

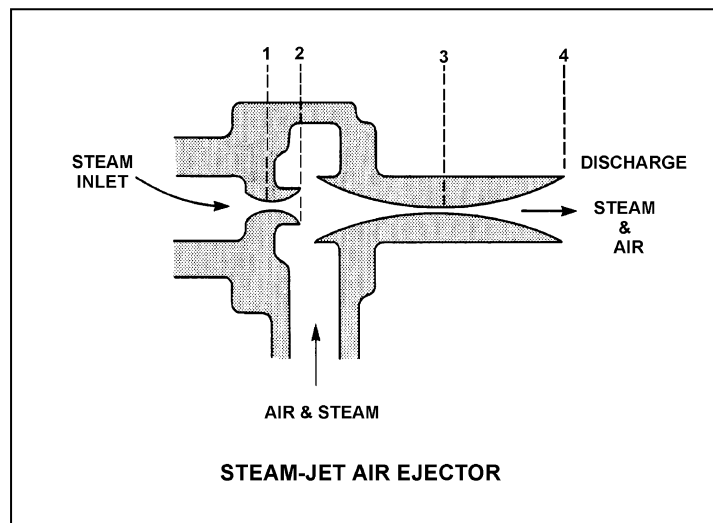
TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B476

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation.

The section of the air ejector that converts steam pressure into kinetic energy is called the...

- A. diffuser.
- B. nozzle.
- C. intercondenser.
- D. riser.

ANSWER: B.



TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B1276

The inlet nozzle of a steam jet air ejector converts the _____ of the inlet steam into _____.

- A. kinetic energy; pressure
- B. enthalpy; kinetic energy
- C. kinetic energy; velocity
- D. enthalpy; pressure

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B1476

Steam entering an air ejector reaches sonic velocity in the throat of a convergent-divergent nozzle. Upon entering the divergent section of the nozzle, steam velocity will _____ and steam pressure will _____.

- A. increase; increase
- B. increase; decrease
- C. decrease; increase
- D. decrease; decrease

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.05 [2.7/2.7]
QID: B276

During jet pump operation, high pressure and low velocity fluid flow is supplied to a _____ where the velocity increases and the pressure drops to create a low pressure area in the _____.

- A. nozzle; throat
- B. nozzle; diffuser
- C. diffuser; throat
- D. diffuser; nozzle

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.05 [2.7/2.7]
QID: B1076

The lowest pressure in a liquid jet pump exists in the...

- A. throat.
- B. diffuser.
- C. rams head.
- D. impeller eye.

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B77

Condensate depression (subcooling) will increase if the _____ increases.

- A. main turbine load
- B. condenser cooling water temperature
- C. condenser cooling water flow rate
- D. air leakage rate into the condenser

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B78 (P2276)

The steam cycle thermal efficiency of a nuclear power plant can be increased by...

- A. decreasing power from 100 percent to 25 percent.
- B. removing a high-pressure feedwater heater from service.
- C. lowering condenser vacuum from 29 inches to 25 inches.
- D. decreasing the amount of condensate depression (subcooling).

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B200

A nuclear power plant is operating at 90 percent of rated power. Which one of the following effects will result from an improved main condenser vacuum (lower absolute pressure)? (Assume reactor power and main steam mass flow rate are unchanged.)

- A. An increase in condensate temperature.
- B. An increase in the heat transfer rate in the main condenser.
- C. An increase in main turbine efficiency.
- D. An increase in condensate subcooling.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B277 (P477)

Main condenser pressure is 1.0 psia. During the cooling process in the condenser, the temperature of the low pressure turbine exhaust decreases to 100°F, at which time it is a...

- A. saturated liquid.
- B. saturated vapor.
- C. subcooled liquid.
- D. superheated vapor.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B1484 (P3576)

A main condenser is operating at 28 inches Hg vacuum with a condensate outlet temperature of 92°F. Which one of the following is the approximate amount of condensate depression?

- A. 5°F
- B. 9°F
- C. 13°F
- D. 17°F

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B1876 (P876)

Which one of the following is the approximate condensate subcooling in a steam condenser operating at 26 inches Hg vacuum with a condensate temperature of 100°F?

- A. 2°F
- B. 19°F
- C. 25°F
- D. 53°F

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2077 (P2476)

A nuclear power plant is operating at 90 percent of rated power. Main condenser pressure is 1.69 psia and hotwell condensate temperature is 120°F.

