科目: 191004
知能類：K1.01 [3.3/3.5]
序號： P21

Which one of the following contains indications of cavitation for an operating centrifugal pump?

A. Low flow rate with low discharge pressure

B. Low flow rate with high discharge pressure

C. High motor amps with low discharge pressure

D. High motor amps with high discharge pressure

ANSWER: A.

下列何者描述了運轉中離心泵孔蝕的徵兆？

A. 低流量搭配低出口壓力。

B. 低流量搭配高出口壓力。

C. 高馬達電流(motor amps)搭配低出口壓力。

D. 高馬達電流搭配高出口壓力。

答案：A.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P221 (B218)

Which of the following changes in pump operating parameters will directly lead to pump cavitation in a centrifugal pump that is operating at rated conditions in an open system?

A. Steadily increasing pump inlet temperature

B. Steadily decreasing pump speed

C. Steadily increasing pump suction pressure

D. Steadily decreasing pump recirculation flow

ANSWER: A.

在泵運轉參數中，改變下列何者，會在一個開放系統運轉的離心泵中，直接引起泵孔蝕現象？

A. 不斷增加泵入口溫度。

B. 不斷降低泵轉速。

C. 不斷增加泵進口壓力。

D. 不斷降低泵的再循環流量。

答案：A.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P421

Pump cavitation occurs when vapor bubbles are formed at the eye of a pump impeller...

A. when the localized flow velocity exceeds sonic velocity for the existing fluid temperature.

B. when the localized pressure exceeds the vapor pressure for the existing fluid temperature.

C. and enter a high pressure region of the pump where they collapse, causing damaging pressure pulsations.

D. and are discharged from the pump where they collapse in downstream piping, causing damaging pressure pulsations.

ANSWER: C.

當泵的葉輪吸入口形成氣泡，且發生下列何種情況時，將使泵產生孔蝕.....

A. 局部流速超過既有流體溫度下的音速。

B. 局部壓力超過既有流體溫度下的蒸汽壓力。

C. 氣泡進入泵高壓區，並於此處破裂，造成有害壓力脈動(pressure pulsation)。

D. 氣泡從泵排出，並於進入下游管路時破裂，形成有害壓力脈動。

答案：C.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P524

Which one of the following is a symptom associated with cavitation of a centrifugal pump?

A. Decreased motor current and pump speed

B. Decreased pump and motor temperature

C. Steadily increasing discharge pressure

D. Increased noise and vibration

ANSWER: D.

下列何者為離心泵孔蝕的相關現象？

A. 馬達電流與泵速降低。

B. 泵與馬達溫度下降。

C. 出口壓力持續攀升。

D. 噪音與震動增加。

答案：D.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P1021

Which one of the following will result in immediate cavitation of a centrifugal pump that is initially operating at normal rated flow?

A. Recirculation flow path is aligned.

B. Recirculation flow path is isolated.

C. Pump suction valve is fully closed.

D. Pump discharge valve is fully closed.

ANSWER: C.

下列何者將導致原運轉於正常額定流量的離心泵，立即產生孔蝕現象？

A. 調整列置(align)再循環流徑。

B. 隔離再循環流徑。

C. 泵進口閥全關。

D. 泵出口閥全關。

答案：C.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P1220 (B1218)

Which one of the following describes pump cavitation?

A. Vapor bubbles are formed when the enthalpy difference between pump discharge and pump suction exceeds the latent heat of vaporization.

B. Vapor bubbles are formed in the eye of the pump impeller and collapse as they enter higher pressure regions of the pump.

C. Vapor bubbles are produced when the localized pressure exceeds the vapor pressure at the existing temperature.

D. Vapor bubbles are discharged from the pump where they collapse on downstream piping and cause localized water hammers.

ANSWER: B.

下列何者描述泵孔蝕現象？

A. 當泵出口和泵進口之間的熱焓差，超過蒸發的潛熱時，產生蒸汽氣泡。

B. 氣泡在泵葉輪吸入口產生，並在進入泵較高壓力區時破掉。

C. 當局部壓力超過現有溫度下蒸汽壓力時，產生蒸汽氣泡。

D. 蒸汽氣泡由泵出口排出，並在下游管路破裂，引起局部水錘。

答案：B.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P1321

Which one of the following is an indication of pump cavitation?

A. Pump motor amps are pegged high.

B. Pump discharge pressure indicates zero.

C. Pump motor amps are fluctuating.

D. Pump discharge pressure indicates shut-off head.

ANSWER: C.

下列何者顯示泵發生孔蝕現象？

A. 泵馬達電流維持在高值。

B. 泵出口壓力指示為零。

C. 泵馬達電流來回晃動。

D. 泵出口壓力指示為關斷水頭(shut-off head)之壓力。

答案：C.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P1520 (B1018)

If a centrifugal pump is started with the discharge valve fully open, versus throttled, the possibility of pump runout will _____ and the possibility of pump cavitation will _____.

A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase

ANSWER: B.

如果在出口閥完全打開的狀況下，啟動離心泵，發生泵過流(runout)的機率會_____，發生泵孔蝕現象的機率會_____。

A. 增加；降低

B. 增加；增加

C. 降低；降低

D. 降低；增加

答案：B.

科目： 191004
知能類：K1.01 [3.3/3.5]
序號： P1820 (B1718)

By starting a centrifugal pump with the discharge valve throttled versus fully open, the possibility of pump runout is _____ , and the possibility of pump cavitation is _____ .

A. increased; decreased

B. increased; increased

C. decreased; decreased

D. decreased; increased

ANSWER: C.

如果在出口閥節流(相對於完全打開)的狀況下，啟動離心泵，發生泵過流(runout)的機率會_____，發生泵孔蝕現象的機率會_____。

A. 增加；降低

B. 增加；增加

C. 降低；降低

D. 降低；增加

答案：C.

科目： 191004
知能類：K1.02 [3.1/3.4]
序號： P106

A centrifugal pump is started and the following indications are observed:

Oscillating flow
Oscillating discharge pressure
Oscillating amps

These indications are symptoms that the pump is experiencing...

A. excessive thrust.

B. cavitation.

C. runout.

D. wear ring failure.

ANSWER: B.

啟動一離心泵時，發現到下列狀況：

流量來回振盪
出口壓力來回振盪
電流(amps)來回振盪

這些跡象表示泵正經歷到……

A. 超額推力。

B. 孔蝕作用。

C. 過流(runout)。

D. 磨耗環故障。

答案：B.

科目： 191004
知能類：K1.02 [3.1/3.4]
序號： P122

Air binding in a centrifugal pump is an undesirable condition which may be avoided by...

A. opening the pump constant vent valve when the pump is secured.

B. closing the pump constant vent valve when the pump is in operation.

C. opening the pump casing vent valve, while priming the pump, until a steady stream of water appears.

D. opening the pump suction vent valve just prior to starting the pump and then closing it after the pump is running.

ANSWER: C.

為了防止離心泵發生氣鎖(air binding)，可採用下列何者來防範……

A. 離心泵停止時，開啟外殼逸氣閥(vent valve)。

B. 離心泵運轉時，關閉其外殼逸氣閥。

C. 當離心泵充水(priming)時，開啟其外殼的逸氣閥，直到出現穩定水流為止。

D. 啟動離心泵之前，開啟其進口逸氣閥，並於泵開始運轉後關閉。

答案：C.

科目： 191004
知能類：K1.02 [3.1/3.4]
序號： P222

The presence of air in a pump casing may result in _____when the pump is started.

A. vortexing

B. pump runout

C. pump overspeed

D. gas binding

ANSWER: D.

泵的殼內若有空氣，可能在啟動時造成_____。

A. 渦流。

B. 泵過流(runout)。

C. 泵超速。

D. 氣鎖(gas binding)。

答案：D.

科目： 191004
知能類：K1.02 [3.1/3.4]
序號： P920

Which one of the following contains indications of a gas/vapor bound motor-operated centrifugal pump that is operating in a cooling water system?

A. Fluctuating pump discharge pressure, reduced system flow rate, and increased pump motor current

B. Reduced system flow rate, increased pump motor current, and increased pump noise level

C. Increased pump motor current, increased pump noise level, and fluctuating pump discharge pressure

D. Increased pump noise level, fluctuating pump discharge pressure, and reduced system flow rate

ANSWER: D.

下列何者描述了在冷卻水系統運轉的馬達帶動離心泵出現空氣/蒸汽氣鎖的情形？

A. 泵出口壓力來回晃動，系統流量降低，泵馬達電流增加。

B. 系統流量降低，泵馬達電流增加，噪音(noise level)提高。

C. 泵馬達電流增加，噪音提高，泵出口壓力來回晃動。

D. 泵噪音提高，出口壓力來回晃動，系統流量降低。

答案：D.

科目： 191004
知能類：K1.03 [3.1/3.3]
序號： P1927 (B1821)

Which one of the following is an effective method for ensuring that a centrifugal pump remains primed and does not become gas bound during operation and after shutdown?

A. Install an orifice plate in the discharge piping of the pump.

B. Install a pump recirculation line from the pump discharge piping to the pump supply piping.

C. Install the pump below the level of the suction supply.

D. Install a check valve in the discharge piping of the pump.

ANSWER: C.

為使離心泵保持最佳狀況，並在運轉中及停止後，都不會有氣鎖的現象，下列何者為有效的方法？

A. 在泵的出口管路中安裝限流板。

B. 從泵的出口管路，安裝一條泵再循環管路，到泵的進口管路。

C. 將泵安裝在低於抽水源水位處。

D. 在泵的出口管路中安裝止回閥。

答案：C.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P23 (B423)

A motor-driven centrifugal pump is operating under no flow conditions. Which one of the following damaging conditions will first occur during pump operation with no flow?

A. Pump failure from overspeed

B. Pump failure from overheating

C. Motor failure from overspeed

D. Motor failure from overheating

ANSWER: B.

馬達驅動離心泵在無流量之下運轉。下列何者為離心泵於無流量下運轉時，首先發生的損害狀況？

A. 泵因過速而故障(failure)。

B. 泵因過熱而故障。

C. 馬達因過速而故障。

D. 馬達因過熱而故障。

答案：B.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P109 (B1823)

When a centrifugal pump is operating at shutoff head, it is pumping at _____ capacity and _____ discharge head.

A. maximum; minimum

B. maximum; maximum

C. minimum; minimum

D. minimum; maximum

ANSWER: D.

當一離心泵在關斷水頭下操作，其操作是在_____流量，以及_____出口水頭。

A. 最大；最小

B. 最大；最大

C. 最小；最小

D. 最小；最大

答案：D.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P119 (B1319)

Refer to the drawing of a centrifugal pump operating curve (see figure below). Which point represents pump operation at shutoff head?

A. Point A

B. Point B

C. Point C

D. Point D

ANSWER: A.

請參照下圖的離心泵特性曲線。

哪一點代表泵在關斷水頭運轉？

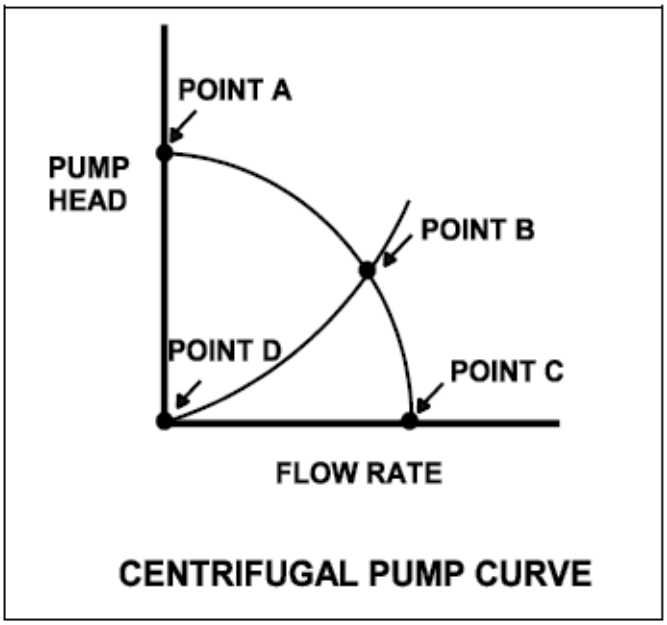
A. A點

B. B點

C. C點

D. D點

答案：A.



科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P223

Operating a centrifugal pump at shutoff head without recirculation flow can directly result in...

A. discharge piping overpressurization.

B. suction piping overpressurization.

C. excessive pump leakoff.

D. pump overheating.

ANSWER: D.

離心泵若在關斷水頭且沒有再循環流量下運轉，可能直接造成……

A. 出口管路超壓。

B. 進口管路超壓。

C. 泵洩漏過多。

D. 泵過熱。

答案：D.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P321 (B319)

A motor-driven centrifugal pump with no recirculation flow path must be stopped when discharge pressure reaches the pump shutoff head to prevent...

A. overheating of the pump.

B. overheating of the motor.

C. bursting of the pump casing.

D. water hammer in downstream lines.

ANSWER: A.

當出口壓力達到泵關斷水頭時，應停止無再循環流路徑的馬達驅動離心泵，以避免……

A. 泵過熱。

B. 馬達過熱。

C. 泵外殼爆炸。

D. 下游管路產生水錘現象。

答案：A.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P1222 (B1181)

A nuclear power plant is operating at full power when a 200 gpm reactor coolant leak occurs, which results in a reactor trip and initiation of emergency coolant injection. Reactor coolant system pressure stabilizes at 1,000 psia and all injection pumps are operating with their pump recirculation lines isolated. The shutoff heads for the pumps are as follows:

High pressure injection (HPI) pumps: 2,500 psia
Low pressure injection (LPI) pumps: 200 psia

Which pumps must be stopped quickly and why?

A. HPI pumps to prevent pump overheating caused by low flow.

B. LPI pumps to prevent pump overheating caused by low flow.

C. HPI pumps to prevent motor overheating caused by high flow.

D. LPI pumps to prevent motor overheating caused by high flow.

ANSWER: B.

核能電廠於全功率運轉，此時發生 200 gpm 的反應器冷卻水洩漏事件，造成反應爐跳脫，並啟動緊急冷卻水注入。反應爐冷卻系統壓力穩定在 1,000 psia 處，所有注水泵均於其再循環管路隔離下運轉。泵的關斷水頭如下：

高壓注水(HPI)泵：2,500 psia
低壓注水(LPI)泵：200 psia

何種泵必須盡快停止運轉？理由何在？

A. 高壓注水泵，以免低流量造成泵過熱。

B. 低壓注水泵，以免低流量造成泵過熱。

C. 高壓注水泵，以免高流量造成馬達過熱。

D. 低壓注水泵，以免高流量造成馬達過熱。

答案：B.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P1320 (B1917)

Refer to the drawing of a pump with recirculation line (see figure below).

The flowpath through valve A is designed to...

A. prevent pump runout by creating a recirculation flowpath.

B. provide a small flow rate through the pump during shutoff head conditions.

C. direct a small amount of water to the pump suction to raise available net positive suction head.

D. prevent the discharge piping from exceeding design pressure during no-flow conditions.

ANSWER: B.

請參照下圖中，設有再循環管路的泵。

通過A閥的流量路徑，是設計來.....

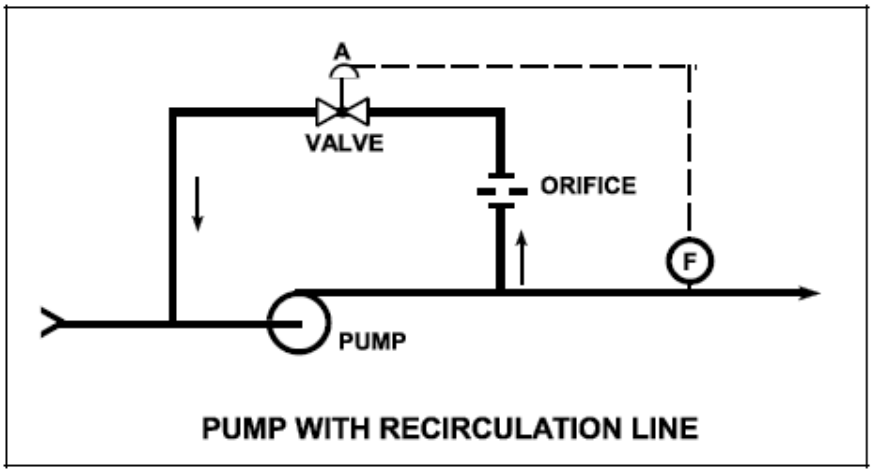
A. 產生一條再循環流量路徑，以避免泵過流(runout)。

B. 在發生關斷水頭狀況時，提供少量的泵流量。

C. 導入少量的水給泵抽取，以提高可用淨正吸水頭。

D. 避免出口管路在無流量狀況時，超過設計壓力。

答案：B.



PUMP WITH RECIRCULATION LINE

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P1423

Which one of the following is at a relatively high value when a centrifugal pump is operating at shutoff head?

