

CHAPTER 12

1. Turbomachines are mechanical devices that either ____ energy from a fluid, in the case of a turbine, or ____ energy to a fluid, in the case of a pump.

YOUR ANSWER: Extract, add

2. In terms of operating as a machine, a sail boat ____ energy from the air.

A. Extracts

B. Adds

3. What three types of turbomachine classifications are there?

YOUR ANSWER: Axial flow, mixed-flow, radial flow.

4. Absolute velocity is the vector sum of _____ velocities and _____ velocities.

YOUR ANSWER: relative, blade.

5. In a turbine, what causes motion?

A. The blade moves the fluid.

B. The fluid moves the blade.

C. A motor moves the blade.

6. Since turbine power output is proportional to the ____, significant power can be extracted from ocean currents.

YOUR ANSWER: Fluid Density

7. If energy is transferred to the fluid, is the machine a pump, or a turbine?

YOUR ANSWER: Pump

8. How is shaft torque related to the mass flowrate?

A. They are inversely proportional

B. They are directly proportional

C. they are not related

9. Shaft power is related to the shaft _____ and _____ velocity.

YOUR ANSWER: torque, angular.

10. Which of these is a main component of the centrifugal pump?

A. Impeller

B. Shroud

C. Caisson

11. Pumps can have multiple stages. True or False

A. True

B. False

12. The overall pump efficiency is affected by the _____ in the pump and the _____ in the bearings and seals.

A) Losses, gains

B) Hydraulic losses, mechanical losses

C) Inefficiencies, efficiencies

YOUR ANSWER: B

13. What are the three sources of pump efficiency?

YOUR ANSWER: Hydraulic efficiency, mechanical efficiency, volumetric efficiency.

14. What is cavitation?

YOUR ANSWER: Cavitation occurs when the liquid pressure at a given location is reduced to the vapor pressure of the liquid, causing vapor bubbles to form in the liquid.

15. The intersection of the pump performance curve and the system curve is called what?

A. The operating point

B. The focal point

C. The efficiency point

16. When two pumps are placed in series, what do you do to determine the resulting pump performance curve?

A. Add heads at the same flowrate.

B. Add flowrates at the same head.

C. Simply add the performance values.

17. The power coefficient is commonly based upon what parameter of the pump?

A. The flowrate

B. The shaft (brake) horsepower

C. The rotational speed of the pump shaft

18. Specific speed can be determined independent of pump size. True or False

A. True

B. False

19. Do centrifugal pumps typically have low or high specific speeds?

YOUR ANSWER: Low

20. What is another term for an axial-flow pump?

YOUR ANSWER: A propeller pump

21. What are used to straighten the flow leaving the rotor of an axial flow pump?

A. Turbine blades

B. An inlet

C. Stator blades

22. If one changes from a centrifugal pump to an axial-flow pump, what happens to the head?

A. Nothing

B. It increases

C. It decreases

23. What is typically the largest change in density of gas flow through a fan?

A. 10%

B. 7%

C. 5%

24. Which best describes the pressure change in a fan?

A. The pressure change is high

B. The pressure change is low

C. There is no change in the pressure

25. Name the two types of hydraulic turbines.

YOUR ANSWER: Impulse and reaction

26. When is a Pelton wheel most efficient?

A. When there is a large head

B. When there is a small head

C. When there is a large flow rate

27. In a Pelton wheel, does the relative velocity of the flow change?

YOUR ANSWER: No

28. What is the typical value of the term β (in degrees) in a Pelton wheel?

A. 180

B. 165

C. 150

29. Reaction turbines are best suited for _____ flow rate applications.

YOUR ANSWER: high

30. What is another term for a typical radial hydraulic turbine?

A. A Francis turbine

B. A Kaplan turbine

C. A Munson turbine

31. Cavitation damage can not occur in turbine blades. True or False

A. True

B. False

32. What differentiates a compressor from a pump?

YOUR ANSWER: A compressor adds energy to the fluid, but results in a significant pressure rise and an increase in fluid density.

33. What is one common way of obtaining high pressure ratios in a compressor?

A. Using a compressor with a higher flow rate

B. Using a multistage compressor

C. Pre-accelerating the flow

34. What is one advantage axial-flow compressors have over centrifugal compressors?

- A. They are more efficient
- B. They provide a larger pressure rise per stage
- C. They require less space**

35. Can stator blades add energy to the flow? Why?

YOUR ANSWER: No, because they are stationary, and can therefore impart no energy upon the flow.

36. Name the three typical components of a gas turbine engine.

YOUR ANSWER: A compressor, a combustor, and a turbine.

37. What is the most common turbine type in electric generating plants?

- A. Axial flow**
- B. Centrifugal flow
- C. Radial flow

38. What is the pressure drop across a strict impulse turbine?

YOUR ANSWER: Zero