Which one of the following describes the effect of a 5 percent decrease in cooling water flow rate through the main condenser on steam cycle thermal efficiency?

- A. Efficiency will increase, because condensate depression will decrease.
- B. Efficiency will increase, because the work output of the main turbine will increase.
- C. Efficiency will decrease, because condensate depression will increase.
- D. Efficiency will decrease, because the work output of the main turbine will decrease.

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2176 (P1176)

A nuclear power plant is operating at 80 percent power with 5°F of condensate depression in the main condenser. If the condensate depression increases to 10°F, the steam cycle thermal efficiency will _____; and the condensate pumps will operate _____ cavitation.

- A. increase; closer to
- B. increase; farther from
- C. decrease; closer to
- D. decrease; farther from

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2277 (P74)

Condensate depression is the process of...

- A. removing condensate from turbine exhaust steam.
- B. spraying condensate into turbine exhaust steam.
- C. heating turbine exhaust steam above its saturation temperature.
- D. cooling turbine exhaust steam below its saturation temperature.

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2576 (P2576)

A nuclear power plant is operating at 80 percent power with 5°F of condensate depression in the main condenser. If the condensate depression decreases to 2°F, the steam cycle thermal efficiency will _____; and the condensate pumps will operate _____ cavitation.

- A. increase; closer to
- B. increase; farther from
- C. decrease; closer to
- D. decrease; farther from

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2676 (P576)

Which one of the following explains why condensate subcooling is necessary in a nuclear power plant steam cycle?

- A. To provide a better condenser vacuum.
- B. To maximize overall steam cycle thermal efficiency.
- C. To provide net positive suction head for the condensate pumps.
- D. To minimize turbine blade and condenser tube erosion by entrained moisture.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2775 (P1977)

Condensate is collecting in a main condenser hotwell at 90°F with a condenser pressure of 28 inches Hg vacuum. Which one of the following will improve the steam cycle thermal efficiency?

- A. Main condenser cooling water flow rate decreases by 5 percent with no change in condenser vacuum.
- B. Main condenser cooling water inlet temperature decreases by 10°F with no change in condenser vacuum.
- C. Main condenser vacuum decreases to 27 inches Hg due to buildup of noncondensable gases.
- D. Steam flow through the turbine decreases by 10 percent with no change in condenser vacuum.

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2976 (P1576)

What is the approximate condensate depression in a condenser operating at 28 inches Hg vacuum with a condensate temperature of 100°F?

- A. Less than 2°F
- B. 3°F to 5°F
- C. 6°F to 8°F
- D. 9°F to 11°F

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B3877 (P3876)

Main turbine exhaust enters a main condenser and condenses at 126°F. The condensate is cooled to 100°F before entering the main condenser hotwell. Assuming main condenser vacuum does not change, which one of the following would improve the thermal efficiency of the steam cycle?

- A. Increase condenser cooling water flow rate by 5 percent.
- B. Decrease condenser cooling water flow rate by 5 percent.
- C. Increase main condenser hotwell level by 5 percent.
- D. Decrease main condenser hotwell level by 5 percent.

ANSWER: B.

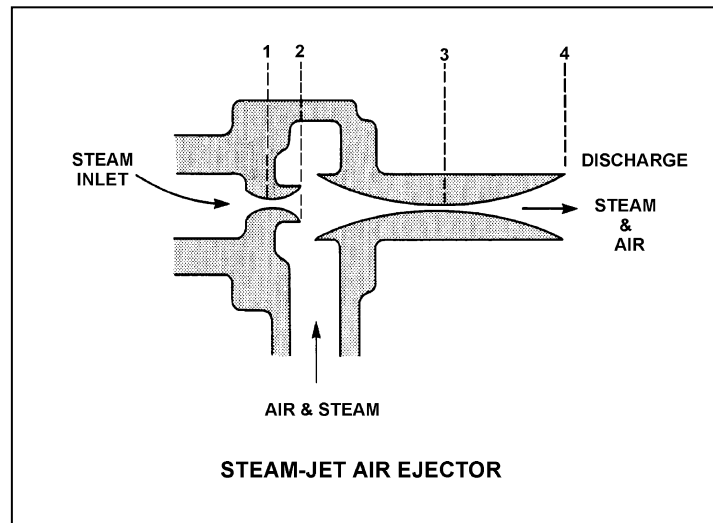
TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B76

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with supersonic steam velocities.