A. Pump motor current

B. Pump volumetric flow rate

C. Available net positive suction head

D. Required net positive suction head

ANSWER: C.

離心泵於關斷水頭運轉時，下列何者相對之值較高？

A. 泵馬達電流。

B. 泵體積流量。

C. 可用淨正吸水頭。

D. 必要淨正吸水頭。

答案：C.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P1523

Which one of the following describes centrifugal pump operating parameters at shutoff head?

A. High discharge pressure, low flow, low power demand

B. High discharge pressure, high flow, low power demand

C. Low discharge pressure, low flow, high power demand

D. Low discharge pressure, high flow, high power demand

ANSWER: A.

下列何者描述了離心泵在關斷水頭下的運轉參數？

A. 高出口壓力、低流量、所需功率低。

B. 高出口壓力、高流量、所需功率低。

C. 低出口壓力、低流量、所需功率高。

D. 低出口壓力、高流量、所需功率高。

答案：A.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P1621

Which one of the following conditions applies to a centrifugal pump running at shutoff head?

A. The volumetric flow rate for the pump has been maximized.

B. Cavitation will occur immediately upon reaching shutoff head.

C. Available net positive suction head is at a maximum value for the existing fluid conditions.

D. Pump differential pressure is at a minimum value.

ANSWER: C.

下列何種情況，適用於在關斷水頭下運轉的離心泵？

A. 泵的體積流量提高至最大。

B. 抵達關斷水頭時，立即發生孔蝕。

C. 可用淨正吸水頭，為現有流體條件下的最大值。

D. 泵差壓為最小值。

答案：C.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P1922

Which one of the following would result from operating a motor-driven centrifugal pump for extended periods of time with the discharge valve shut and no recirculation flow?

A. No motor damage, but the pump will overheat and may be damaged.

B. No motor damage, but the pump will overspeed and may be damaged.

C. No pump damage, but the motor will overspeed and the motor bearings may fail.

D. No pump damage, but the motor windings will draw excessive current and may fail.

ANSWER: A.

馬達驅動的離心泵，若在關閉出口閥與缺乏再循環流量下運轉一段時間後，將產生下列何種現象？

A. 馬達沒有損壞，但泵過熱而可能受損。

B. 馬達沒有損壞，但泵超速而可能受損。

C. 泵沒有損壞，但馬達超速，馬達軸承(bearing)可能故障。

D. 泵沒有損壞，但馬達繞線(winding)可能因電流過大而故障。

答案：A.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P2019 (B2017)

Refer to the drawing of a pump with recirculation line (see figure below).

Which one of the following describes the response of the pump if a complete flow blockage occurs in the discharge line just downstream of the flow transmitter?

A. The pump will overheat after a relatively short period of time due to a loss of both main flow and recirculation flow.

B. The pump will overheat after a relatively long period of time due to a loss of main flow only.

C. The pump will overheat after a relatively long period of time due to a loss of recirculation flow only.

D. The pump will be able to operate under these conditions indefinitely due to sustained main flow.

ANSWER: B.

請參照下圖中，具備再循環管路的泵。

倘若在流量傳送器(flow transmitter)下游的出口管路，發生流量徹底堵塞的情形，泵將有下列何種反應？

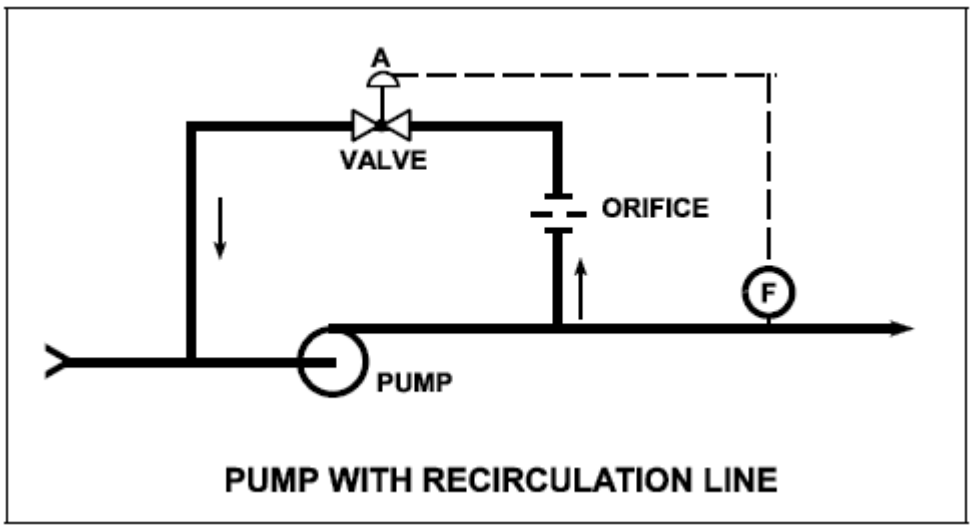
A. 由於失去主流量和再循環流量，泵將於短時間內變得過熱。

B. 由於僅失去主流量，泵將於相當長的一段時間後變得過熱。

C. 由於僅失去再循環流量，泵將於相當長的一段時間後變得過熱。

D. 由於仍維持主流量，泵能在這些狀況下持續運轉。

答案：B.



PUMP WITH RECIRCULATION LINE

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P2022 (B2018)

A variable-speed centrifugal fire water pump is taking a suction on an open storage tank and discharging through a 4-inch diameter fire hose and through a nozzle located 50 feet above the pump.

Which one of the following will cause the pump to operate at shutoff head?

A. The fire hose is replaced with a 6-inch diameter fire hose.

B. The fire hose is replaced with a 2-inch diameter fire hose.

C. Pump speed is increased until steam formation at the eye of the impeller prevents pump flow.

D. Pump speed is decreased until pump discharge pressure is insufficient to cause flow.

ANSWER: D.

一變速離心消防泵在一開放儲水槽取水，同時經由4吋直徑的消防水管，由位於泵上方50呎之噴嘴注水。下列何者會導致泵在關斷水頭下操作？

A. 消防水管以6吋直徑之消防水管取代。

B. 消防水管以2吋直徑之消防水管取代。

C. 泵轉速增加直到在泵吸入口形成蒸汽而阻止泵內之水流流動。

D. 泵轉速減少直到泵排放壓力不足以讓水流動。

答案：D.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P2221 (B1219)

Refer to the drawing of a pump with a recirculation line (see figure below).

Valve "A" will open when pump...

A. discharge pressure increases above a setpoint.

B. discharge pressure decreases below a setpoint.

C. flow rate increases above a setpoint.

D. flow rate decreases below a setpoint.

ANSWER: D.

請參照下圖中，設有再循環管路的泵。

當泵_____時，A閥會打開。

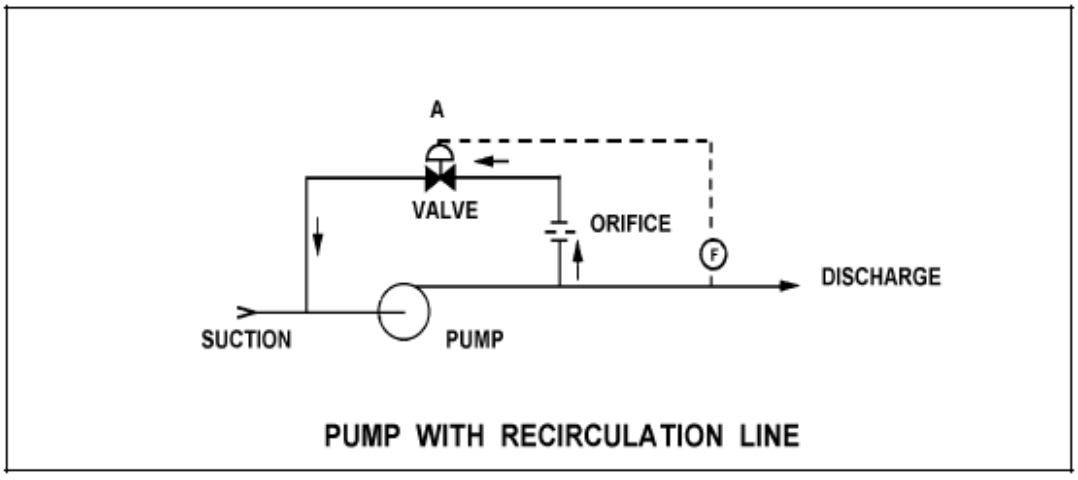
A. 出口壓力增加，超過設定值。

B. 出口壓力降低，低於設定值。

C. 流量增加，超過設定值。

D. 流量降低，低於設定值。

答案：D.



PUMP WITH RECIRCULATION LINE

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P2322 (B520)

A centrifugal fire water pump takes a suction on an open storage tank and discharges through a fire hose. Which one of the following will cause the pump to operate at shutoff head?

A. Suction temperature is increased to the point that gas binding occurs.

B. Suction pressure is adjusted until available net positive suction head is reduced to zero feet.

C. Pump speed is adjusted to the value at which cavitation occurs.

D. The fire hose nozzle is raised to an elevation that prevents any flow.

ANSWER: D.

一離心消防泵在一開放儲水槽取水，並透過消防水管注水。下列何者將導致此泵在關斷水頭下操作？

A. 進口溫度增加到某點而使氣鎖發生。

B. 進口壓力調整直到可用的淨正吸水頭降低至0呎。

C. 泵轉速調整到某數值而使孔蝕發生。

D. 消防水管噴嘴提高至某一高度，而阻止任何流動。

答案：D.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P2721 (B2721)

A centrifugal fire water pump takes a suction on an open storage tank and discharges through a fire hose. Which one of the following will cause the pump to operate at shutoff head?

A. A firefighter inadvertently severs the fire hose.

B. The fire hose becomes completely crimped in a fire door.

C. Fire water storage tank level drops below the pump suction tap.

D. A firefighter adjusts the fire hose nozzle spray pattern from “deluge” to “fog.”

ANSWER: B.

一離心消防泵在一開放儲水槽取水，同時經由消防水管注水。下列何者會導致泵在關斷水頭的情況下操作？

A. 消防隊員不小心將消防水管切斷。

B. 消防水管在防火門變成完全捲摺(crimped)。

C. 消防水儲水槽水位下降至泵進口管路之下。

D. 消防隊員調整消防水管噴嘴噴灑方式，從「大水」(deluge)調至「水霧」(fog)。

答案：B.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P2820 (B3320)

A centrifugal fire water pump takes a suction on an open storage tank and discharges through a fire hose. Which one of the following will cause the pump to operate at shutoff head?

A. A firefighter inadvertently severs the fire hose.

B. The fire hose becomes partially crimped in a fire door.

C. Fire water storage tank level drops below the pump suction tap.

D. A firefighter adjusts the fire hose nozzle spray pattern from “deluge” to “off”.

ANSWER: D.

一離心消防泵在一開放儲水槽取水，同時經由消防水管噴灑。下列何者會導致泵在關斷水頭下操作？

A. 消防隊員不小心將消防水管切斷。

B. 消防水管在防火門變成部分捲摺(crimped)。

C. 消防水儲槽水位下降至泵進口龍頭之下。

D. 消防隊員調整消防水管噴嘴噴灑方式，從「大水」(deluge)至「關」(off)。

答案：D.

科目： 191004
知能類：K1.04 [3.3/3.4]
序號： P3122 (B2225)

Refer to the drawing of a pump with a recirculation line (see figure below).

Valve "A" will close when pump...

A. flow rate increases above a setpoint.

B. flow rate decreases below a setpoint.

C. discharge pressure increases above a setpoint.

D. discharge pressure decreases below a setpoint.

ANSWER: A.

請參照下圖中，設有再循環管路的泵。

當泵_____時，A閥會關閉。

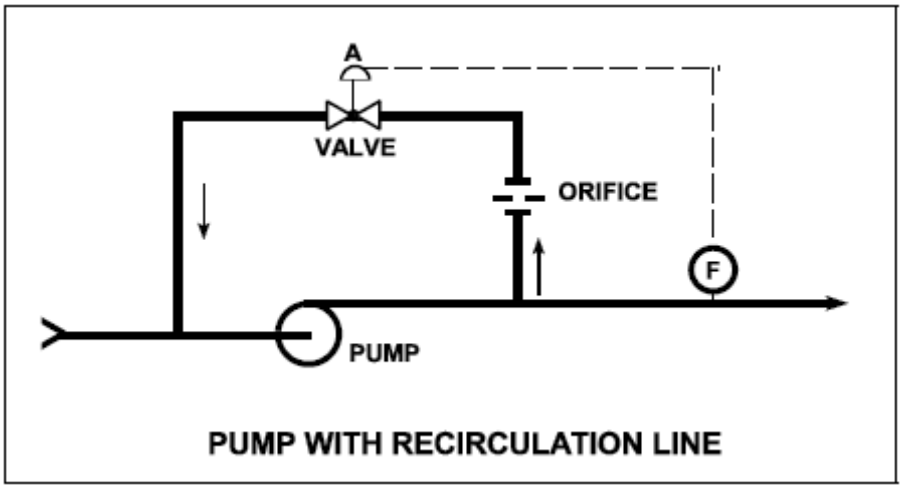
A. 流量增加且高於設定值。

B. 流量降低且低於設定值。

C. 出口壓力增加且超過設定值

D. 出口壓力降低且低於設定值。

答案：A.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P322 (B324)

The available net positive suction head for a pump may be expressed as...

A. suction pressure minus saturation pressure of the fluid being pumped.

B. suction pressure plus discharge pressure.

C. discharge pressure minus saturation pressure of the fluid being pumped.

D. discharge pressure minus suction pressure.

ANSWER: A.

對於一泵，可用的淨正吸水頭，可以表示為.....

A. 進口壓力減去被抽取流體的飽和壓力。

B. 進口壓力減去出口壓力。

C. 出口壓力減去被抽取流體的飽和壓力。

D. 出口壓力減去進口壓力。

答案：A.

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P1120 (B121)

Which one of the following operations will cause a decrease in available net positive suction head for an operating centrifugal pump?

A. Decreasing the inlet fluid temperature

B. Increasing the pump discharge pressure

C. Increasing the pump suction pressure

D. Throttling open the pump discharge valve

ANSWER: D.

下列何種運轉將導致離心泵的可用淨正吸水頭降低？

A. 降低入口流體的溫度。

B. 增加泵出口壓力。

C. 增加泵進口壓力。

D. 節流開啟泵出口閥。

答案：D.

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P1221 (B1621)

Refer to the drawing of a cooling water system (see figure below).

The available net positive suction head for the centrifugal pump will be increased by...

A. opening surge tank makeup valve "A" to raise tank level.

B. throttling heat exchanger cooling water valve "B" closed.

C. throttling pump discharge valve "C" more open.

D. throttling pump suction valve "D" more closed.

ANSWER: A.

請參照下圖的冷卻水系統。

下列何者會提高離心泵的可用淨正吸水頭？

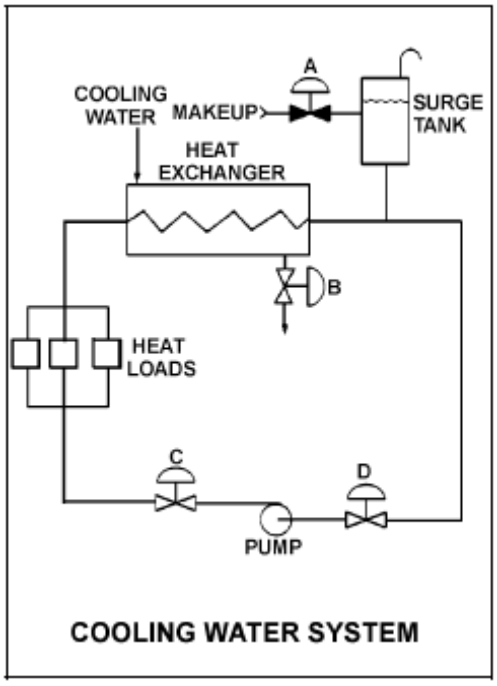
A. 開啟調節槽(surge tank)補水閥「A」。

B. 節流關閉熱交換器冷卻水閥「B」。

C. 節流開啟泵出口閥「C 」。

D. 節流關閉泵進口閥「D 」。

答案：A.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P1521 (B1918)

Refer to the drawing of a cooling water system (see figure below).

The available net positive suction head for the centrifugal pump will be decreased by...

A. opening surge tank makeup valve "A" to raise tank level.

B. throttling heat exchanger cooling water valve "B" more open.

C. throttling pump discharge valve "C" more open.

D. reducing the heat load on the cooling water system.

ANSWER: C.

