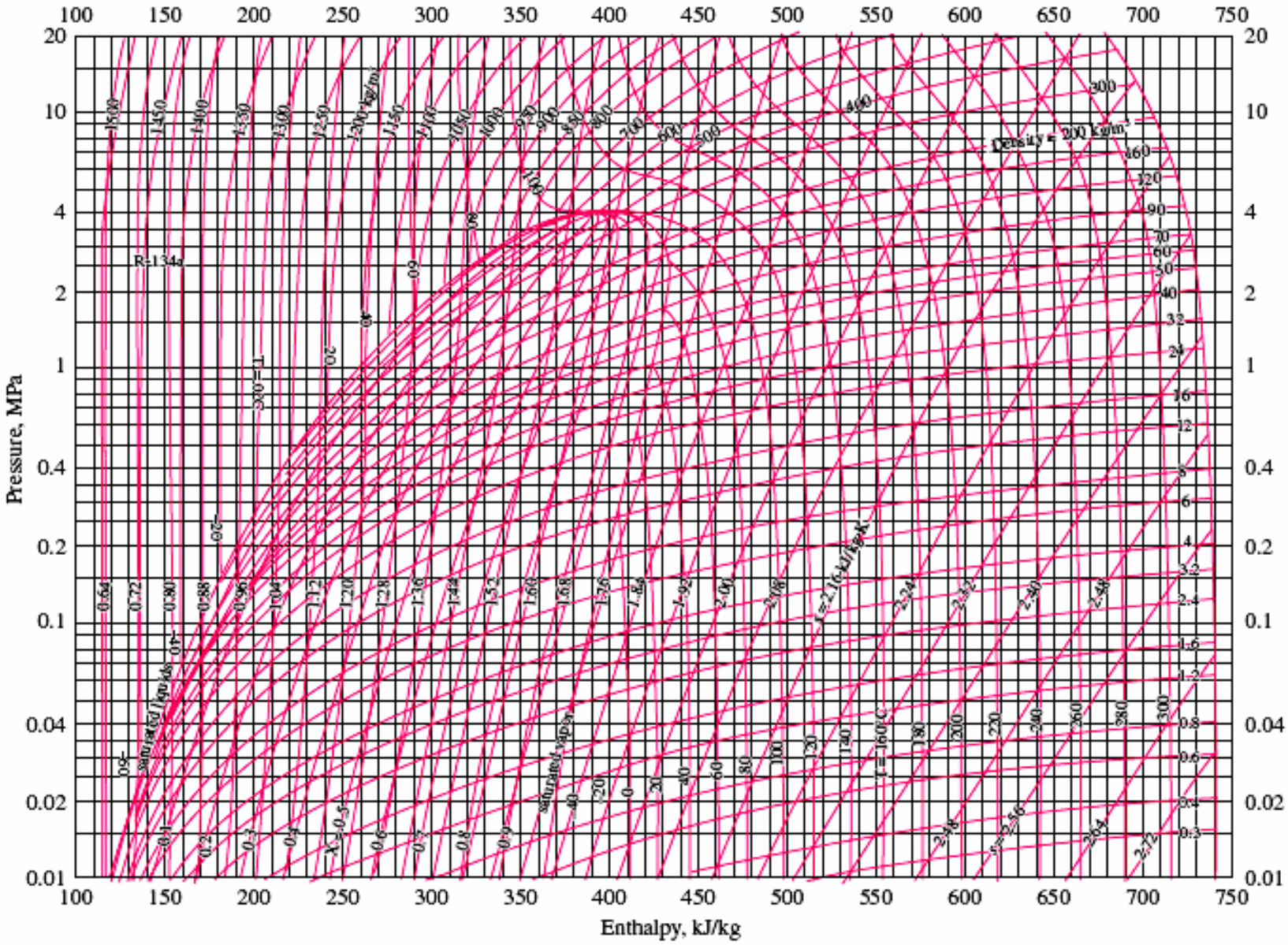
1. Does condensating water depend on air speed? And how?
2. How to obtain air condition at 25 ^{O}C and relative humidity of 50%?

Reference

1. Frank M. White, *Fluid mechanics*, 2nd ed., McGraw-Hill, 1986
2. Cengel, Y.A., and Boles, M., *Thermodynamics an engineering approach*. 4th ed., McGraw-Hill, 2002.
3. Wilbert F. Stoecker and Jerold W. Jones, Refrigeration & air conditioning, 2nd ed., McGraw-Hill, 1982.

Data sheet

Item	Condition	Speed	Air flow		T1				T2				T3				Refrigerant		Pressure		Condensation			
			$P_{incline}$	Velocity	db	wb	%RH	h	db	wb	%RH	h	db	wb	%RH	h	Mass flow		P_{evap}	P_{cond}	Volume	Time	Temp	Rate
1	**Initial**																							
2	**Blower**																							
2.1		Min																						
2.2		Med																						
2.3		Max																						
3	**Blower + compressor**																							
3.1		Min																						
3.2		Med																						
3.3		Max																						
4	**Blower + compressor+ preheater**																							
4.1		Min																						
4.2		Med																						
4.3		Max																						
5	**Blower + compressor+ afterheater**																							
5.1		Min																						
5.2		Med																						
5.3		Max																						



P-h diagram for refrigerant-134a.

Note: The reference point used for the chart is different than that used in the R-134a tables. Therefore, problems should be solved using all property data either from the tables or from the chart, but not from both.