RAC Piping Systems – I

UNIT 3: PIPING COMPONENTS

Piping Components: Pipe-seamless, welded pipes, pipe sizes, dimensional specifications, material, specifications, pipe ends, pipe fittings, pipe support

1. What are the differences between seamless and welded pipes in terms of construction?
Seamless pipes are manufactured without any joints or seams, while welded pipes are made by welding joints together.

2. What are some common pipe sizes available in the market?
Common pipe sizes range from 1/8 inch to 72 inches in diameter, with various schedules such as schedule 40 and schedule 80.

3. What are some important dimensional specifications to consider when selecting piping components?
Key dimensional specifications include outer diameter, wall thickness, and length of the pipe.

4. What materials are commonly used for manufacturing pipes?
Common materials used for pipes include carbon steel, stainless steel, alloy steel, and PVC (polyvinyl chloride).

5. What are pipe specifications and how do they affect the selection of piping components?
Pipe specifications include details such as material grade, pressure rating, and temperature range, which are crucial factors in selecting the right pipe for a specific application.

6. What are the different types of pipe ends available in the market?
Common types of pipe ends include plain ends, threaded ends, and socket weld ends, each serving different purposes in piping systems.

7. What are pipe fittings and why are they important in piping systems?
Pipe fittings are components used to connect and redirect pipes in a piping system, ensuring proper flow and functionality.

8. How do pipe supports contribute to the integrity of a piping system?
Pipe supports provide stability and prevent sagging of pipes, ensuring proper alignment and support throughout the system.

9. What are some key considerations when selecting pipe fittings for a project?
Considerations include compatibility with the pipe material, pressure rating, temperature range, and the type of connection (welded, threaded, etc.).

10. How important is proper installation and maintenance of piping components in ensuring system efficiency and safety?
Proper installation and regular maintenance of piping components are crucial in preventing leaks, ensuring system efficiency, and maintaining a safe working environment.

MCQS:

1. What is the primary difference between seamless and welded pipes?
a) Seamless pipes have a smoother surface finish
b) Welded pipes are less expensive
c) Seamless pipes are stronger in pressure-bearing applications
Answer: c) Seamless pipes are stronger in pressure-bearing applications

2. What is a common nominal size for pipes used in industrial applications?
a) 1 inch
b) 10 inches
c) 100 inches
Answer: a) 1 inch

3. What are some common dimensional specifications for pipes?
a) Diameter, wall thickness, length
b) Weight, color, material
c) Volume, pressure rating, temperature range
Answer: a) Diameter, wall thickness, length

4. Which material is commonly used for high-temperature and corrosion-resistant piping applications?
a) Aluminum
b) PVC
c) Stainless steel
Answer: c) Stainless steel

5. What are the two main types of pipe ends commonly used in piping systems?
a) Threaded and socket weld ends
b) Flanged and compression ends
c) Grooved and butt weld ends
Answer: a) Threaded and socket weld ends

6. Which type of pipe fitting is used to change the direction of flow in a piping system?
a) Elbow
b) Nipple
c) Valve
Answer: a) Elbow

7. What is the purpose of pipe support in a piping system?
a) To increase flow rate
b) To reduce pressure
c) To hold the weight of the pipe and contents
Answer: c) To hold the weight of the pipe and contents

8. What do material specifications for pipes typically include?
a) Color
b) Pressure rating
c) Chemical composition and mechanical properties
Answer: c) Chemical composition and mechanical properties

9. Which type of pipe is more vulnerable to leaks and failures due to the welding process?
a) Seamless pipe
b) Welded pipe
Answer: b) Welded pipe

10. What type of pipe is commonly used for underground water and gas distribution systems?
a) PVC
b) Copper
c) HDPE (High-Density Polyethylene)
Answer: c) HDPE (High-Density Polyethylene)

UNIT 4: VALVES

Valves–gate valve, globe valve, check valve, ball valve, plug valve, butterfly valve, control valve, pressure relief valve, valve, codes and standard, valve size, pressure class rating.

1. What is a gate valve?
Answer: A gate valve is a type of valve that uses a gate or wedge-like disc to control the flow of fluid. It is commonly used in applications where straight-line flow and minimal restriction are needed.