請參照下圖的冷卻水系統。

離心泵的可用淨正吸水頭，會因____而降低。

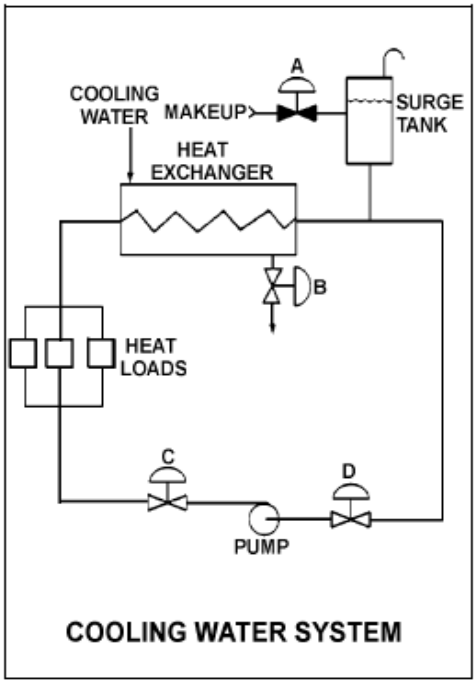
A. 開啟調節槽補水閥「A」，升高水槽水位。

B. 節流熱交換器冷卻水閥「B」以開得更大。

C. 節流泵出口閥「C」以開得更大。

D. 降低冷卻水系統的熱負載。

答案：C.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P1822 (B2119)

Refer to the drawing of an operating cooling water system (see figure below).

Which one of the following will increase available net positive suction head for the centrifugal pump?

A. Draining the surge tank to decrease level by 10%

B. Positioning heat exchanger service water valve B more closed

C. Positioning pump discharge valve C more closed

D. Positioning pump suction valve D more closed

ANSWER: C.

請參照下圖運轉中的冷卻水系統。

下列何者將增加離心泵的可用淨正吸水頭？

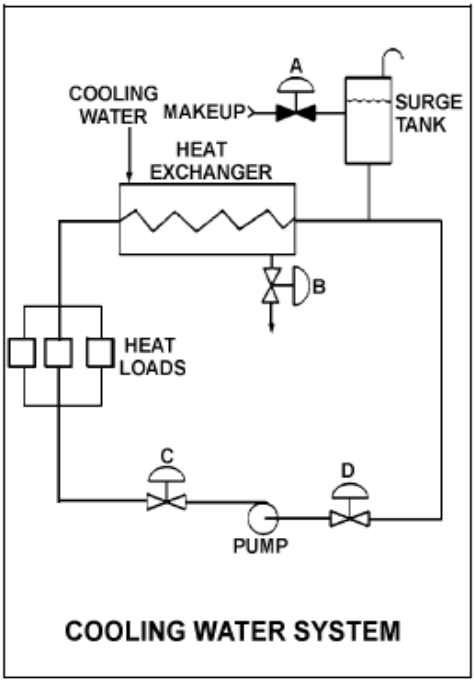
A. 將調節槽放水，降低10%的水位。

B. 減少熱交換器的冷卻水閥B開度。

C. 減少泵出口閥C的開度。

D. 減少泵進口閥D的開度。

答案：C.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P2222 (B2518)

Refer to the drawing of a cooling water system (see figure below).

The available net positive suction head for the centrifugal pump will be decreased by...

A. increasing surge tank level by 5 percent.

B. throttling heat exchanger cooling water valve "B" more open.

C. throttling pump discharge valve "C" more closed.

D. increasing the heat loads on the cooling water system.

ANSWER: D.

請參照下圖的冷卻水系統。

此離心泵的可用淨正吸水頭，將因____而減少。

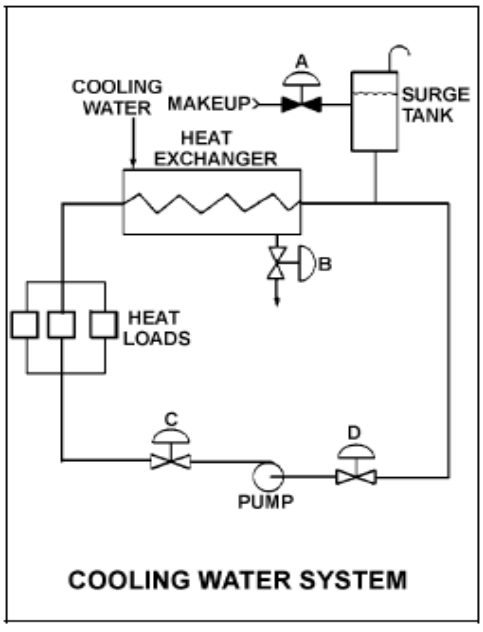
A. 提高調節槽5%的水位。

B. 節流熱交換器冷卻水閥「B」以開得更大。

C. 節流泵出口閥「C」以關得更小。

D. 增加冷卻水系統的熱負載。

答案：D.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P2323 (B2319)

Refer to the drawing of an operating cooling water system (see figure below).

Which one of the following will decrease available net positive suction head for the centifugal pump?

A. Adding water to the surge tank to raise level by 10%

B. Positioning heat exchanger service water valve B more open

C. Positioning pump discharge valve C more open

D. Reducing heat loads on the cooling water system by 10%

ANSWER: C.

請參照下圖運轉中的冷卻水系統。

下列何者將降低這個離心泵的可用淨正吸水頭？

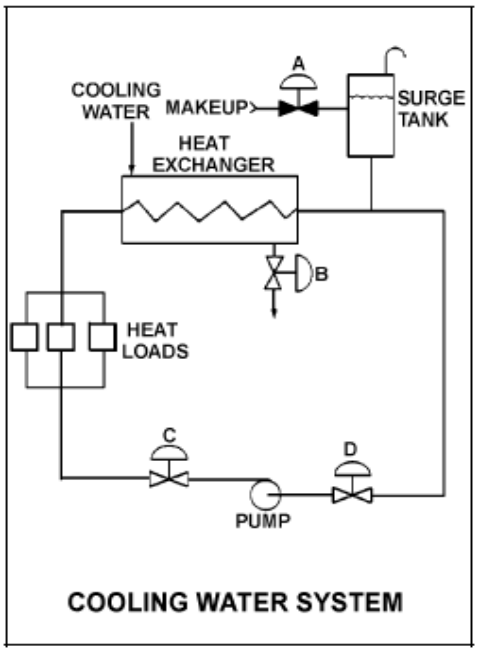
A. 在調節槽加水，提高10%的水位。

B. 增加熱交換器廠用水閥B的開度。

C. 增加泵出口閥C的開度。

D. 將冷卻水系統的熱負載降低10%。

答案：C.



COOLING WATER SYSTEM

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P2621 (B2621)

A cooling water pump is operating with pump suction parameters as follows:

Suction Temperature: 124°F
Suction Pressure: 11.7 psia

What is the approximate available net positive suction head (NPSH) for the pump? (Neglect the contribution of the suction fluid velocity to NPSH.)

A. 23 feet

B. 27 feet

C. 31 feet

D. 35 feet

ANSWER: A.

冷卻水泵正以下列泵進口參數運轉：

進口溫度：124˚F
進口壓力：11.7 psia

下列何者為可用淨正吸水頭(NPSH)的約略值(忽略進水流體速度帶給NPSH的影響)?

A. 23 feet

B. 27 feet

C. 31 feet

D. 35 feet

答案：A.

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P2722 (B2722)

A centrifugal pump is operating at maximum design flow rate, taking suction on a vented water storage tank and discharging through two parallel valves. Valve "A" is fully open and valve "B" is half open.

Which one of the following will occur if valve B is fully closed?

A. The pump will operate at shutoff head.

B. The pump will operate at runout conditions.

C. The pump available net positive suction head will increase.

D. The pump required net positive suction head will increase.

ANSWER: C.

一離心泵運轉在最大設計流量下，從一有排氣設計之儲水槽中取水，泵出口則連接二只並聯閥門，閥「A」全開，閥「B」半開。

此時若閥B全關，將發生下列何事？

A. 泵會在關斷水頭下操作。

B. 泵會在過流(runout)狀況下運轉。

C. 泵的可用淨正吸水頭增加。

D. 泵的所需淨正吸水頭增加。

答案：C.

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P2921 (B2920)

Refer to the drawing of an operating cooling water system (see figure below).

Which one of the following will increase the available net positive suction head for the centrifugal pump?

A. Draining the surge tank to decrease level by 10%

B. Positioning the service water valve B more closed

C. Positioning the pump discharge valve C more open

D. Reducing the heat loads on the cooling water system

ANSWER: D.

請參照下圖的運轉中冷卻水系統。

下列何者將增加離心泵的可用淨正吸水頭？

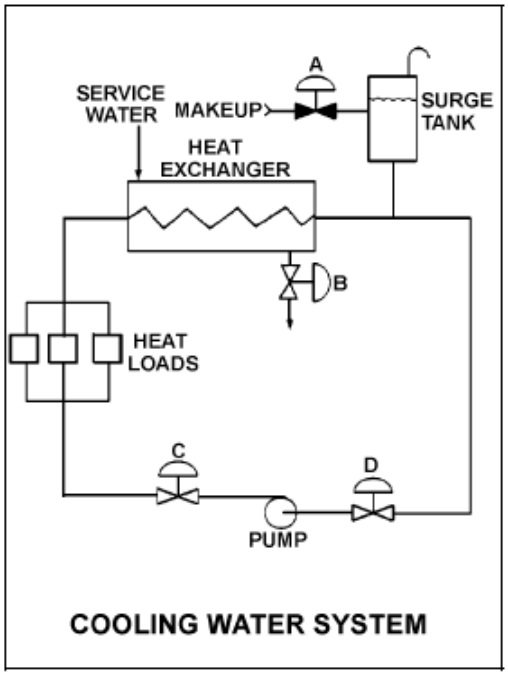
A. 將調節槽放水，降低10%的水位。

B. 減少冷卻水閥B開度。

C. 增加泵出口閥C開度。

D. 減少冷卻水系統的熱負載。

答案：D.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P3020 (B3022)

A centrifugal pump is needed to take suction on a hot water storage tank and deliver high pressure hot water to a water spray system. To minimize axial thrust on the pump shaft, the pump should have _____ stage(s); and to maximize the available NPSH at the impeller inlet, the pump should be _____ suction.

A. a single; single

B. a single; double

C. multiple opposed; single

D. multiple opposed; double

Answer: D.

一離心泵從一熱水槽中取水，並將高壓熱水輸送至灑水系統。為將作用於泵轉軸之軸向推力降至最低，此泵應該有_____級；而為將葉輪入口的可用淨正進口水頭增至最大，則此泵應該為_____進口。

A. 單一；單

B. 單一；雙

C. 多(multiple)；單

D. 多(multiple)；雙

答案：D.

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P3221 (B3219)

A centrifugal pump is taking suction on an open storage tank that has been filled to a level of 40 feet with 10,000 gallons of 60°F water. The pump is located at the base of the tank, takes a suction from the bottom of the tank, and discharges through a fire hose.

Given:

- The pump is currently operating at its design flow rate of 200 gpm and a total developed head of 150 feet.
- The pump requires 4 feet of net positive suction head (NPSH).

How will the centrifugal pump flow rate be affected as the water storage tank level decreases?

A. Flow rate will remain constant until the pump begins to cavitate at a tank level of about 4 feet.

B. Flow rate will remain constant until the pump becomes air bound when the tank empties.

C. Flow rate will gradually decrease until the pump begins to cavitate at a tank level of about 4 feet.

D. Flow rate will gradually decrease until the pump becomes air bound when the tank empties.

ANSWER: D.

離心泵由開放儲水槽進水，水槽水位40呎，有60˚F的水10,000加侖。泵位於水槽底，從底部進水，由消防水管排出。

已知：

- 泵正以設計流量200 gpm運轉，其總水頭(total developed head)為150呎。
- 泵需要4呎的淨正吸水頭(NPSH)。

儲水槽水位下降時，離心泵的流量會受到何種影響？

A. 流量維持不變，直到泵在水槽水位達4呎時，發生孔蝕現象為止。

B. 流量維持不變，直到泵在水槽空了後發生氣鎖為止。

C. 流量逐漸降低，直到泵在水槽水位達4呎時，發生孔蝕現象為止。

D. 流量逐漸降低，直到泵在水槽空了之後發生氣鎖為止。

答案：D.

科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P4010 (B4011)

Refer to the drawing below of a centrifugal pump taking suction from the bottom of an open storage tank containing water at 66°F. Pump and water level elevations are indicated in the figure. Assume standard atmospheric pressure.

Assuming that pump suction fluid velocity head loss is negligible, what is the approximate value of net positive suction head available to the pump.

A. 6 feet

B. 13 feet

C. 20 feet

D. 25 feet

ANSWER: C.

下圖為在水溫66˚F的開放儲水槽底部取水的離心泵，泵和水位高度如圖所示。假定為標準氣壓。

假設泵進水流體速度水頭損失可以忽略，泵的淨正吸水頭約略值為何？

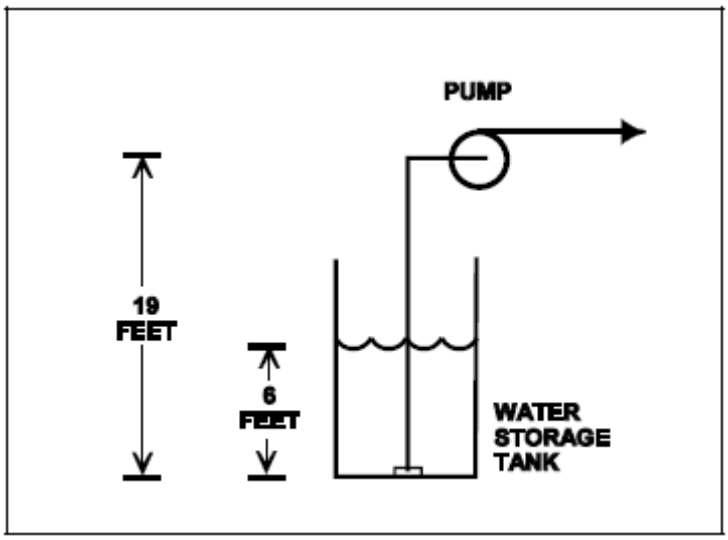
A. 6 feet

B. 13 feet

C. 20 feet

D. 25 feet

答案：C.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P4110 (B4113)

Refer to the drawing of an elevated centrifugal pump taking suction from the bottom of an open storage tank containing water at 66°F (see figure below). Assume standard atmospheric pressure.

The pump requires 4.0 ft-lbf/lbm of net positive suction head (NPSH). Assume that pump suction fluid velocity head loss is negligible.

If tank water level is allowed to decrease continuously, at what approximate water level will the pump begin to cavitate?

A. 34 feet

B. 29 feet

C. 21 feet

D. 16 feet

ANSWER: C.

下圖為架高式離心泵(elevated centrifugal pump)，此泵從水溫66˚F的開放儲水槽底部取水。假設為標準氣壓。

該泵所需的淨正吸水頭(NPSH)為4.0 ft-lbf/lbm。假設可忽略該泵的進口流體速度水頭損失。

如果槽內水位持續下降，泵將於下列何種水位，開始產生孔蝕作用？

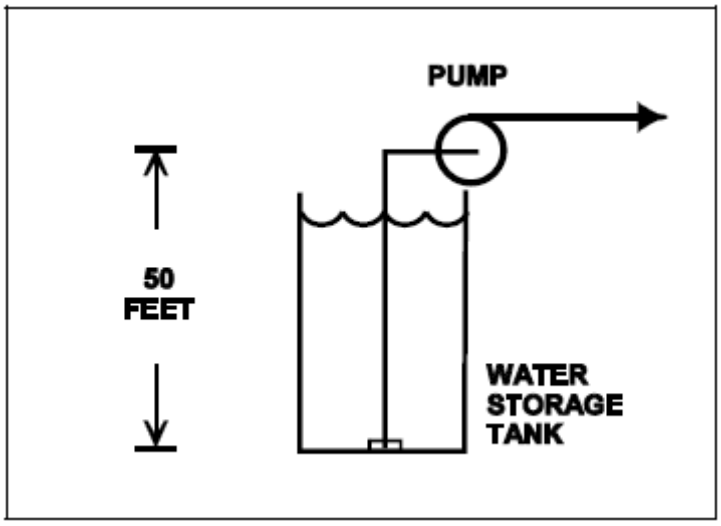
A. 34呎

B. 29呎

C. 21呎

D. 16呎

答案：C.



科目： 191004
知能類：K1.06 [3.2/3.3]
序號： P4410 (B4410)

Refer to the drawing below of a centrifugal pump taking suction from the bottom of an open storage tank containing water at 66°F. Pump and water level elevations are indicated in the figure. Assume standard atmospheric pressure.

Assuming that pump suction fluid velocity head loss is negligible, what is the approximate value of net positive suction head available to the pump.

A. 6 feet

B. 12 feet

C. 39 feet

D. 45 feet

ANSWER: D.

