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1. In a compressed air system approximately what percentage of energy reaches the point of final use?

a. 10% b. 20% c. 30% d. 50%

2. The volumetric efficiency of the compressor _____ with the increase in Altitude.

a. Increases b. Decreases c. Does not change d. None of the above

3. The basic function of an air dryer in a compressor is to

a. Prevent dust from entering the compressor

b. Store and smoothen the pulsating air output

c. Reduce the temperature of the air before it enters the next stage to increase efficiency

d. Remove remaining traces of moisture after the after-cooler

4. The percentage increase in power consumption of a compressor with suction side air filter and with the pressure drop across the filter of 250 mmWc (250 mm water column) is

a. 1 % b. 2 % c. 2.4 % d. 3 %

5. Which of the following is correct for air compressors?

a. For every 5.5°C drop in the inlet air temperature, the increase in energy consumption is by 2%

b. For every 4 °C rise in the inlet air temperature, the decrease in energy consumption is by 1%

c. For every 4 °C rise in the inter air temperature, the increase in energy consumption is by 1%

d. The energy consumption remains same irrespective of inlet air temperature

6. Reduction in the delivery pressure of a Compressor working at 7 bar, by 1 bar would reduce the power consumption by

a. 2 – 3 % b. 6 - 10 % c. 12 – 14 % d. None of the above

7. The acceptable pressure drop at the farthest point in mains header of an industrial compressed airnetwork is

a. 0.3 bar b. 0.5 bar c. 1 bar d. 2 bar

8. Which of the following parameters are not required for evaluating volumetric efficiency of the compressor?

a. Power b. Cylinder bore diameter c. Stroke length d. FAD

9. If the compressor of 200 cfm loads in 10 seconds and unloads in 20 seconds, the air leakage would be

a. 67 cfm b. 100 cfm c. 10 cfm d. 133 cfm

1ဝ. Which of the compressors is used to supply large quantities of air for a medium to high pressure range?

a. Reciprocating b. Rotary vane c. Rotary screw d. Centrifugal

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ANSWERS

1. a	2. b	3. d	4. b	5. c
6. b	7. a	8. a	9. a	11. d

11. Which of the following type does Screw compressor belongs to?

a) Positive displacement compressor c) Both a & b

b) Dynamic compressors d) None of the above

12. The compressor capacity of a reciprocating compressor is directly proportional to __ .

a) Speed b) Pressure d) All c) Volume

13. Vertical type reciprocating compressors are used in the capacity range of _____

a) 50 – 150 cfm b) 200 – 500 cfm c) Above 1000 cfm d) 10 – 50 cfm

14. The specific power consumption of non lubricated compressor compared to lubricated type is _____

a) Lesser b) Same c) Higher d) None

15.The discharge temperature of two stage compressor compared to single stage one is ____

a) Lesser b) Same c) Higher d) None

16. The compression ratios for axial flow compressors are ____.

a) Lesser b) Higher c) moderate d) None

17. The volumetric efficiency of the compressor with the increase in altitude of place

a) increases b) decreases c) does not change d) None

18.The ratio of isothermal power to actual measured input power of a compressor is known as:

a) Isothermal efficiency b) Volumetric Efficiency

c) Barometric efficiency d) None

19. The basic function of air dryer in a compressor is:

a. prevent dust from entering compressor

b. storage and smoothening pulsating air output

c. reduce the temperature of the air before it enters the next state to increase efficiency

d. to remove remaining traces of moisture after after-cooler

2၀. For every 4°C raise in air inlet temperature of an air compressor, the power consumption will increases by_____

a) 2% b) 1% c) 3% d) 4%

21. The percentage increase in power consumption of a compressor with suction side air filter and with the pressure drop across the filter of 200 mmWc is ____

a) 1.0% b) 3% c) 2.4% d) 1.6%

22. Which of the statement is "True" for centrifugal compressors?

a) The compressor should not be operated at full load

b) The compressor should be operated at shut off pressure

c) The compressor should not be operated with inlet-guide vane control

d) The compressor should not be operated close to the surge point

23. Identify the correct statement for air compressors.

a. For every 5.5°C drop in the inlet air temperature, the increase in energy consumption is by 2%.