2. What is a globe valve?
Answer: A globe valve is a type of valve that regulates flow in a pipeline by raising or lowering a plug against the flow path. It is often used for throttling and controlling flow.

3. What is a check valve?
Answer: A check valve is a valve that allows fluid to flow in one direction but prevents it from flowing in the opposite direction. It is commonly used to prevent backflow in pipelines.

4. What is a ball valve?
Answer: A ball valve is a valve that uses a ball with a hole through it to control the flow of fluid. It is popular for its quick operation and tight shut-off capabilities.

5. What is a plug valve?
Answer: A plug valve is a valve that uses a tapered or cylindrical plug to control the flow of fluid. It is often used in applications where frequent operation is needed.

6. What is a butterfly valve?
Answer: A butterfly valve is a valve that uses a rotating disc to control the flow of fluid. It is typically used in large pipelines where quick operation and low pressure drop are important.

7. What is a control valve?
Answer: A control valve is a valve that is used to regulate the flow of fluid in a system, typically by varying the size of the flow passage. It is commonly used in process control applications.

8. What is a pressure relief valve?
Answer: A pressure relief valve is a valve that is designed to open when a system's pressure exceeds a certain set point, releasing excess pressure to prevent damage or failure.

9. What are valve codes and standards?
Answer: Valve codes and standards refer to the regulations and guidelines that dictate the design, manufacturing, and testing of valves to ensure they meet industry requirements for safety and performance.

10. What factors determine the valve size and pressure class rating?
Answer: The valve size and pressure class rating are determined by factors such as the flow rate, pressure, temperature, and material compatibility of the system in which the valve will be installed. These factors help ensure that the valve can handle the specific conditions it will be subjected to.

MCQS:
1. Which type of valve is commonly used to control the flow of fluids in piping systems?
A) Gate valve
B) Globe valve
C) Check valve
D) Ball valve
Answer: B) Globe valve

2. Which type of valve is best suited for applications requiring quick on/off control?
A) Plug valve
B) Butterfly valve
C) Control valve
D) Ball valve
Answer: D) Ball valve

3. Which type of valve prevents backflow in piping systems?
A) Gate valve
B) Globe valve
C) Check valve
D) Pressure relief valve
Answer: C) Check valve

4. Which valve is commonly used in high-pressure applications due to its compact design and reliability?
A) Control valve
B) Pressure relief valve
C) Butterfly valve
D) Plug valve
Answer: D) Plug valve

5. ANSI and API are examples of:
A) Valve materials
B) Valve types
C) Valve codes and standards
D) Valve sizes
Answer: C) Valve codes and standards

6. What does the pressure class rating of a valve indicate?
A) Maximum temperature it can handle

B) Maximum flow rate it can handle
C) Maximum pressure it can withstand
D) Maximum level of corrosion resistance
Answer: C) Maximum pressure it can withstand

7. Which valve type is known for its easy maintenance and repair?
A) Butterfly valve
B) Globe valve
C) Plug valve
D) Ball valve
Answer: C) Plug valve

8. Which type of valve is commonly used in HVAC systems for temperature regulation?
A) Gate valve
B) Control valve
C) Check valve
D) Ball valve
Answer: B) Control valve

9. What is the function of a pressure relief valve?
A) To regulate flow rate
B) To prevent backflow
C) To control system pressure
D) To release excess pressure
Answer: D) To release excess pressure

10. Which factor is NOT typically considered when selecting a valve size?
A) Flow rate requirements
B) Piping system pressure
C) Fluid viscosity
D) Valve material composition
Answer: D) Valve material composition

UNIT 5: FLOW THROUGH PIPES

Viscosity, Reynolds number, friction factor, Darcy Weisback friction factor, friction factor for laminar and turbulent flows, equivalent pipe length, hydraulic radius, compressible, flow

1. Q: What is viscosity?
Answer: Viscosity is a measure of a fluid's resistance to flow. It is the internal friction of a moving fluid.