下圖的離心泵，從水溫66°F的開放儲水槽底部取水。泵與水位高度如圖所示。假設為標準氣壓。

假設可忽略該泵的進口流體速度水頭損失，該泵的可用淨正吸水頭數值約為多少？

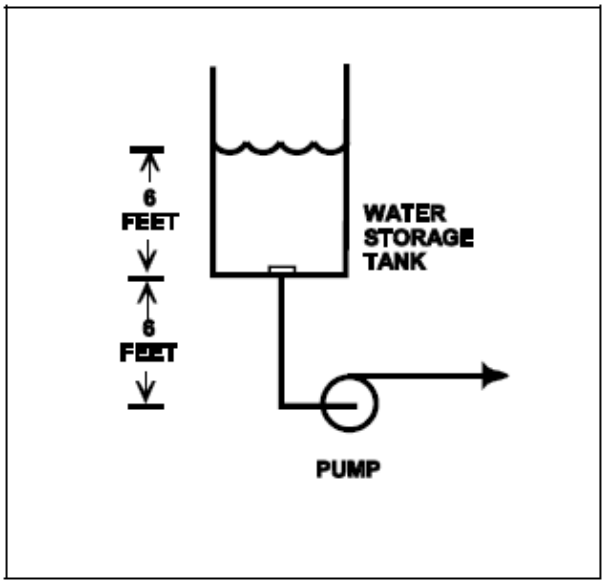
A. 6呎

B. 12呎

C. 39呎

D. 45呎

答案：D.



科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P24

Shutting the discharge valve on an operating centrifugal pump will cause the motor amps to _____ and the pump discharge pressure to _____.

A. increase, increase

B. decrease, increase

C. increase, decrease

D. decrease, decrease

ANSWER: B.

若關閉運轉中離心泵的出口閥，將導致馬達的電流_____，泵出口壓力_____。

A. 增加，增加

B. 降低，增加

C. 增加，降低

D. 降低，降低

答案：B.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P117

When starting an ac motor-driven centrifugal pump, the response of motor current will be...

A. low starting amps, increasing to a higher equilibrium running amperage.

B. low starting amps, remaining at a low equilibrium running amperage.

C. high starting amps, decreasing to a lower equilibrium running amperage.

D. high starting amps, remaining at a high equilibrium running amperage.

ANSWER: C.

啟動交流馬達驅動的離心泵時，馬達的電流反應情況為.....

A. 起初的電流較低，之後增至較高的平衡運轉電流。

B. 起初的電流較低，之後維持在較低的平衡運轉電流。

C. 起初的電流較高，之後降至較低的平衡運轉電流。

D. 起初的電流較高，之後維持在較高的平衡運轉電流。

答案：C.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P224

A constant-speed centrifugal pump motor draws the least current when the pump is...

A. at runout conditions.

B. at operating conditions.

C. accelerating to normal speed during start.

D. at shutoff head.

ANSWER: D.

離心泵採定速運轉，泵處於下列情況時，馬達電流將最小.....

A. 過流(runout)狀態。

B. 運轉狀態。

C. 啟動加速至正常速度時。

D. 關斷水頭時。

答案：D.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P424

A centrifugal pump is circulating water at 100°F in a cooling water system. After several hours the water temperature has increased to 150°F. Assuming system flow rate (gpm) is constant, pump motor amps will have _____ because _____.

A. decreased; water density has decreased

B. decreased; water volume has increased

C. increased; water density has decreased

D. increased; water volume has increased

ANSWER: A.

冷卻水系統的離心泵，循環水流溫度為 100°F。幾小時後，水溫增至 150°F。假設系統流量(gpm)維持不變，泵馬達的電流，基於_____而_____。

A. 水密度減少；減少

B. 水體積增加；減少

C. 水密度減少；增加

D. 水體積增加；增加

答案：A.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P821

Refer to the drawing of an operating cooling water system (see figure below).

The pump is circulating 200°F water. Several hours later, after system cooldown and no lineup changes, the pump is circulating 120°F water.

During the system cooldown, pump motor current has...

A. decreased because water density has increased.

B. increased because water density has increased.

C. decreased because pump motor efficiency has decreased.

D. increased because pump motor efficiency has decreased.

ANSWER: B.

請參照下圖運轉中的冷卻水系統。

泵的循環水流溫度為 200°F。數小時後，系統冷卻且管路沒有異動下，泵循環水流溫度降至 120°F。

此系統冷卻期間，泵馬達的電流.....

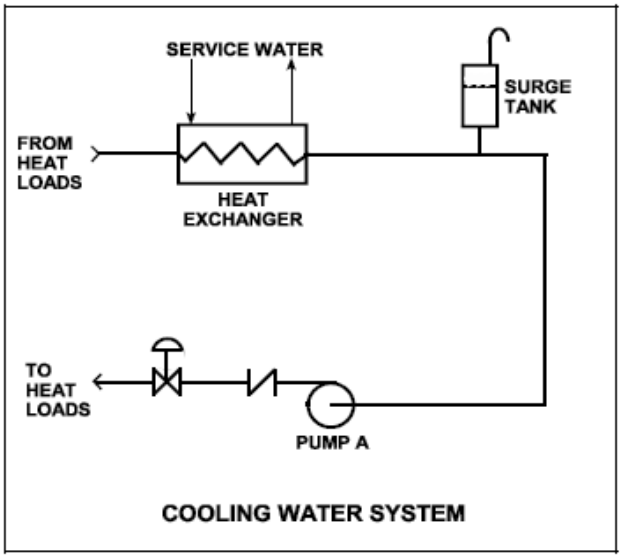
A. 降低，水密度增加所致。

B. 增加，水密度增加所致。

C. 降低，泵馬達效率降低所致。

D. 增加，泵馬達效率降低所致。

答案：B.



科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P923

A centrifugal pump is operating in a closed system with all valves fully open. If the pump discharge valve is throttled 75% closed, pump motor current will...

A. increase and stabilize at a higher value.

B. decrease and stabilize at a lower value.

C. increase briefly, then return to original value.

D. decrease briefly, then return to original value.

ANSWER: B.

一離心泵於封閉系統中運轉，所有閥全開。倘若調整該泵的出口閥，讓其關閉 75%，泵馬達的電流將……

A. 增加，並趨於穩定至較高數值。

B. 降低，並趨於穩定至較低數值。

C. 暫時增加，之後回到原始數值。

D. 暫時降低，之後回到原始數值。

答案：B.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P1223

Which one of the following centrifugal pump operating conditions will result in the most current being drawn by the pump ac motor?

A. Pump discharge head is at shutoff head.

B. The pump is operating at minimum flow.

C. Pump discharge head is at design head.

D. The pump is operating at runout.

ANSWER: D.

下列何種離心泵運轉狀況，將導致泵的交流馬達使用最大電流？

A. 泵的出口水頭處於關斷水頭處。

B. 泵以最低流量運轉。

C. 泵的出口水頭處於設計水頭處。

D. 泵以過流(runout)狀態運轉。

答案：D.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P1420 (B2219)

A centrifugal pump is circulating water at 150°F in a cooling water system. After several hours the water temperature has decreased to 100°F. Assuming system flow rate (gpm) is constant, pump motor amps will have _____ because _____ has increased.

A. increased; water density

B. decreased; water density

C. increased; motor efficiency

D. decreased; motor efficiency

ANSWER: A.

離心泵在冷卻水系統中循環水流，其冷卻水溫度為150˚F。數小時後，水溫降低至100˚F。假設系統流量(gpm)不變，泵馬達電流將會_____，因為_____增加。

A. 增加；水密度

B. 降低；水密度

C. 增加；馬達效率

D. 降低；馬達效率

答案：A.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P1622 (B922)

An ac induction motor-driven centrifugal pump is circulating water at 180°F with a motor current of 100 amps. After several hours, system temperature has changed such that the water density has increased by 4%.

Assuming pump head and volumetric flow rate do not change, which one of the following is the new pump motor current?

A. 84 amps

B. 96 amps

C. 104 amps

D. 116 amps

ANSWER: C.

交流感應馬達驅動的離心泵，在180˚F水溫之循環水流下運轉，馬達電流為100安培。在數小時後，系統溫度改變，水的密度因而增加了4%。

假設泵水頭以及體積流量沒有改變，下列何者為新的泵馬達電流？

A. 84安培

B. 96安培

C. 104安培

D. 116安培

答案：C.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P1824 (B419)

Refer to the drawing of a cooling water system (see figure below).

The centrifugal pump is circulating water at 100°F. After several hours the water temperature has increased to 200°F. Assuming system flow rate (gpm) is constant, pump motor amps will have _____ because _____.

A. decreased; water density has decreased

B increased; water density has decreased

C. decreased; pump efficiency has increased

D. increased; pump efficiency has increased

ANSWER: A.

請參照下圖的冷卻水系統圖。

離心泵在100˚F水溫的循環水流下運轉。數小時後，水溫增加到200˚F。假設系統流量(gpm)不變，泵馬達電流將會_____，因為_____。

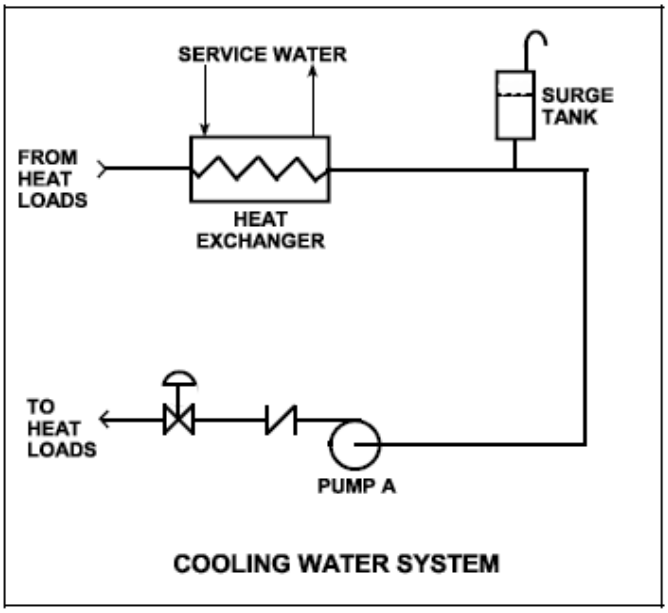
A. 降低；水密度降低

B. 增加；水密度降低

C. 降低；泵效率增加

D. 增加；泵效率增加

答案：A.



科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P1924 (B115)

A constant-speed centrifugal pump motor draws the least current when the pump is...

A. at maximum rated flow conditions.

B. operating on recirculation flow only.

C. accelerating to normal speed during start.

D. at shutoff head with no recirculation flow.

ANSWER: D.

當離心泵_____，該定速泵的馬達電流會最小。

A. 在最大額定流量時。

B. 只用再循環流量運轉時。

C. 在啟動加速至正常速度時。

D. 在關斷水頭且無再循環流量時。

答案：D.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P2023 (B2020)

A reactor coolant pump (RCP) is circulating reactor coolant at 100°F. After several hours the reactor coolant temperature has increased to 150°F.

Assuming coolant flow rate (gpm) is constant, RCP motor amps will have _____ because _____.

A. decreased; coolant density has decreased

B. decreased; system head losses have increased

C. increased; coolant density has increased

D. increased; system head losses have decreased

ANSWER: A.

反應爐冷卻泵(RCP)循環100˚F的反應爐冷卻水。數小時後，反應爐冷卻水溫提高到150˚F。

假設冷卻水的流量(gpm)不變，反應爐冷卻泵馬達的電流將_____，因為_____。

A. 降低；冷卻水密度降低

B. 降低；系統水頭損失增加

C. 增加；冷卻水密度增加

D. 增加；系統水頭損失減少

答案：A.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P2123 (B622)

A centrifugal pump is operating at rated conditions in an open system with all valves fully open. If the pump discharge valve is throttled to 50% closed, pump discharge pressure will _____ and pump motor current will _____.

A. decrease; decrease

B. decrease; increase

C. increase; increase

D. increase; decrease

ANSWER: D.

一離心泵於開放系統中，在額定狀況下運轉，所有閥全開。若將此泵出口閥開度降低至50%，泵出口壓力將會_____，而泵馬達電流將會_____。

A. 減小；減小

B. 減小；增加

C. 增加；增加

D. 增加 ;減小

答案：D.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P2124 (B2423)

A centrifugal pump in a cooling water system is circulating water at 180°F with a motor current of 200 amps. After several hours, system temperature has changed such that the water density has increased by 3%.

Assuming pump head remains the same, which one of the following is the new pump motor current?

A. 203 amps

B. 206 amps

C. 218 amps

D. 236 amps

ANSWER: B.

冷卻水系統的離心泵，以180˚F循環水流，馬達電流為200安培。數小時後，系統溫度改變，水密度因而增加3%。

假設泵水頭不變，下列何者為新的泵馬達電流？

A. 203安培

B. 206安培

C. 218安培

D. 236安培

答案：B.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P2520 (B2520)

A constant-speed centrifugal pump motor draws the most current when the pump is...

A. at maximum rated flow conditions.

B. operating at runout flow.

C. accelerating to normal speed during start.

D. at shutoff head with no recirculation flow.

ANSWER: C.

定速離心泵馬達在泵____時，會使用最大電流？

A. 使用最大額定流量。

B. 以過流(runout)運轉。

C. 啟動加速到正常轉速。

D. 在關斷水頭時且無再循環流量。

答案：C.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P2821 (B2822)

An ac motor-driven centrifugal pump was just started. During the start, motor current remained peaked for 6 seconds before decreasing to standard running current. Normally, the starting current peak lasts about 4 seconds.

Which one of the following could have caused the extended starting current peak?

A. The pump shaft was seized and did not turn.

B. The pump was initially rotating slowly in the reverse direction.

C. The pump discharge check valve was stuck closed and did not open.

D. The pump was initially air bound, and then primed itself after 6 seconds of operation.

ANSWER: B.

交流馬達驅動的離心泵剛開始啟動。在啟動時，馬達電流在其尖峰值停留6秒，然後降低到標準運轉電流。一般而言，啟動電流在尖峰值只持續4秒。

下列何者可能引起上述啟動電流於尖峰延長停留的現象？

A. 泵軸卡住，沒有轉動。

B. 泵在開始時，以反向慢慢轉動。

C. 泵的出口止回閥卡住在關閉位置，打不開。

D. 泵在開始時產生氣鎖，然後在運轉6秒後自行回復。

答案：B.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P2925 (B2921)

A centrifugal pump is circulating water at 180°F with a motor current of 200 amps. After several hours, system temperature has changed such that the water density has increased by 6%.

Assuming pump head and volumetric flow rate do not change, which one of the following is the new pump motor current?

A. 203 amps

B. 206 amps

C. 212 amps

D. 224 amps

ANSWER: C.

離心泵在180˚F循環水流，馬達電流為200安培。數小時之後，系統溫度改變，水密度因而增加6%。

假設泵水頭和體積流量沒有改變，下列何者為新的泵馬達電流？

A. 203安培

B. 206安培

C. 212安培

D. 224安培

答案：C.

科目： 191004
知能類：K1.07 [2.9/2.9]
序號： P3822 (B3820)

An ac motor-driven centrifugal water pump was just started. During the start, motor current remained peaked for 2 seconds, and then decreased and stabilized at about one-fifth the standard running current. Normally, the starting current peak lasts about 4 seconds.

Which one of the following could have caused the abnormal start indications above?

A. The pump shaft was seized and the motor breaker opened.

B. The pump was initially rotating slowly in the reverse direction.

C. The pump was initially air bound, and then primed itself after 2 seconds of operation.

D. The coupling between the motor and pump shafts was left unfastened after maintenance.

ANSWER: D.

啟動交流電馬達驅動的離心泵時，馬達電流停在高峰2秒，然後降低，並在額定運轉電流五分之一處穩定。正常狀況下，啟動電流高峰應持續4秒鐘。

下列何者可能是導致上述不正常啟動現象發生的原因？

A. 泵的軸卡住，馬達斷路器打開。

B. 泵在開始時往反向轉動。

C. 泵在開始時有氣鎖現象，在運轉2秒鐘後自動修正。

D. 在維修後，馬達軸和泵軸間的耦合(coupling)沒有固定。

答案：D.

科目： 191004
知能類：K1.08 [2.4/2.6]
序號： P225

Many larger centrifugal pumps are started with their discharge valves closed to prevent...

A. cavitation in the pump.

B. lifting the discharge relief valve.

C. loss of recirculation (miniflow).

D. excessive current in the pump motor.

ANSWER: D.

大型離心泵多半在關閉出口閥之下啟動，此舉旨在避免.....

A. 泵孔蝕。

B. 頂開出口釋壓閥。

C. 喪失再循環流量(最小流量)。

D. 泵馬達電流過高。

答案：D.

科目： 191004
知能類：K1.08 [2.4/2.6]
序號： P1325 (B1822)*

Some large centrifugal pumps are interlocked so that the pump will not start unless its discharge valve is at least 90% fully closed. This interlock is provided to minimize the...