b. For every 4 °C rise in the inlet air temperature, the decrease in energy consumption is by 1%

c. For every 4 °C rise in the inter air temperature, the increase in energy consumption is by 1%

d. The energy consumption remains same irrespective of inlet air temperature

24. Reduction in the delivery pressure of a Compressor working at 7 bar, by 1 bar would reduce the power consumption by

a) 6 to 10 % b) 2 to 3 % c) 12 to 14 % d) None of the above

25. The acceptable pressure drop at the farthest point in mains header of an industrial compressed air network is:

a)0.3 bar b) 0.5 bar c) 1.0 bar d) 2 bar

26. The likely estimate on equivalent power wastage for a leakage from 7 bar compressed

air system through 1.6 mm orifice size is ____

a) 0.2 kW b) 3.0 kW c) 0.8 kW d) 12 kW

27. From the point of lower specific energy consumption, which of the following compressors are suitable for part load operation?

a) Two stage reciprocating compressors b) Centrifugal compressors

c) Two stage screw compressor d) Single stage screw compressor

28. From base load operation and from achieving best specific energy consumption point of view, which of the following compressors are suitable?

a) Single stage reciprocating compressors b) Centrifugal compressors

c) Two stage reciprocating compressor d) Multi stage reciprocating compressor

29. Which of the following parameters are not required for evaluating volumetric efficiency of the compressor?

a) Power b) Cylinder bore diameter c) Stroke length d) FAD

3ဝ. If the compressor of 200 cfm loads in 10 seconds and unloads in 20 seconds, the air leakage would be_____

a) 67 cfm b) 100 cfm c) 10 cfm d) 133 cfm

31. Which of the following type does Screw compressor belongs to?

a) Positive displacement compressor b) Dynamic compressors

c) Both a & b d) None of the above

Ans: a) Positive displacement compressor

32. The compressor capacity of a reciprocating compressor is directly proportional to _____

a) Speed b) Pressure c) Volume d) All

Ans: a) Speed

33. Vertical type reciprocating compressors are used in the capacity range of _____

a) 50 – 150 cfm b) 200 – 500 cfm c) Above 10000 cfm d) 10 – 50 cfm

Ans a) 50 – 150 cfm

34. The specific power consumption of non lubricated compressor compared to lubricated type is ____

a) Lesser b) Same c) Higher d) None

Ans c) Higher

35. The efficiency of compressed air system is around

a) 80% b) 60% c) 90% d) 10%

36. For instrumentation air needs, which of the following compressors are used:

a) Roots blower b) Lubricated screw c) Lubricated reciprocating d) Non-lubricated compressor

37. Which of the following is not a rotary compressor?

a) Roots blower b) Screw c) Centrifugal d) Reciprocating

38. Which of the following compressors best meet high volume low pressure requirements?

a) Reciprocating b) Screw c) Centrifugal d) Lobe

39. FAD refers to the compressed air discharge

a) at ISO stated conditions b) Inlet conditions c) at outlet conditions d) at STP

4၀. Isothermal efficiency is the ratio of isothermal power to

a) Motor power drawn b) isentropic power c) Shaft power d) theoretical power

41. Which of the following parameters are not required for evaluating volumetric efficiency of the compressor?

a) Power b) Cylinder bore diameter c) stroke length d) FAD

42. The smoothening of the pulsating output of a reciprocating compressor is helped by

a) Receiver b) intercooler c) after cooler d) drain traps

43. Which of the following does not improve compressor performance ?

a) cool air intake b) clean air intake c) humid air intake d) lower elevation

44. The leak test results show load time of 5 seconds and unload time of 10 seconds. If the compressor capacity is 100 cfm, then the leakage would be

a) 33 cfm b) 50 cfm c) 200 cfm d) 66 cfm

45. In a compressor capacity trial in a plant, following were the observations:

Receiver capacity : 10 m3

Initial pressure : 0.2 kg / cm2g

Final pressure : 6.0 kg / cm2g
Additional hold-up volume : 1.2 m3
Atmospheric pressure : 1.026 kg / cm2A
Compressor pump-up time : 4.26 minutes
Motor power consumption (avg.): 98.6 kW
Calculate the operational capacity of compressor & specific power consumption (neglect temperature correction)?

46. List the factors that affect energy efficiency in air compressors.
47. What are the methods of capacity control in reciprocating air compressors?
48. Briefly explain shop floor method of air compressor capacity assessment.
49. What are the effects of moisture on compressed air?
5၀. Briefly explain the benefits of an air receiver.
51. A reciprocating V belt driven compressor was found to operating during normal factory operation with the following parameters:
Load pressure = 6 bar
Unload pressure = 8 bar
Load time = 3 minutes
Unload time = 1.5 minutes
Suggest possible energy saving opportunities on a short-term basis.

