Chapter 5 Review Questions

Metering Devices

Instructor's Answer Sheet

1. What is the primary function of a metering device?

   a. To provide refrigerant to the evaporator in order to absorb heat

2. What are two ways the metering device accomplishes its primary function?

   b. Changes incoming liquid to a spray, and lowers its temperature.

3. What are two ways the metering device lowers the temperature of refrigerant as it enters the evaporator?

   c. Drop in pressure and adiabatic expansion, or flashing off of some liquid

4. Why is superheat important in a TEV system?

   a. It acts as a margin of safety to prevent compressor damage due to flooding.

5. The suction pressure at the outlet of the evaporator is 65 psig on an R404 system, and the temperature of the suction line at the bulb is 35°. What is the superheat?

   b. 8°

6. According to TROT, what is the approximate evaporator superheat setting for a medium temperature walk-in box?

   b. 10°

7. According to T.R.O.T., what is the approximate evaporator superheat setting for a walk-in freezer?

   a. 5°

8. Can you use a pocket thermometer to calculate superheat? Why or why not?

    b. No, they are not accurate enough for measuring line temperature

9. If the compressor is 60’ from the evaporator, can you use the suction pressure at the compressor suction valve to calculate evaporator superheat? Why or why not?

    b. Probably, if you allow for a 2 psig pressure drop in the suction line.

10. When is the best time to take superheat readings?

    a. When the space temperature is within 5° of design temperature.

11. What are the three primary forces on a TEV?

    b. Bulb pressure, evaporator pressure, and spring pressure

12. What is the only opening force on a TEV?

    c. The sensing bulb pressure.

13. What is the prime consideration when installing a sweat type TEV?

    a. Not to overheat the valve.

14. What type of evaporator will need an externally equalized valve?

    b. Multi-circuit evaporator with equalizer tube.

15. Why are externally equalized valves needed on some evaporators?

    a. Because of the high pressure drop in the distributors.

16. When adjusting a Sporlan TEV for 2° more superheat, how many turns of the adjustment stem are needed and in what direction?

    b. Clockwise (in) one half turn

17. How is the factory setting of the superheat adjustment determined on a Sporlan expansion valve?

    a. Find the mid-point of the superheat adjustment stem.

18. According to valve manufacturers, where should the TEV sensing bulb be mounted on a horizontal suction line that is 7/8” in diameter or larger?

    c. At a four o’clock or eight o’clock position.

19. Based on the previous question, where would you mount the bulb if the pipe size was 5/8” O.D. or under?

    b. Anywhere except the bottom of the suction line.

20. What happens to the capacity of a TEV as the head pressure decreases?

    b. The capacity decreases because of less pressure drop across the valve.

21. What happens to the capacity of a TEV as the liquid temperature decreases?

    a. The capacity increases due to less adiabatic expansion needed.

22. An 18,000 Btuh evaporator would require what size TEV? Give the answer in both Btuh and tonnage.

    a. 1.5 ton, 18,000 Btuh.

23. What are the three criteria needed for a TEV to work correctly?

    a. Valve sized correctly, bulb installed correctly, and complete liquid to the valve.

24. How do you know if a TEV is flooding?

    c. no superheat

25. What are the first three things to check if TEV is flooding?

    c. Ice in valve, bulb sensing properly , and superheat

26. How do you know if a TEV is starving?

    b. High superheat

27. What four things would you check if TEV is starving?

    a. Ice in the valve, bulb charge, strainer blockage, and superheat

28. How do you know if a TEV is hunting?

    c. Superheat fluctuates

29. What three things would you check if a TEV is hunting?

    a. Valve sizing, liquid to the valve, and if opening the valve stops the hunting.

30. How do cap tubes meter refrigerant?

    b. Lower liquid pressure to evaporator pressure.

31. If a replacement cap tube has a larger I.D. than the original, should it be longer or shorter than the original cap tube?

    a. Longer

32. A convenience store customer just bought a reach-in refrigerator with a cap tube system. He wants it repaired because the warm bottled beer he loaded into it after lunch is not cold by his busy period at 5:00 P.M. What would you tell him and why?

    The reach-in refrigerator is not designed to bring warm product down quickly. There are no repairs necessary. Suggest to the customer to load warm product the night before it is needed, or load it in smaller batches during the day.

33. You are servicing a warm reach-in with a cap tube system. The customer says it runs, but at a temperature 10° to 20° higher than normal, and the product entering the box is from a properly operating walk-in box. How would you check the box without putting your gauges on it?

Check door gaskets and the customer's use of the box to make sure it is not suffering from warm air entering the box continuously. Make sure the customer is not overloading the box and restricting air flow around the product. Check the condenser and evaporator for air flow problems due to dirt, ice, or fan problems. Ask if someone has recently serviced the unit and if they added refrigerant. If all the previous symptoms do not indicate a problem, then it may be time to check pressures. See the answer to the next question.

34. Upon putting gauges on the unit in the previous question you find the low side in a vacuum and the head pressure slightly lower than normal for the ambient conditions. What would you suspect as the problem and how would you correct it?

The low side, or suction pressure, is usually in a vacuum because the capillary tube is restricted. Remove the refrigerant and filter-drier. Cut off the first 2 inches of the capillary tube. Install a new filter-drier, evacuate, and weigh in the proper charge of new refrigerant. Start the unit and allow it time to come down to temperature. Note, make sure the thermostat is set properly; customers usually turn down the tstat at the first sign of trouble.