A. pump discharge pressure.

B. heating of the pumped fluid.

C. cavitation at the pump suction.

D. duration of the pump motor starting current.

ANSWER: D.

有些大型離心泵之連鎖設計為：除非泵的出口閥至少完全關閉90%，否則泵無法啟動。這種連鎖裝置是為了將_____降至最低。

A. 泵的出口壓力。

B. 加入泵送流體之熱量。

C. 泵的進口產生孔蝕。

D. 泵馬達啟動電流的持續時間。

答案：D.

科目： 191004
知能類：K1.08 [2.4/2.6]
序號： P2622 (B821)

Which one of the following contains two reasons for starting a centrifugal pump with the discharge piping full of water and the discharge valve shut?

A. Prevent pump runout and prevent motor overspeed

B. Prevent pump runout and ensure lubrication of pump seals

C. Prevent water hammer and ensure adequate pump recirculation flow

D. Prevent water hammer and prevent excessive starting current

ANSWER: D.

下列何者為啟動離心泵時，必須將出口管路充滿水，並關閉出口閥的兩個理由？

A. 避免泵過流(runout)及馬達過速。

B. 避免泵過流(runout)，確保泵軸封保持潤滑。

C. 避免水錘現象，確保泵有充足的再循環流量。

D. 避免水錘現象，避免啟動電流過大。

答案：D.

科目： 191004
知能類：K1.09 [2.4/2.5]
序號： P323

Refer to the drawing of a cooling water system and the associated centrifugal pump operating curve (see figure below) in which pumps A and B are identical single-speed centrifugal pumps and only pump A is operating.

If pump B is started, system flow rate will be _____ and common pump discharge pressure will be _____.

A. the same; higher

B. higher; the same

C. the same; the same

D. higher; higher

ANSWER: D.

請參照下圖的冷卻水系統及相關的離心泵運轉曲線，泵 A 與 B 為相同的單轉速離心泵，僅有泵 A 在運轉。

假設啟動泵 B，系統流量將_____，泵共通出口壓力將_____。

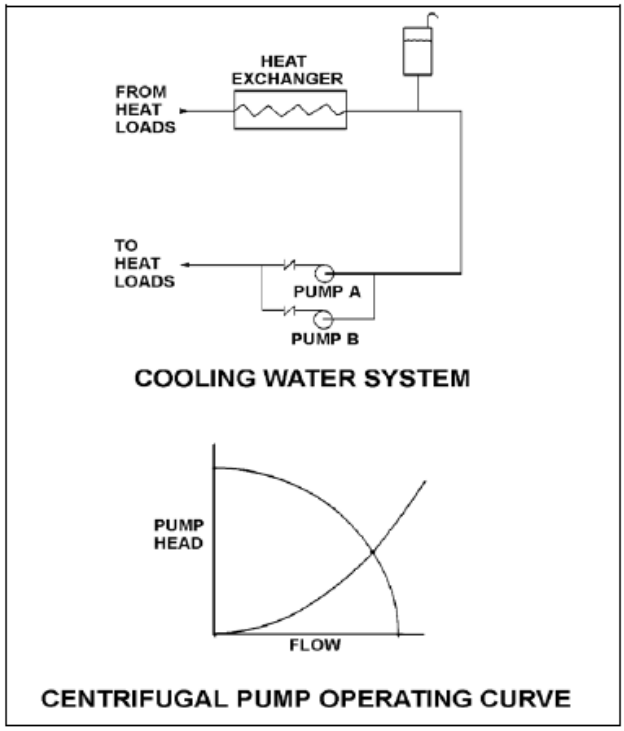
A. 相同；升高

B. 增加；相同

C. 相同；相同

D. 增加；升高

答案：D.



科目： 191004
知能類：K1.09 [2.4/2.5]
序號： P1823

Refer to the drawing of a cooling water system and the associated centrifugal pump operating curve (see figure below).

Pumps A and B are identical single-speed centrifugal pumps and only pump A is operating. If pump B is started, after the system stabilizes system flow rate will be...

A. twice the original flow.

B. the same as the original flow.

C. less than twice the original flow.

D. more than twice the original flow.

ANSWER: C.

請參照下圖的冷卻水系統及相關的離心泵運轉曲線。

泵 A 與 B 為相同的單轉速離心泵，僅有泵 A 在運轉。假設啟動泵 B，系統穩定之後，系統流量將.....

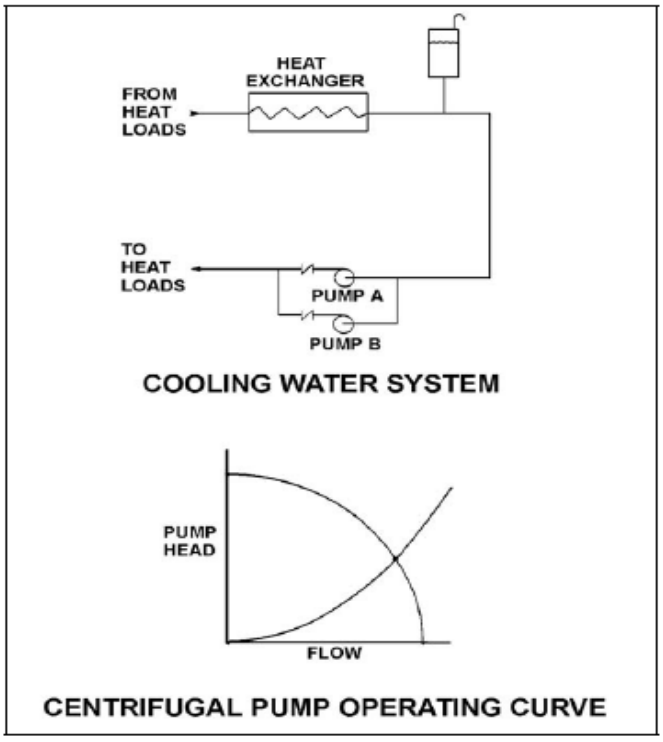
A. 變成原有流量的兩倍。

B. 同於原有流量。

C. 少於原有流量的兩倍。

D. 多於原有流量的兩倍。

答案：C.



科目： 191004
知能類：K1.09 [2.4/2.5]
序號： P2223

A centrifugal pump is operating in parallel with a positive displacement pump in an open water system. Each pump has the same maximum design pressure.

If pump discharge pressure increases to the maximum design pressure of each pump, the centrifugal pump will be operating at _____ flow and the positive displacement pump will be operating near _____ flow.

A. minimum; minimum

B. minimum; maximum rated

C. maximum rated; minimum

D. maximum rated; maximum rated

ANSWER: B.

於開放式水系統中，一離心泵與正排量泵並聯運轉。各泵的最大設計壓力相同。

如果泵的出口壓力，增至各泵的最大設計壓力，離心泵將以_____流量運轉，正排量泵將以接近_____的流量運轉。

A. 最小；最小

B. 最小；最大額定

C. 最大額定；最小

D. 最大額定；最大額定

答案：B.

科目： 191004
知能類：K1.09 [2.4/2.5]
序號： P2324

Refer to the drawing of a cooling water system (see figure below).

Pumps A and B are identical single-speed centrifugal pumps and both pumps are operating. If pump B trips, after the system stabilizes, system flow rate will be...

A. more than one-half the original flow.

B. one-half the original flow.

C. the same; only the pump head will change.

D. less than one-half the original flow.

ANSWER: A.

請參照下圖的冷卻水系統。

泵 A 與 B 為相同的單轉速離心泵，兩泵均處於運轉中。如果泵 B 跳脫，等到系統穩定後，系統流量將……

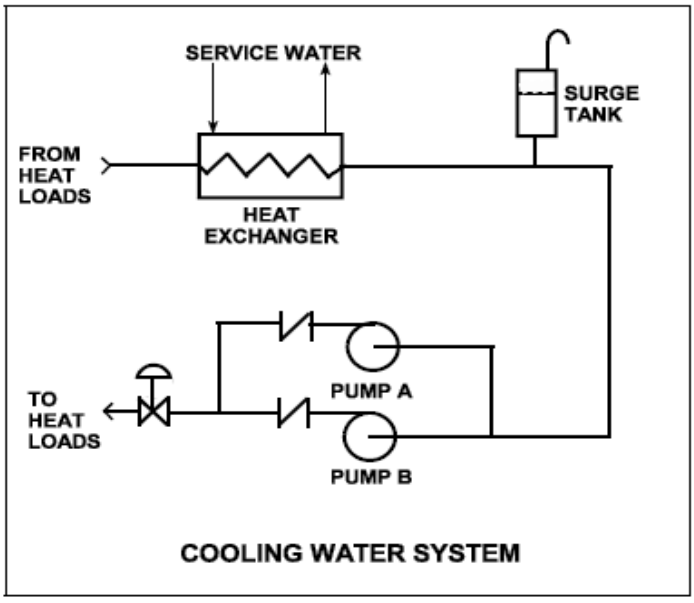
A. 大於原有流量的二分之一。

B. 等於原有流量的二分之一。

C. 維持相同，僅有泵的水頭改變。

D. 少於原有流量的二分之一。

答案：A.



科目： 191004
知能類：K1.12 [2.5/2.7]
序號： P324

Which one of the following is an indication of pump runout?

A. Low pump flow rate

B. High pump vibration

C. Low pump motor current

D. High pump discharge pressure

ANSWER: B.

下列何者為泵過流(runout)現象？

A. 泵流量低。

B. 泵震動高。

C. 泵馬達電流低。

D. 泵出口壓力高。

答案：B.

科目： 191004
知能類：K1.12 [2.5/2.7]
序號： P823

Which one of the following is an indication of pump runout?

A. High discharge pressure

B. Low pump motor current

C. High pump flow rate

D. Pump flow reversal

ANSWER: C.

下列何者為泵過流(runout)的現象？

A. 出口壓力高。

B. 泵馬達電流低。

C. 泵流量高。

D. 泵流量相反。

答案：C.

科目： 191004
知能類：K1.12 [2.5/2.7]
序號： P1123 (B1920)

Which one of the following describes centrifugal pump runout conditions?

A. High discharge pressure, low flow, high power demand

B. High discharge pressure, high flow, low power demand

C. Low discharge pressure, low flow, low power demand

D. Low discharge pressure, high flow, high power demand

ANSWER: D.

下列何者描述了離心泵過流(runout)狀況？

A. 高出口壓力(discharge pressure)，低流量，高功率消耗。

B. 高出口壓力，高流量，低功率消耗。

C. 低出口壓力，低流量，低功率消耗。

D. 低出口壓力，高流量，高功率消耗。

答案：D.

科目： 191004
知能類：K1.12 [2.5/2.7]
序號： P1623 (B1323)

A centrifugal pump is operating at maximum design flow rate, delivering water through two parallel valves. Valve "A" is half open, and valve "B" is one quarter open.

Which one of the following will occur if both valves are fully opened?

A. The pump will operate at shutoff head.

B. The pump available net positive suction head will increase.

C. The pump required net positive suction head will decrease.

D. The pump will operate at runout conditions.

ANSWER: D.

一離心泵運轉在最大設計流量下，透過兩只並聯閥門傳送水。閥「A」開度為50%，閥「B」開度為25%。

若兩閥全開，下列何者狀況會發生？

A. 泵立即在關斷水頭下運轉。

B. 泵的可用淨正吸水頭將會增加。

C. 泵的所需淨正吸水頭將會減少。

D. 泵立即在過流(runout)狀況下運轉。

答案：D.

科目： 191004
知能類：K1.12 [2.5/2.7]
序號： P1721 (B1024)

Refer to the drawing of a centrifugal pump operating curve (see figure below). Which point represents pump operation at runout conditions?

A. Point A

B. Point B

C. Point C

D. Point D

ANSWER: C.

請參照下圖的離心泵運轉曲線。

哪一點會發生泵過流(runout)？

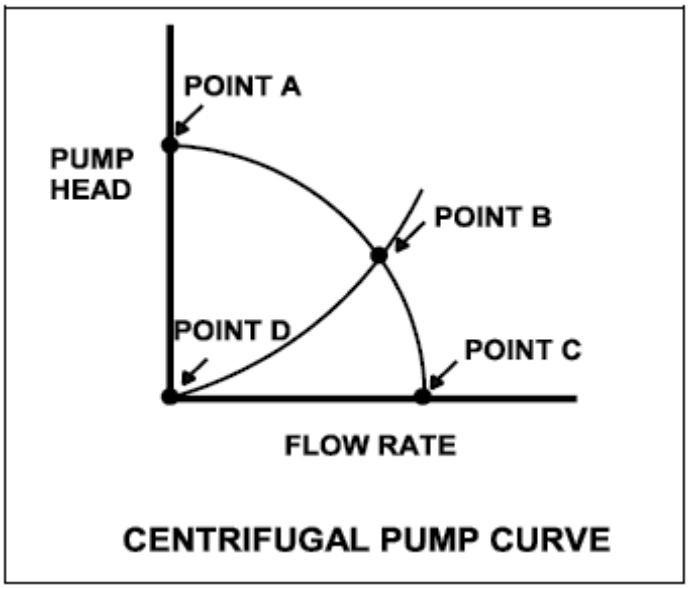
A. 位置A

B. 位置B

C. 位置C

D. 位置D

答案：C.



科目： 191004
知能類：K1.12 [2.5/2.7]
序號： P3910 (B3910)

Refer to the drawing of a cooling water system in which only centrifugal pump A is operating and the common pump discharge valve is currently 90% open (see figure below).

An abnormal total heat load on the cooling water system is causing pump A to approach operation at runout conditions. Which one of the following will cause pump A to operate farther away from runout conditions? (Assume that satisfactory available net positive suction head is maintained at all times.)

A. Starting pump B.

B. Positioning the discharge valve to 100% open.

C. Raising the water level in the surge tank by 2 feet.

D. Decreasing heat exchanger service water flow rate by 10%.

ANSWER: A.

請參照下圖的冷卻水系統，其中只有泵A在運轉，而泵之出口閥目前開度為90%。

若因冷卻水系統一異常之熱負載，導致泵A在接近過流(runout)情況下運轉。下列何者會導致泵A在更遠離過流狀況下運轉？(假設一直維持足夠的可用淨正吸水頭)。

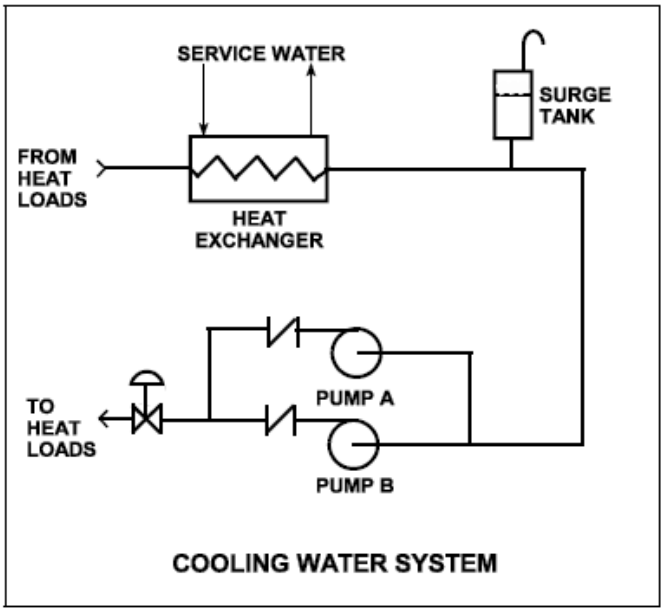
A. 啟動泵B。

B. 將出口閥調整成100%開啟。

C. 提高調節槽水位2呎。

D. 降低熱交換器冷卻海水流量10%。

答案：A.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P623 (B1423)

Refer to the drawing of a lube oil temperature control system and the associated centrifugal pump operating curve (see figure on the following page).

If the pump is operating at point B on the operating curve, how will the operating point change if the temperature control valve modulates farther open?

A. Operating point B will be located on curve 1 closer to point E.

B. Operating point B will be located on curve 1 closer to point D.

C. Operating point B will be located on curve 2 closer to point A.

D. Operating point B will be located on curve 2 closer to point C.

ANSWER: D.