At which one of the following locations is the lowest pressure experienced?

- A. 1
- B. 2
- C. 3
- D. 4

ANSWER: B.



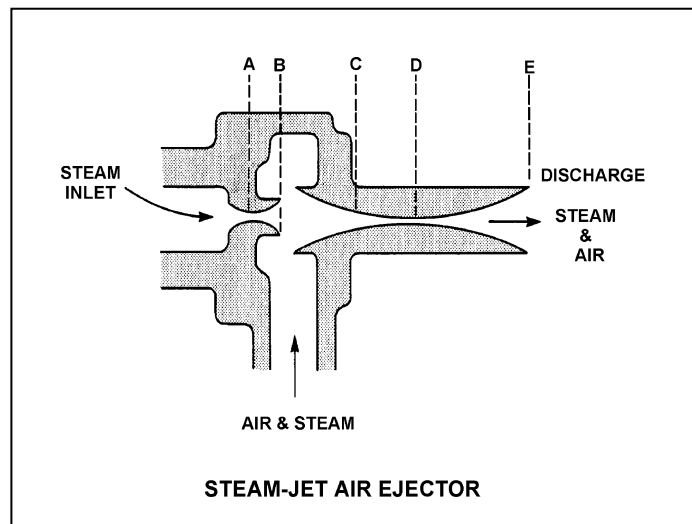
TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B376

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with steam reaching supersonic velocities.

Steam flowing from D to E undergoes a pressure _____ and a velocity _____.

- A. decrease; decrease
- B. decrease; increase
- C. increase; increase
- D. increase; decrease

ANSWER: D.



TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B377

A nuclear power plant is operating at 100 percent power when the only in-service steam jet air ejector is inadvertently isolated from the main condenser. The operator verifies that condenser cooling water system parameters have not changed. If no operator action is taken over the next 60 minutes, condenser pressure will...

- A. slowly decrease.
- B. slowly increase and stabilize at a slightly higher pressure.
- C. slowly and continuously increase towards atmospheric pressure.
- D. remain the same.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B877

The vacuum in a main condenser is maintained by the condensation of turbine exhaust steam, because the _____ of the turbine exhaust steam _____ as it condenses.

- A. enthalpy; increases
- B. enthalpy; decreases
- C. specific volume; increases
- D. specific volume; decreases

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B977

A nuclear power plant is operating at 90 percent power. Which one of the following describes the effect of increasing cooling water flow rate through the main condenser?

- A. The saturation temperature in the main condenser decreases.
- B. The enthalpy of the condensate leaving the main condenser increases.
- C. The temperature of the cooling water leaving the main condenser increases.
- D. The total rate of heat transfer from the turbine exhaust steam to the cooling water decreases.

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B1177

A nuclear power plant is operating at 100 percent power. Which one of the following describes how and why main condenser pressure changes when condenser cooling water flow rate significantly decreases?

- A. Decreases, because main condenser saturation temperature increases.
- B. Decreases, because main condenser condensate subcooling decreases.
- C. Increases, because main condenser saturation temperature increases.
- D. Increases, because main condenser condensate subcooling decreases.

ANSWER: C.

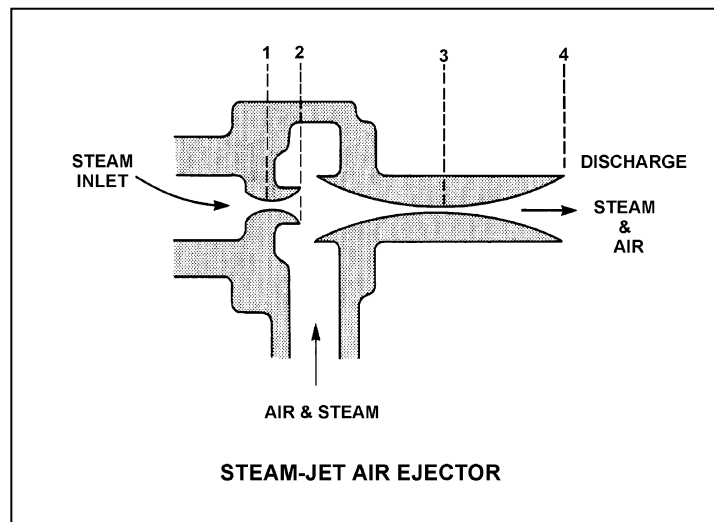
TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B1775

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with supersonic steam velocities.