2. Q: What is Reynolds number?
Answer:: The Reynolds number is a dimensionless quantity that helps predict flow patterns in different fluid flow situations. It is calculated as the ratio of inertial forces to viscous forces.

3. Q: What is friction factor in fluid mechanics?

Answer:: The friction factor is a dimensionless quantity used in the Darcy-Weisbach equation to calculate pressure loss in a pipeline due to fluid flow.

4. Q: What is the Darcy-Weisbach friction factor?
Answer:: The Darcy-Weisbach friction factor is a dimensionless parameter that relates the frictional head loss in a pipe to the velocity of the fluid and the pipe diameter.

5. Q: What is the friction factor for laminar flow?
Answer:: For laminar flow, the friction factor is 64/Reynolds number.

6. Q: What is the friction factor for turbulent flow?
Answer:: The friction factor for turbulent flow is determined using empirical correlations or charts based on Reynolds number and roughness of the pipe.

7. Q: What is equivalent pipe length?
Answer:: Equivalent pipe length is the length of straight pipe that would offer the same resistance to flow as a complex piping arrangement.

8. Q: What is hydraulic radius?
Answer:: The hydraulic radius is the cross-sectional area of flow divided by the wetted perimeter. It is used to calculate the flow velocity and pressure drop in open channel flow.

9. Q: What is compressible flow?
Answer:: Compressible flow is the flow of a fluid in which changes in density cannot be neglected. This occurs at high velocities or in the presence of significant pressure gradients.

10. Q: What is meant by flow in the context of fluid mechanics?
Answer:: Flow refers to the movement of a fluid, either liquid or gas, in a specific direction. It can be characterized by factors such as velocity, pressure, and volume flow rate.

MCQS:
1. What property of a fluid determines its resistance to flow and is measured in units of poise?
A) Viscosity
B) Density
C) Surface tension
D) Pressure
Answer: A) Viscosity

2. Which dimensionless number characterizes the flow regime in a pipe and is calculated using the formula $\rho VD/\mu$, where ρ is the fluid density, V is the flow velocity, D is the pipe diameter, and μ is the dynamic viscosity?
A) Froude number
B) Peclet number
C) Reynolds number
D) Grashof number

Answer: C) Reynolds number

3. What is the dimensionless quantity used to calculate the frictional resistance in a pipe and is denoted by the symbol f?
A) Reynolds number
B) Darcy Weisbach friction factor
C) Equivalent pipe length
D) Hydraulic radius
Answer: B) Darcy Weisbach friction factor

4. In which type of flow is the friction factor constant and given by the formula 64/Re, where Re is the Reynolds number?
A) Laminar flow
B) Transient flow
C) Turbulent flow
D) Compressible flow
Answer: A) Laminar flow

5. Which formula is commonly used to express the Darcy Weisbach friction factor in turbulent flow?
A) 64/Re
B) 0.316/Re^0.25
C) 0.079/Re^0.25
D) 4.8/Re
Answer: C) 0.079/Re^0.25

6. What term refers to the length of straight pipe that would provide the same resistance to flow as an actual pipe fitting, valve, or other obstruction?
A) Friction factor
B) Equivalent pipe length
C) Reynolds number
D) Hydraulic radius
Answer: B) Equivalent pipe length

7. The hydraulic radius of a pipe is calculated as the cross-sectional area of flow divided by which characteristic length?
A) Pipe diameter
B) Equivalent pipe length
C) Pipe length
D) Friction factor
Answer: A) Pipe diameter

8. In which type of flow is the flow velocity of a fluid not constant throughout the pipe length, leading to changes in density and pressure?
A) Incompressible flow
B) Irrotational flow

C) Compressible flow
D) Steady flow
Answer: C) Compressible flow

9. Which property of a fluid is crucial to consider in compressible flow analysis due to its effects on fluid density and temperature changes?
A) Viscosity
B) Surface tension
C) Pressure
D) Density
Answer: C) Pressure

10. When analyzing flow in a compressible fluid system, which key parameter must be accounted for due to its impact on flow behavior and energy losses?
A) Friction factor
B) Hydraulic radius
C) Reynolds number
D) Mach number
Answer: D) Mach number