請參照下頁的潤滑油溫度控制系統，以及與其相關之離心泵運轉曲線圖。

如果此泵在運轉曲線的B點運轉，將溫度控制閥開得更大，運轉點將有何種變化？

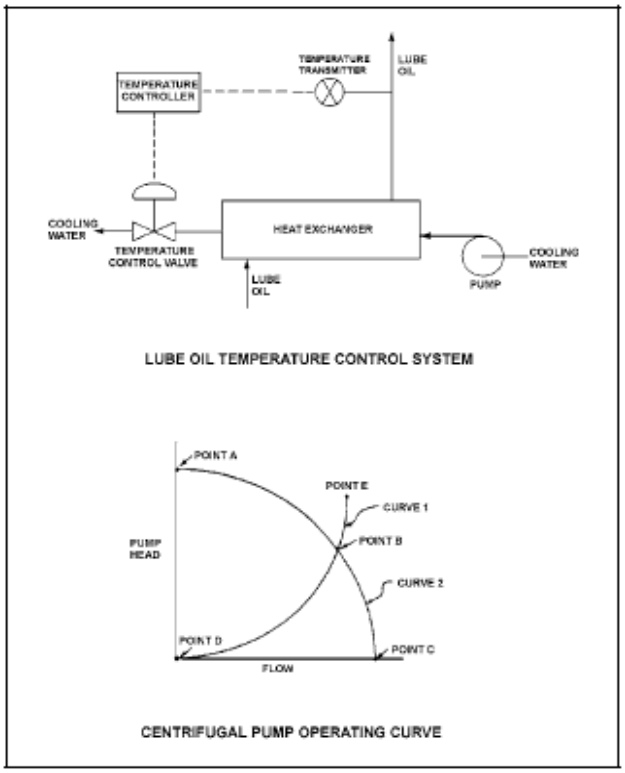
A. 運轉點B將落在曲線1上、靠近E點處。

B. 運轉點B將落在曲線1上、靠近D點處。

C. 運轉點B將落在曲線2上、靠近A點處。

D. 運轉點B將落在曲線2上、靠近C點處。

答案：D.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P723 (B722)

Refer to the drawing of a lube oil temperature control system and the associated centrifugal pump operating curve (see figure below).

The pump is operating at point B on the operating curve. If the temperature control valve modulates farther closed, operating point B will be located on curve _____, closer to point _____. (The options below assume that curves 1 and 2 are exactly as shown in the figure.)

A. 1; D

B. 2; A

C. 1; E

D. 2; C

ANSWER: B.

請參照下圖的潤滑油溫度控制系統，以及與其相關的離心泵曲線。

離心泵於運轉曲線上的B點運轉。若溫度控制閥朝關閉方向調整，運轉點B將位於曲線_____上、靠近_____點處(下列選項假設曲線1與2確實如圖所示)。

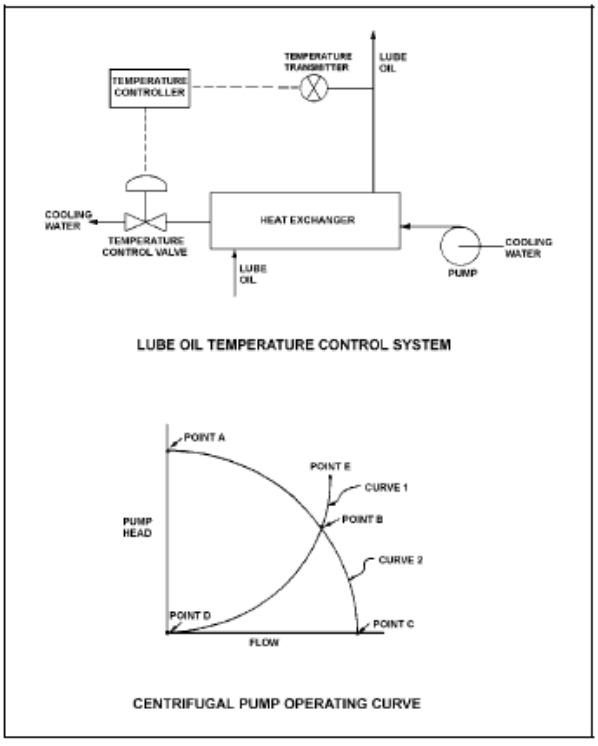
A. 1；D

B. 2；A

C. 1；E

D. 2；C

答案：B.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P824

Refer to the drawing of four centrifugal pump operating curves (see figure below).

A centrifugal pump in a closed system is operating with a partially open discharge valve. The discharge valve is then opened fully. Which set of curves illustrates the initial and final operating conditions?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: D.

請參照下圖的離心泵運轉曲線。

該離心泵於密封系統內運轉，此時的出口閥半開。之後，將出口閥調整至全開。下列何組曲線說明了最初與最後的運轉狀況？

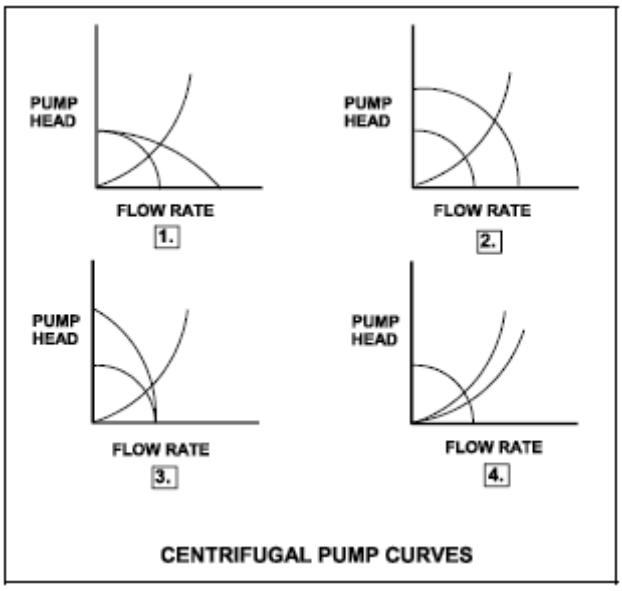
A. 1

B. 2

C. 3

D. 4

答案：D.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P926 (B1578)

Refer to the drawing of four sets of centrifugal pump operating curves (see figure below). Each set of curves shows the combination of two pump/system operating conditions.

Two identical constant-speed centrifugal pumps are operating in series in an open system when one pump trips.

Which set of operating curves depicts the "before" and "after" conditions described above?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: C.

請參照下圖的四組離心泵運轉曲線。每組曲線呈現了兩種泵/系統運轉狀態的組合。

兩個相同的定速離心泵，採串聯方式在開放系統內運轉，此時有一泵跳脫。

下列何組運轉曲線，描述了上述事件的「事前」與「事後」情形？

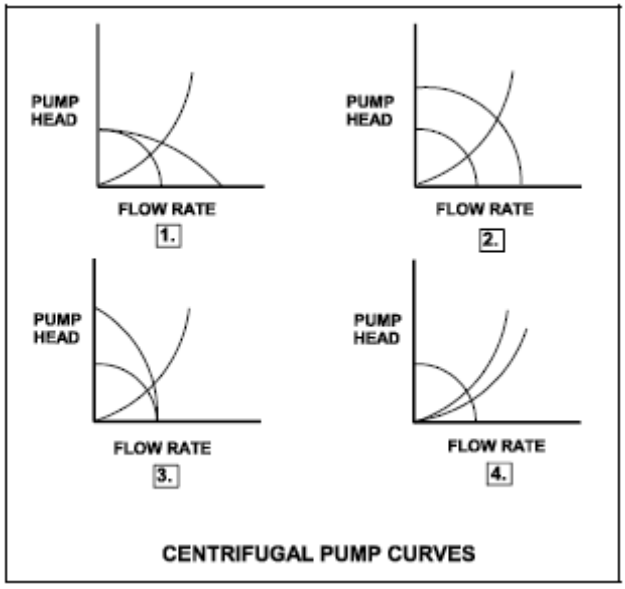
A. 1

B. 2

C. 3

D. 4

答案：C.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P1324 (B2179)

Refer to the drawing of four centrifugal pump operating curves (see figure below).

A centrifugal pump is operating in a cooling water system. Another identical centrifugal pump is started in series with the first. Which set of curves illustrates the resulting change in system parameters?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: C.

請參照下圖的四組離心泵運轉曲線。

一離心泵於冷卻水系統內運轉。另一相同離心泵採與第一離心泵串聯的方式啟動。下列何組曲線說明了系統參數的之後變化？

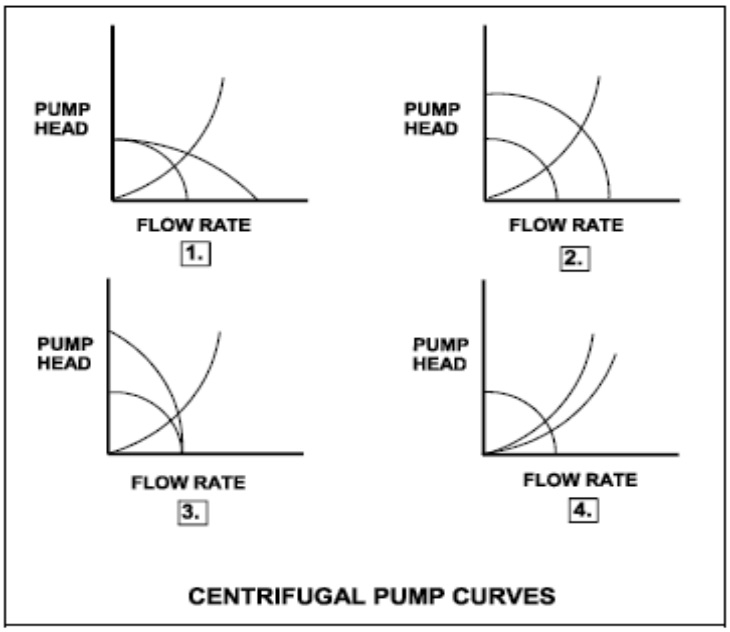
A. 1

B. 2

C. 3

D. 4

答案：C.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P1524 (B2480)

Refer to the drawing of four sets of centrifugal pump operating curves (see figure below). Each set of curves shows the results of a change in pump/system operating conditions.

Two identical constant-speed centrifugal pumps are operating in parallel in an open system when one pump trips.

Which set of operating curves depicts the "before" and "after" conditions described above?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: A.

請參照下圖的四組離心泵運轉曲線。每組曲線呈現了泵/系統運轉狀況改變的結果。

兩個相同的定速離心泵，採並聯方式在開放系統內運轉，此時有一泵跳脫。

下列何組運轉曲線，描述了上述事件的「事前」與「事後」情形？

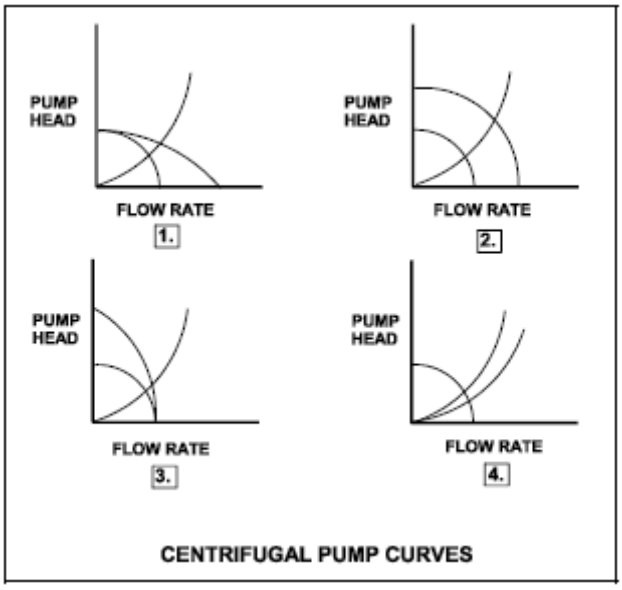
A. 1

B. 2

C. 3

D. 4

答案：A.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P1624 (B2279)

Refer to the drawing of four sets of centrifugal pump operating curves (see figure below). Each set of curves shows the results of a change in pump/system operating conditions.

One constant-speed centrifugal pump is operating in an open system when a second identical centrifugal pump is started in parallel.

Which set of operating curves depicts the "before" and "after" conditions described above?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: A.

請參照下圖的四組離心泵運轉曲線。每組曲線呈現了泵/系統運轉狀況改變的結果。

一定速離心泵於開放系統內運轉，此時採並聯方式，啟動另一個相同的離心泵。

下列何組運轉曲線，描述了上述事件的「事前」與「事後」情形？

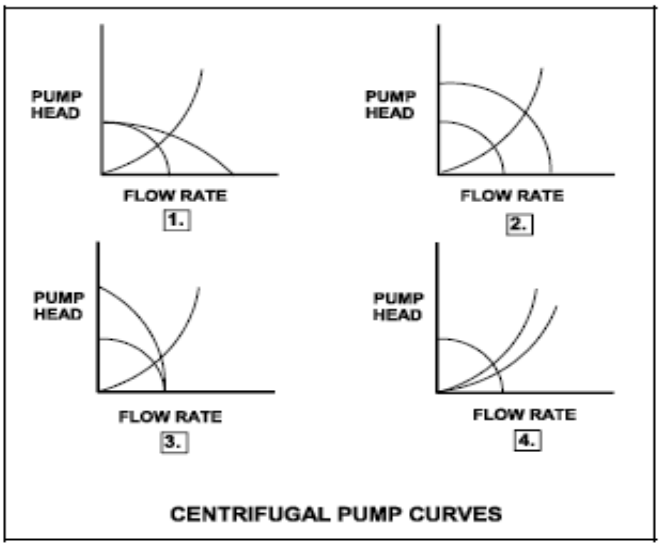
A. 1

B. 2

C. 3

D. 4

答案：A.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P1724 (B1780)

Refer to the drawing of four centrifugal pump operating curves (see figure below).

A centrifugal pump is operating in a closed water system and discharging through a heat exchanger. A second heat exchanger, in parallel with the first, is then placed in service.

Which set of curves illustrates the initial and final operating conditions?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: D.

請參照下圖的四組離心泵運轉曲線。

一離心泵於密閉水系統內運轉，並透過熱交換器排出。與第一熱交換器並聯的第二熱交換器，於此時開始運轉。

下列何組運轉曲線，描述了最初與最後的運轉狀況？

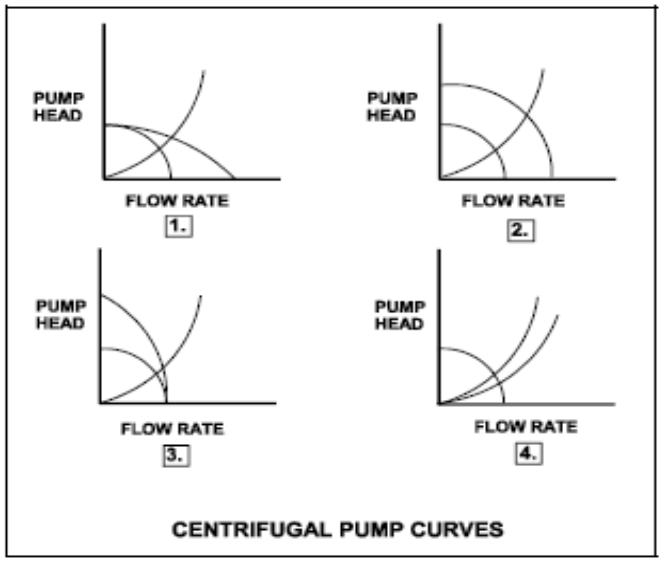
A. 1

B. 2

C. 3

D. 4

答案：D.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P1921 (B925)

Refer to the drawing of a centrifugal pump and system operating curve (see figure below).

Which one of the following determines the general shape of the curve from point D to point B?

A. The frictional losses between the pump impeller and its casing as the pump head increases

B. Pump flow losses due to back leakage through the clearances between the pump impeller and casing as the pump head increases

C. The frictional and throttling losses in the piping system as the system flow rate increases

D. Pump flow losses due to the decrease in available net positive suction head as the system flow rate increases

ANSWER: C.

請參照下圖的離心泵及系統運轉曲線。

下列何者代表從 D 點至 B 點的曲線概略形狀？

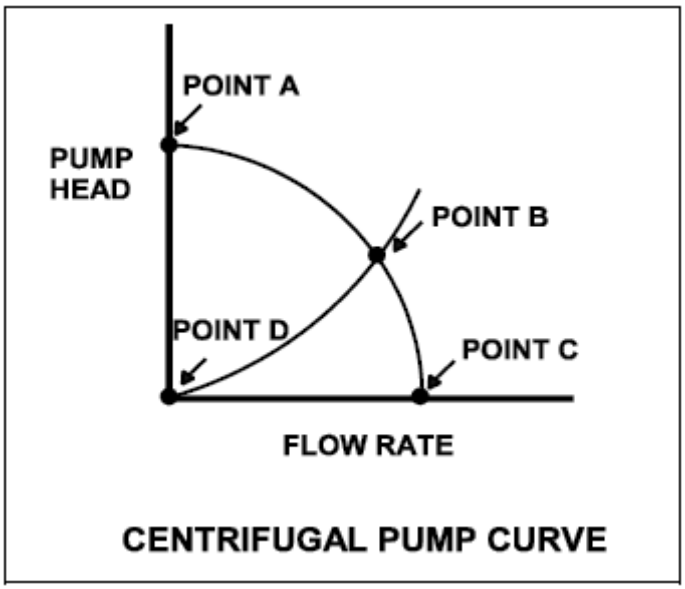
A. 隨著泵水頭增加，泵葉輪與外殼之間，出現摩擦損失。

B. 隨著泵水頭增加，泵葉輪與外殼之間的間距(clearance)出現後方洩漏(back leakage)，導致泵流量流失。

C. 隨著系統流量增加，管路系統出現摩擦與節流損失。

D. 隨著系統流量增加，可用淨正吸水頭降低，造成泵流量損失。

答案：C.