Steam flowing from 1 to 2 undergoes a pressure _____ and a velocity _____.

- A. increase; decrease
- B. increase; increase
- C. decrease; decrease
- D. decrease; increase

ANSWER: D.



TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B2377

A nuclear power plant is operating at 100 percent power. Which one of the following describes how and why main condenser pressure will change if condenser cooling water flow rate increases significantly?

- A. Decreases, because main condenser saturation temperature decreases.
- B. Decreases, because main condenser condensate subcooling increases.
- C. Increases, because main condenser saturation temperature decreases.
- D. Increases, because main condenser condensate subcooling increases.

ANSWER: A.

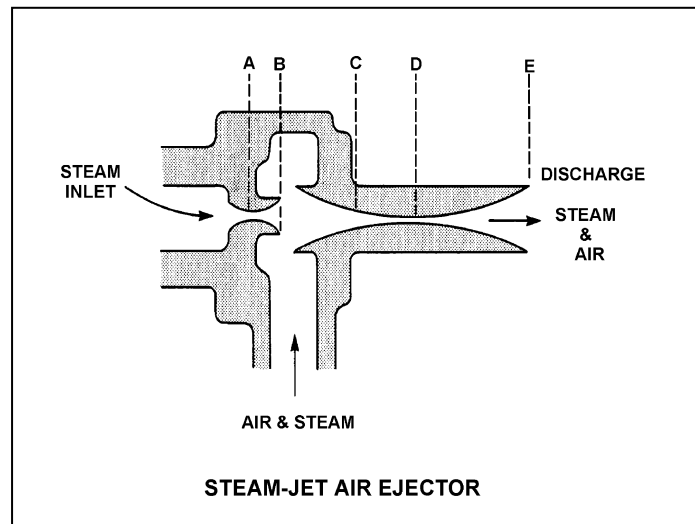
TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B3476

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with the steam attaining supersonic velocity.

Steam flowing from C to D undergoes a pressure _____ and a velocity _____.

- A. decrease; decrease
- B. decrease; increase
- C. increase; increase
- D. increase; decrease

ANSWER: D.



TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B7609 (P7609)

Steam enters a main turbine at 1,000 psia and exhausts to a main condenser at 1.0 psia. If 20,000 ft³ of dry saturated steam enters the main turbine, which one of the following will be the approximate volume of the condensate formed in the main condenser? (Assume the mass of the steam equals the mass of the condensate.)

- A. 1 ft³
- B. 10 ft³
- C. 100 ft³
- D. 1,000 ft³

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B1677

Which one of the following is a primary function performed by a main condenser?

- A. Deaerate the turbine exhaust condensate
- B. Remove ions from the main condensate
- C. Filter out impurities from the main condensate
- D. Provide net positive suction head for the feedwater pumps

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B1777

A nuclear power plant is operating normally at 80 percent power. Which one of the following will result in the most rapid initial loss of condenser vacuum?

- A. All air ejectors are isolated from the main condenser.
- B. All feed and condensate pumps are stopped.
- C. All condenser cooling water flow is stopped.
- D. All condenser hotwell makeup water flow is stopped.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B3077 (P3078)

Which one of the following will be caused by a decrease in main condenser vacuum (higher absolute pressure) in a nuclear power plant operating at 100 percent power? (Assume that main steam and main condenser circulating water mass flow rates do not change.)

- A. Decrease in the condensate temperature.
- B. Decrease in the ideal steam cycle thermal efficiency.
- C. Decrease in the condensate pump required net positive suction head.
- D. Decrease in the mass of noncondensable gases in the condenser.

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B3777 (P3734)

A nuclear power plant is operating near rated power with the following initial conditions:

Main steam pressure = 900 psia
Main steam quality = 100 percent, saturated vapor
Main condenser pressure = 1.0 psia

Air leakage into the main condenser results in the main condenser pressure increasing and stabilizing at 2.0 psia. Assume that all main steam parameters (e.g., pressure, quality, and mass flow rate) remain the same and that the main turbine efficiency remains at 100 percent.

Which one of the following is the percent by which the main generator MW output will decrease as a result of the main condenser pressure increase?

- A. 5.0 percent
- B. 6.3 percent
- C. 7.5 percent
- D. 8.8 percent

ANSWER: C.