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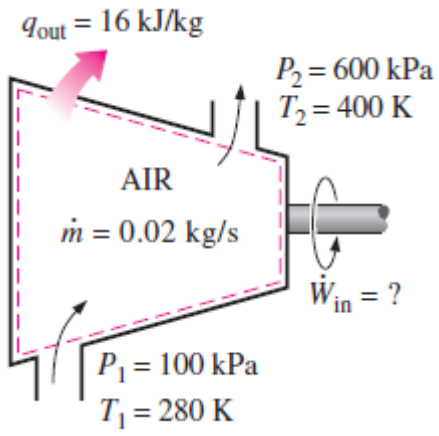
(1) A 75-hp compressor in a facility that operates at full load for 2500 h a year is powered by an electric motor that has an efficiency of 88 percent. If the unit cost of electricity is $0.06/kWh, the annual electricity cost of this compressor is
(a) $7382 (b) $9900 (c) $12,780 (d) $9533 (e) $8389

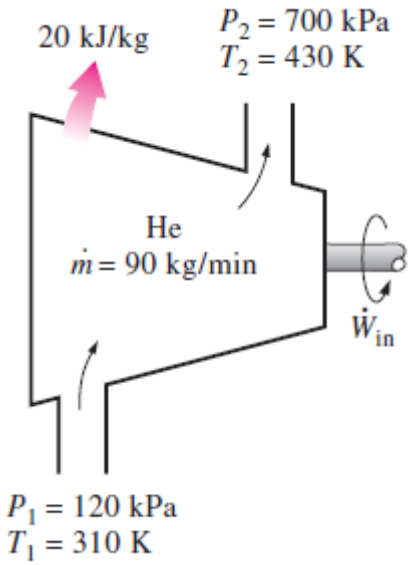
(2) Refrigerant-134a enters an adiabatic compressor as saturated vapor at 24°C and leaves at 0.8 MPa and 60°C. The mass flow rate of the refrigerant is 1.2 kg/s. Determine
(a) the power input to the compressor and (b) the volume flow rate of the refrigerant at the compressor inlet.



(2) Air at 100 kPa and 280 K is compressed steadily to 600 kPa and 400 K. The mass flow rate of the air is 0.02 kg/s, and a heat loss of 16 kJ/kg occurs during the process. Assuming the changes in kinetic and potential energies are negligible, determine the necessary power input to the compressor. (Page 263)

(3) Air enters the compressor of a gas-turbine plant at ambient conditions of 100 kPa and 25°C with a low velocity and exits at 1 MPa and 347°C with a velocity of 90 m/s. The compressor is cooled at a rate of 1500 kJ/min, and the power input to the compressor is 250 kW. Determine the mass flow rate of air through the compressor.

(4) Air is compressed from 14.7 psia and 60°F to a pressure of 150 psia while being cooled at a rate of 10 Btu/lbm by circulating water through the compressor casing. The volume flow rate of the air at the inlet conditions is 5000 ft3/min, and the power input to the compressor is 700 hp. Determine (a) the mass flow rate of the air and (b) the temperature at the compressor exit.
Answers: (a) 6.36 lbm/s, (b) 801 R



(5) Helium is to be compressed from 120 kPa and 310 K to 700 kPa and 430 K. A heat loss of 20 kJ/kg occurs during the compression process. Neglecting kinetic energy changes, determine the power input required for a mass flow rate of 90 kg/min.

(6) Carbon dioxide enters an adiabatic compressor at 100 kPa and 300 K at a rate of 0.5 kg/s and leaves at 600 kPa and 450 K. Neglecting kinetic energy changes, determine (a) the volume flow rate of the carbon dioxide at the compressor inlet and (b) the power input to the compressor.

Answers: (a) 0.28 m3/s, (b) 68.8 kW

(7) Refrigerant-134a is compressed by a compressor from the saturated vapor state at 0.14 MPa to 1.2 MPa and 70°C at a rate of 0.108 kg/s. The refrigerant is cooled at a rate of 1.10 kJ/s during compression. The power input to the compressor is

(a) 5.54 kW (b) 7.33 kW (c) 6.64 kW (d) 7.74 kW (e) 8.13 kW

(8)A 75 hp (shaft) compressor in a facility that operates at full load for 2500 hours a year is powered by an electric motor that has an efficiency of 88 percent. If the unit cost of electricity is $0.06/kWh, the annual electricity cost of this compressor is

(a) $7382 (b) $9900 (c) $12,780 (d) $9533 (e) $8389

Answer (d) $9533

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