POINT A
PUMP
HEAD
POINT B
POINT D
POINT C
FLOW RATE
CENTRIFUGAL PUMP CURVE

科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P2325 (B2323)

Refer to the drawing of a centrifugal pump operating curve (see figure below).

A centrifugal pump is currently operating at point B. If the pump speed is reduced by one-half, the new operating point will be located on curve _____, closer to point _____. (Assume that no other changes occur in the system.)

A. 1; D

B. 2; A

C. 1; E

D. 2; C

ANSWER: A.

請參照下圖的離心泵運轉曲線。

一離心泵在B點上運轉。若泵轉速降低一半，則新運轉點將會落在曲線_____上，比較靠近_____點(假設系統沒有其他改變發生)。

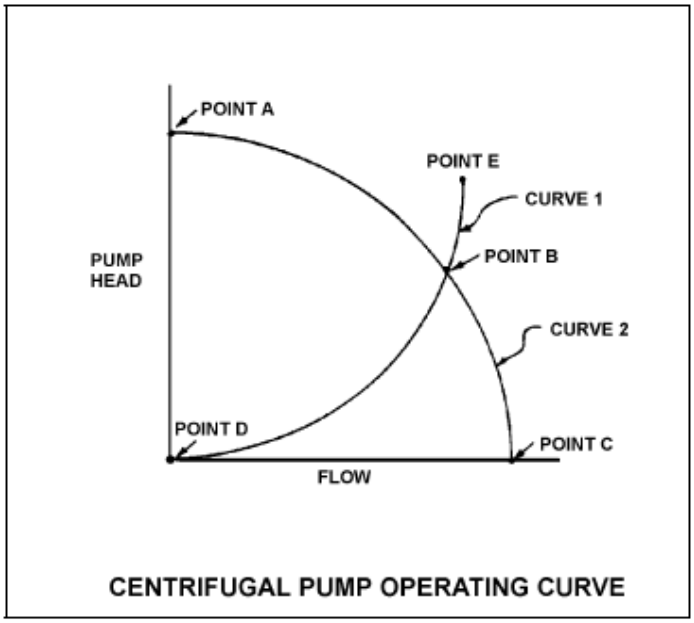
A. 1；D

B. 2；A

C. 1；E

D. 2；C

答案：A.



CENTRIFUGAL PUMP OPERATING CURVE

科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P2422 (B2422)

Refer to the drawing of a lube oil temperature control system (see figure below).

The pump is operating with the temperature control valve one-half open. If the temperature control valve modulates farther closed, system head loss will _____ and pump head will _____.

A. increase, decrease

B. increase, increase

C. decrease, decrease

D. decrease, increase

ANSWER: B.

請參照下圖的潤滑油溫度控制系統。

此泵原在溫度控制閥半開情況下運轉。若此溫度控制閥朝關閉方向調整，則系統之水頭損失將_____，而泵水頭將會_____。

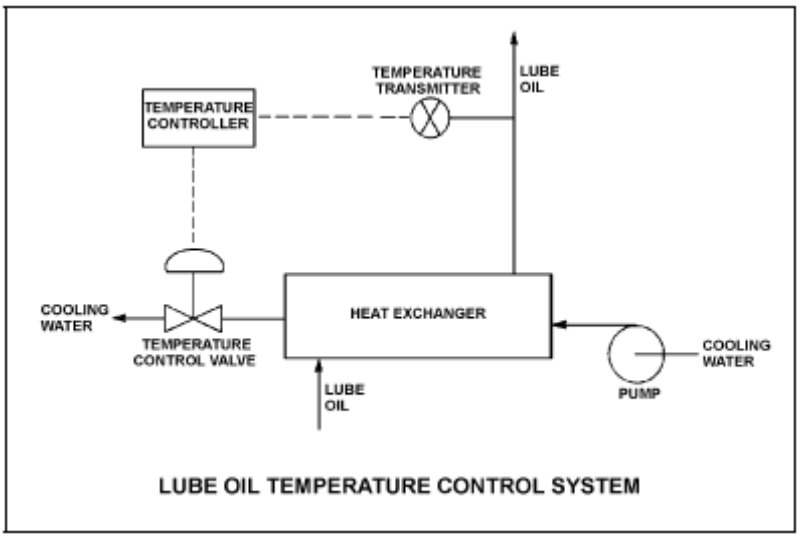
A. 增加；減小

B. 增加；增加

C. 減小；減小

D. 減小；增加

答案：B.



LUBE OIL TEMPERATURE CONTROL SYSTEM

科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P2523 (B2524)

Refer to the drawing of a lube oil temperature control system and the associated centrifugal pump operating curve (see figure below).

If the pump is operating at point B on the operating curve, how will the operating point change if the temperature controller setpoint is decreased by 10°F?

A. Operating point B will be located on curve 1 closer to point E.

B. Operating point B will be located on curve 1 closer to point D.

C. Operating point B will be located on curve 2 closer to point A.

D. Operating point B will be located on curve 2 closer to point C.

ANSWER: D.

請參照下圖的潤滑油溫度控制系統，以及與相關之離心泵運轉曲線。

此泵在運轉曲線上的B點運轉。現若將此溫度控制器設定值減小10°F，則運轉點將會如何改變？

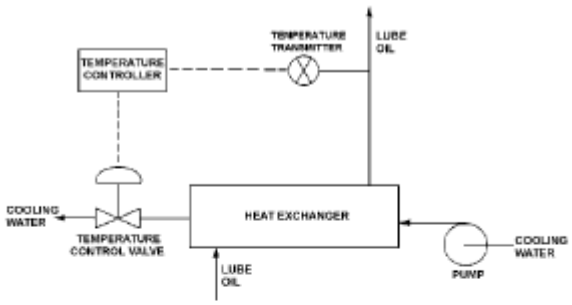
A. 運轉點B將會落在曲線1上、較靠近E點。

B. 運轉點B將會落在曲線1上、較靠近D點。

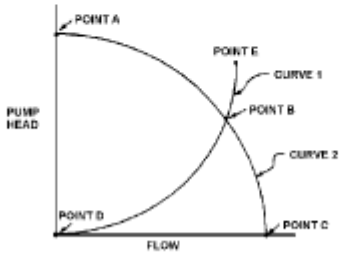
C. 運轉點B將會落在曲線2上、較靠近A點。

D. 運轉點B將會落在曲線2上、較靠近C點。

答案：D.



LUBE OIL TEMPERATURE CONTROL SYSTEM



CENTRIFUGAL PUMP OPERATING CURVE

科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P2723 (B2718)

Refer to the drawing showing two operating points for the same centrifugal pump (see figure below).

Operating point A was generated from pump performance data taken six months ago. Current pump performance data was used to generate operating point B. Which one of the following would cause the observed difference between operating points A and B?

A. The pump discharge valve was more open when data was collected for operating point A.

B. The pump discharge valve was more closed when data was collected for operating point A.

C. The pump internal components have worn since data was collected for operating point A.

D. The system piping head loss has increased since data was collected for operating point A.

ANSWER: C.

請參照下圖中，同一離心泵的兩個運轉點。

運轉點A從六個月前的運轉資料產生。運轉點B由現在的泵運轉資料產生。下列何者可能為造成運轉點A和運轉點B之間差異的原因？

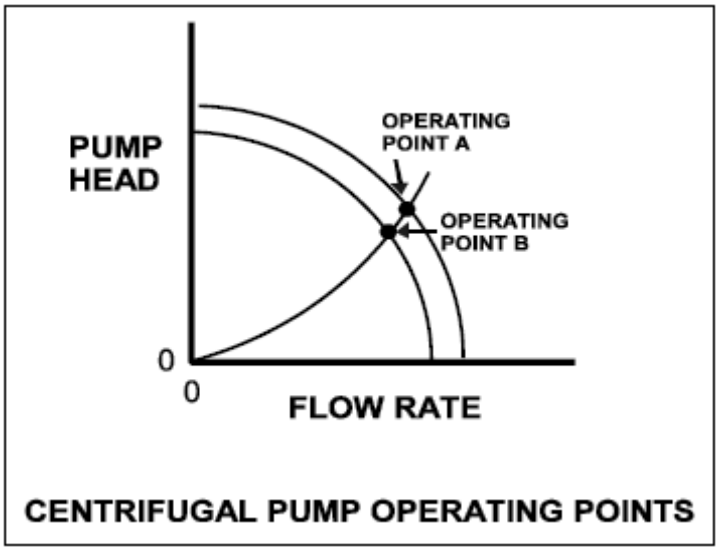
A. 收集運轉點A的資料時，泵的出口閥開度較大。

B. 收集運轉點A的資料時，泵的出口閥開度較小。

C. 收集完運轉點A的資料後，泵內部元件有磨損。

D. 收集完運轉點A的資料之後，系統管路水頭損失增加。

答案：C.



CENTRIFUGAL PUMP OPERATING POINTS

科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P2823 (B2879)

Refer to the drawing of four centrifugal pump operating curves (see figure below).

A two-speed centrifugal pump is operating in low speed in a cooling water system and discharging through a heat exchanger. The pump is then switched to high speed.

Which set of curves illustrates the initial and final operating conditions?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: B.

請參照下圖的四組離心泵運轉曲線。

一部兩段速離心泵於密閉水系統內低速運轉，並透過熱交換器排出。接著將離心泵切換至高速。

下列何組運轉曲線描述了最初與最後的運轉狀況？

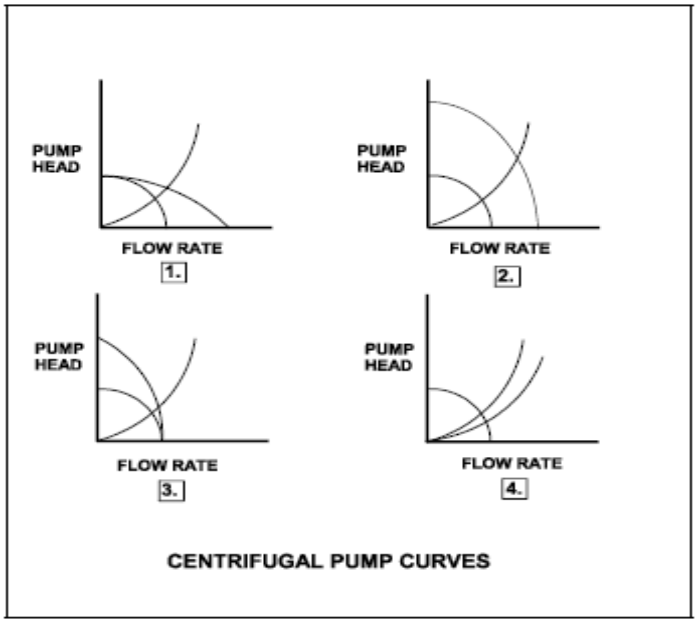
A. 1

B. 2

C. 3

D. 4

答案：B.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P2923 (B3579)

Refer to the drawing of four centrifugal pump operating curves (see figure below).

A two-speed centrifugal pump is operating at fast speed in a cooling water system and discharging through a heat exchanger. The pump is then switched to slow speed.

Which set of curves illustrates the initial and final operating conditions?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: B.

請參照下圖的四組離心泵運轉曲線。

一部兩段速離心泵於冷卻水系統內高速運轉，並透過熱交換器排出。接著將離心泵切換至低速。

下列何組運轉曲線描述了最初與最後的運轉狀況？

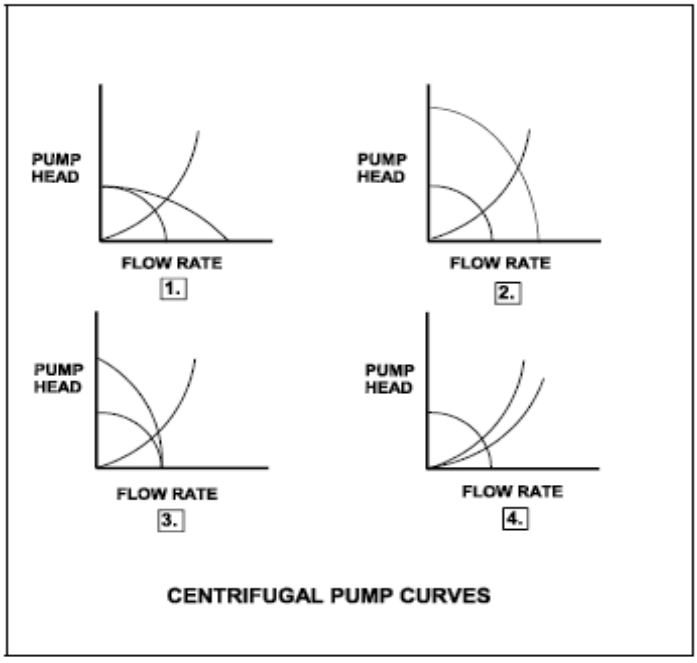
A. 1

B. 2

C. 3

D. 4

答案：B.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P3323 (B1020)

Refer to the drawing of a cooling water system and the associated centrifugal pump operating curve (see figure below). Pumps A and B are identical single-speed centrifugal pumps and initially only pump A is operating.

Pump B is then started. After the system stabilizes, system flow rate will be...

A. the same as the initial flow rate.

B. less than twice the initial flow rate.

C. twice the initial flow rate.

D. more than twice the initial flow rate.

ANSWER: B.

請參照下圖的冷卻水系統，以及相關的離心泵運轉曲線。泵A和泵B為相同的單轉速離心泵，開始時只有泵A在運轉。

接著泵B開始運轉，等到系統穩定之後，系統流量將會……

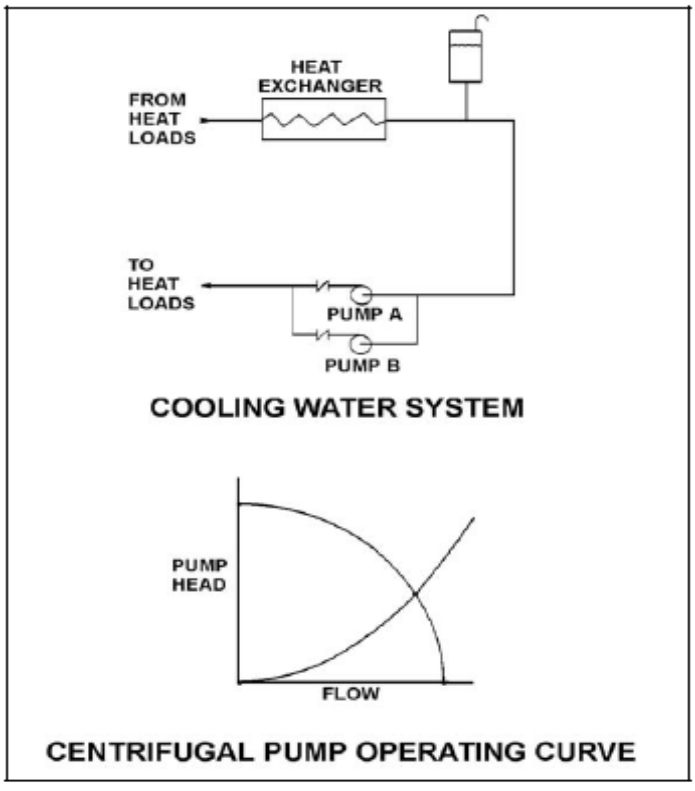
A. 和原流量相同。

B. 低於原流量的兩倍。

C. 變成原流量的兩倍。

D. 多於原流量的兩倍。

答案：B.



科目： 191004
知能類：K1.14 [2.4/2.5]
序號： P4211 (B4211)

Refer to the drawing of an operating cooling water system (see figure below). As depicted in the drawing, only two of the three system heat loads are currently in service.

Which one of the following changes to the cooling water system will result in a higher cooling water pump flow rate and a reduced pump discharge head?

A. Increase pump speed by 20%.

B. Decrease pump speed by 20%.

C. Isolate one of the two in-service heat loads.

D. Place the third system heat load in service.

ANSWER: D.

