
Q621 - Steam Plants

1. Waterboxes on condensers are vented to _____.

- provide a minimum condensate level in the hotwell
- prevent vapor binding of the circulating pump
- prevent excessive pressure on tube sheets
- **liberate air pockets and reduce waterside oxidation**

Note:
Waterboxes are vented to release trapped air and reduce waterside oxidation.

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2. Under normal conditions, the rate of heat transfer in a feedwater heater is most greatly affected by the _____.

- pH of the feedwater
- **temperature differential between the steam and feedwater**
- density of the feedwater
- speed of the main feed pump

Note:
Heat transfer rate in a feedwater heater is primarily determined by the temperature differential between the steam and feedwater, as this difference directly drives the heat transfer process according to the fundamental equation $Q = U \cdot A \cdot \Delta T$, where U and A are relatively constant under normal operating conditions.

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3. The main feed check valve functions to _____.

- reduce feed pump discharge pressure loading
- **prevent backflow of water from the boiler in the event of a feed pump failure**
- check pressure pulsations in the feed line
- provide feed pump positive discharge head

Note:
The main feed check valve prevents backflow of water from the boiler into the feed line during feed pump failure.

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4. Which of the following is the advantage of operating a typical closed feedwater system for a marine boiler when compared to an open feedwater system?

- Reduced steam requirement for feedwater heating.
- Reduced requirement for condensate purity.
- Allows for lower feed pump operating pressures.
- **Increased capability of removing and controlling dissolved oxygen.**

Note:
A closed feedwater system minimizes air contact and facilitates efficient deaeration, primarily improving dissolved oxygen removal and control, which is its key advantage over an open system.

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5. In the boiler steam and water system, pressure is highest in the _____.

- mud drum
- **feed line**
- dry pipe
- steam stop

Note:
The feed line experiences the highest pressure because the feed pump must generate pressure exceeding boiler steam pressure to deliver water into the boiler.

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6. As steam accomplishes work in an engine or turbine, the pressure of the steam is reduced because it _____.

- **expands in volume**
- becomes saturated again
- becomes superheated again
- diminishes in volume

Note:
Steam pressure decreases as it performs work due to expansion in volume, which requires an increase in volume to move a piston or turbine blades.

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7. Why is superheated steam used in the main propulsion turbines instead of saturated steam?

- Less specific energy available per pound of steam.
- **Greater heat energy available per pound of steam.**
- Lower required specific volume than saturated steam.
- Higher pressure available than saturated steam.

Note:
Superheated steam is used instead of saturated steam because it possesses greater heat energy per pound, allowing for more work to be extracted in the turbine before condensation.

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8. Which type of energy conversion is associated with an operating steam boiler?

- Specific
- **Thermal**
- Mechanical
- Kinetic

Note:
A steam boiler converts the chemical energy of fuel into heat energy; therefore, the energy conversion is thermal.

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9. The best conductor of heat in a marine boiler is _____.

- water
- brick
- steam
- **steel**

Note:
Steel is the best heat conductor of the options and is used in marine boiler heating surfaces to efficiently transfer heat.

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10. The correct method of expanding a generating tube at the boiler drum tube sheet is to roll _____.

- slightly at the tube end prior to welding the tube to the drum tube sheet
- heavily at the tube end prior to welding the tube to the drum tube sheet
- to a depth less than the thickness of the drum tube sheet
- **to a depth greater than the thickness of the drum tube sheet**

Note:
Tube expansion requires rolling to a depth exceeding the drum tube sheet thickness to ensure a secure, leak-tight joint and prevent stress concentration.