請參照下圖的運轉中冷卻水系統。如圖所示，三個系統熱負載(heat load)之中，目前僅有使用兩個。

冷卻水系統若經歷下列何種變化，將導致冷卻水泵流量增加，並且泵出口水頭降低？

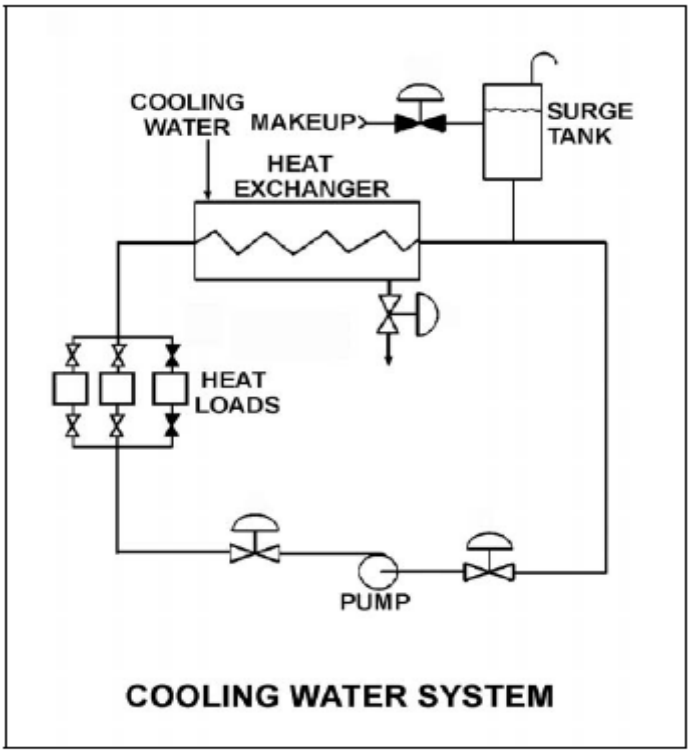
A. 泵轉速增加 20%。

B. 泵轉速降低 20%。

C. 隔離兩個使用中的熱負載。

D. 使用第三個系統熱負載。

答案：D.



COOLING WATER SYSTEM

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P114 (B2223)

A motor-driven centrifugal pump is operating in an open system with its discharge valve throttled to 50%. If the discharge valve is fully opened, available net positive suction head (NPSH) will _____ and required NPSH will _____.

A. remains the same; increase

B. remains the same; remains the same

C. decrease; increase

D. decrease; remains the same

ANSWER: C.

馬達驅動的離心泵，在開放系統中運轉，泵的出口閥節流至50%開度。如果泵的出口閥位置調整至全開，可用淨正吸水頭(NPSH)將會_____，而所需NPSH將會_____。

A. 維持不變；增加

B. 維持不變；維持不變

C. 降低；增加

D. 降低；維持不變

答案：C.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P325 (B322)

Increasing the flow rate through a centrifugal pump by throttling open the discharge valve will cause pump head to...

A. increase and stabilize at a higher value.

B. decrease and stabilize at a lower value.

C. remain constant.

D increase, then decrease following the pump's efficiency curve.

ANSWER: B.

調整離心泵出口閥的開度以增加流量，將導致泵水頭.....

A. 增加，並於較高數值處趨於穩定。

B. 降低，並於較低數值處趨於穩定。

C. 維持不變。

D. 增加，然後隨著泵效率曲線降低。

答案：B.

科目： 191004
知能類：K1.15
序號： P724 (B723)

A centrifugal pump is operating at rated conditions in an open system. If the pump recirculation valve is opened farther, pump discharge pressure will _____ and pump flow rate will _____.

A. increase; decrease

B. decrease; increase

C. increase; increase

D. decrease; decrease

ANSWER: B.

一離心泵於開放系統中，按照額定狀況運轉。若此泵之再循環閥開度增加，則泵出口壓力將會_____，而泵流量將會_____。

A. 增加；減小

B. 減小；增加

C. 增加；增加

D. 減小；減小

答案：B.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P1421 (B1421)

A centrifugal pump is operating at rated conditions in an open system with all valves fully open. If the pump discharge valve is throttled to 50%, pump suction pressure will _____ and pump discharge pressure will _____.

A. increase; decrease

B. decrease; increase

C. increase; increase

D. decrease; decrease

ANSWER: C.

一開放系統中，一離心泵在額定狀況下運轉，所有閥全開。若此泵出口閥節流至50%開度，則泵進口壓力將_____，而泵出口壓力將會_____。

A. 增加；減小

B. 減小；增加

C. 增加；增加

D. 減小；減小

答案：C.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P2025 (B2019)

A variable-speed centrifugal pump is operating at rated speed in an open system. If the pump speed is decreased by 50%, available net positive suction head (NPSH) will _____ and required NPSH will _____.

A. increase; decrease

B. increase; remain the same

C. decrease; decrease

D. decrease; remain the same

ANSWER: A.

變速離心泵在開放系統中以額定速率運轉。如果將泵的轉速降低50%，可用淨正吸水頭(NPSH)將會_____，而所需NPSH將會_____。

A. 增加；減少

B. 增加；維持不變

C. 減少；減少

D. 減少；維持不變

答案：A.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P2224 (B521)

A motor-driven centrifugal pump is operating in an open system with its discharge valve throttled to 50%. How will the pump be affected if the discharge valve is fully opened?

A. Total developed head decreases, and motor current decreases.

B. Total developed head increases, and available net positive suction head decreases.

C. The potential for pump cavitation decreases, and pump differential pressure decreases.

D. Available net positive suction head decreases, and pump differential pressure decreases.

ANSWER: D.

一馬達驅動之離心泵，在一開放系統下操作，其出口閥節流至50%開度。若此閥全開，則此泵會受到何種影響？

A. 淨出口水頭減小，馬達電流減小。

B. 淨出口水頭增加，可用淨正吸水頭減小。

C. 泵孔蝕可能性減小，泵差壓減小。

D. 可用淨正吸水頭減小，泵差壓減小。

答案：D.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P2424 (B2420)

A variable speed motor-driven centrifugal pump is operating at 50% speed in an open system. If the pump speed is increased to 100%, available net positive suction head (NPSH) will _____ and required NPSH will _____.

A. increase; remain the same

B. increase; increase

C. decrease; remain the same

D. decrease; increase

ANSWER: D.

變速馬達驅動的離心泵，在開放系統中以50%的轉速運轉。如果泵轉速提高到100%，可用淨正吸水頭(NPSH)將會_____，所需NPSH將會_____。

A. 增加；維持不變

B. 增加；增加

C. 減少；維持不變

D. 減少；增加

答案： D.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P2624 (B2622)

Which one of the following describes a reason for designing centrifugal pumps with suction nozzles that are larger than their discharge nozzles?

A. Increases total pump head by increasing the velocity head at the suction of the pump.

B. Increases the differential pressure across the pump by decreasing pump head loss.

C. Increases pump available net positive suction head by decreasing head loss at the pump suction.

D. Increases pump capacity by decreasing turbulence at the suction of the pump.

ANSWER: C.

下列何者是設計離心泵時，進口噴嘴較出口噴嘴為大的原因之一？

A. 藉由增加泵進口處之速度水頭而增加總泵水頭。

B. 藉由減少泵水頭損失而增加泵之差壓。

C. 藉由減小在泵進口處的水頭損失，而增加可用淨正進口水頭。

D. 藉由減小泵進口處的擾流而增加泵流量。

答案：C.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P2924 (B2924)

Refer to the drawing of a centrifugal pump operating curve (see figure below).

A centrifugal pump operating in a cooling water system exhibits the operating curve shown below. Which one of the following points on the curve will be closest to the pump operating conditions after the pump suction valve is inadvertently closed?

A. Point A

B. Point B

C. Point C

D. Point D

ANSWER: D.

請參照下圖的離心泵運轉曲線。

一離心泵在冷卻水系統中運轉，其運轉曲線如下圖所示。在泵進口閥不小心關閉後，下圖何點最接近泵的運轉狀況？

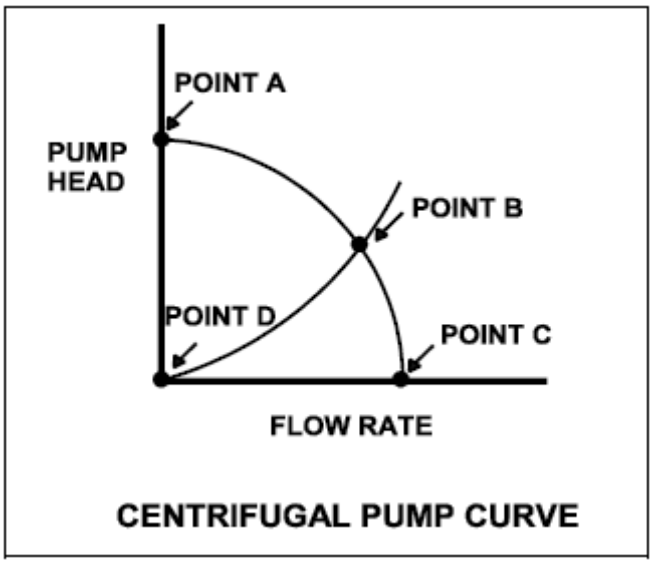
A. A點

B. B點

C. C點

D. D點

答案：D.



科目： 191004
知能類：K1.15 [2.6/2.8]
序號： P3623 (B3623)

A centrifugal firewater pump is operating to pressurize a fire main. The pump takes suction on a water reservoir. The reservoir water level and the pump are both at sea level.
Given:

- The pump has a design shutoff head of 100 feet.
- The required net positive suction head (NPSH) for the pump is 15 feet.
- The reservoir water temperature is 60°F.
- A fire hose connected to the fire main is being used to suppress an elevated fire.

At which one of the following elevations (referenced to sea level) will the fire hose spray nozzle first be unable to provide flow? (Disregard head loss in the fire main and fire hose.)

A. 86 feet

B. 101 feet

C. 116 feet

D. 135 feet

ANSWER: B.

一離心消防泵為一消防主水管加壓。此泵從一水池取水，此水池水位與泵均位於海平面。

已知：

- 此泵之設計關斷水頭為100呎。
- 泵所需之淨正吸水頭為15呎。
- 水池水溫為60°F。
- 消防水管連接至消防主水管，用以撲滅一高處火災。

請問於下列何種高度(以海平面為準)時，消防水管噴嘴將首次無法提供水流？(忽略在消防主水管以及消防水管之水頭損失)。

A. 86呎

B. 101呎

C. 116呎

D. 135呎

答案：B.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P3912 (B3911)

A centrifugal firewater pump is operating to pressurize a fire main. The pump takes suction from a water reservoir. A fire hose connected to the fire main is being used to suppress an elevated fire.

Given:
- The pump eye is located 5 feet above the reservoir water level.
- The pump has a design shutoff head of 120 feet.
- The required net positive suction head (NPSH) for the pump is 15 feet.
- The reservoir water temperature is 60°F.

At which one of the following elevations above the pump eye will the fire hose spray nozzle first be unable to provide flow? (Disregard all sources of system frictional head loss.)

A. 111 feet

B. 116 feet

C. 121 feet

D. 126 feet

ANSWER: B.

一離心消防泵為一消防主水管加壓。此泵從一水池取水。消防水管連接至消防主水管用以撲滅一高處火災。

已知：
- 泵吸入口位於水池水面上方5呎。
- 此泵設計之關斷水頭為120呎。
- 泵的所需淨正吸水頭為15呎。
- 水池水溫為60°F。

於泵吸入口上方何種高度時，消防水管噴嘴將首次無法提供水流？(忽略所有系統摩擦水頭損失來源)。

A. 111呎

B. 116呎

C. 121呎

D. 126呎

答案：B.

科目： 191004
知能類：K1.15 [2.5/2.8]
序號： P4313 (B4312)

A centrifugal firewater pump is operating to pressurize a fire main. The pump takes suction from a vented water storage tank. A fire hose connected to the fire main is being used to suppress an elevated fire.

Given:
- The pump impeller eye is located 30 feet below the tank water level.
- The pump has a design shutoff head of 120 feet.
- The required net positive suction head (NPSH) for the pump is 15 feet.
- The tank water temperature is 60°F.

At which one of the following elevations above the pump impeller eye will the fire hose spray nozzle first be unable to provide flow? (Disregard all sources of system frictional head loss.)

A. 106 feet

B. 121 feet

C. 136 feet

D. 151 feet

ANSWER: D.

一離心消防泵為消防主水管加壓。此泵從一通大氣之水池取水。消防水管連接至消防主水管用以撲滅高處火災。

已知：
- 泵的葉輪吸入口位於水池水面下方30呎。
- 泵的設計關斷水頭為120呎。
- 泵的所需淨正吸水頭(NPSH)為15呎。
- 水池水溫為60°F。

請問於泵葉輪吸入口上方多少高度時，消防水管噴嘴將首度無法提供水流？(忽略所有系統摩擦水頭損失來源)。

A. 106呎

B. 121呎

C. 136呎

D. 151呎

答案：D.

科目： 191004
知能類：K1.16 [2.8/2.9]
序號： P624

Which one of the following specifies the proper pump discharge valve position and the basis for that position when starting a large centrifugal pump?

A. Discharge valve fully open to reduce motor power requirements

B. Discharge valve throttled to reduce motor power requirements

C. Discharge valve fully open to ensure adequate pump net positive suction head

D. Discharge valve throttled to ensure adequate pump net positive suction head

ANSWER: B.

下列何者規定了啟動大型離心泵時，泵出口閥的適當位置，以及該位置的依據？

A. 出口閥全開以降低所需馬達功率。

B. 出口閥節流以降低所需馬達功率。

C. 出口閥全開，確保適當的淨正吸水頭。

D. 出口閥節流，確保適當的淨正吸水頭。

答案：B.

科目： 191004
知能類：K1.16 [2.8/2.9]
序號： P1725 (B1722)

A typical single-stage radial-flow centrifugal pump is being returned to service following maintenance on its ac motor. Which one of the following will occur when the pump is started if two of the three motor power leads were inadvertently swapped during restoration?

A. The motor breaker will trip on instantaneous overcurrent.

B. The motor will not turn and will emit a humming sound.

C. The motor will rotate in the reverse direction with reduced or no flow rate.

D. The motor will rotate in the normal direction with reduced flow rate.

ANSWER: C.

一典型之單級徑流式離心泵，其交流馬達經維修之後，重新安裝於系統。若此泵三組馬達引線中，有兩組在修復時無意中被調換，則將發生下列何種狀況？

A. 馬達斷路器將因瞬間過電流超載而跳脫。

B. 馬達無法轉動，且將發出低鳴聲。

C. 馬達將以反向運轉，流量降低或無流量。

D. 馬達將會以正常方向運轉，流量降低。

答案：C.

科目： 191004
知能類：K1.20 [2.8/2.8]
序號： P25

If the speed of a positive displacement pump is increased, the available net positive suction head will _____ and the probability of cavitation will _____.

A increase; increase

B. decrease; decrease

C. increase; decrease

D. decrease; increase

ANSWER: D.

如果正排量泵的轉速增加，可用淨正吸水頭將_____，孔蝕可能性將_____。

A. 增加；提高

B. 減少；降低

C. 增加；降低

D. 減少；提高

答案：D.

科目： 191004
知能類：K1.20 [2.8/2.8]
序號： P226

An increase in positive displacement pump speed will cause the available net positive suction head for the pump to...

A. decrease due to the increase in fluid flow.

B. decrease due to the increase in fluid discharge pressure.

C. increase due to the increase in fluid discharge pressure.

D. increase due to the increase in fluid flow.

ANSWER: A.

如果正排量泵的轉速增加，該泵的可用淨正吸水頭將……

A. 降低，因為流量增加。

B. 降低，因為流體出口壓力增加。

C. 增加，因為流體出口壓力增加。

D. 增加，因為流量增加。

答案：A.

科目： 191004
知能類：K1.20 [2.8/2.8]
序號： P1025

The minimum required net positive suction head for a typical positive displacement pump will increase the most if the pump...

A. motor speed increases from 1,200 rpm to 1,600 rpm.

B. discharge pressure decreases from 100 psig to 50 psig.

C. suction temperature increases from 75°F to 85°F.

D. discharge valve is positioned from 90% open to fully open.

ANSWER: A.

典型的正排量泵遇到下列何種情形，將導致該泵的最低所需淨正吸水頭增至最高？

A. 馬達轉速從 1,200 rpm 增至 1,600 rpm。

B. 出口壓力從 100 psig 減至 50 psig。

C. 進口溫度從 75°F 增至 85°F。

D. 出口閥從 90%開度移至全開。

答案：A.

科目： 191004
知能類：K1.21 [3.0/3.1]
序號： P1425 (B1125)

Which one of the following describes the proper location for a relief valve that will be used to prevent exceeding the design pressure of a positive displacement pump and associated piping?

A. On the pump suction piping upstream of the suction isolation valve.

B. On the pump suction piping downstream of the suction isolation valve.

C. On the pump discharge piping upstream of the discharge isolation valve.

D. On the pump discharge piping downstream of the discharge isolation valve.

ANSWER: C.

針對用以預防正排量泵與相關管路超出設計壓力之釋壓閥適當位置，下列何者敘述正確？

A. 在泵進口管路上，位於進口隔離閥的上游。

B. 在泵進口管路上，位於進口隔離閥的下游。

C. 在泵出口管路上，位於出口隔離閥的上游。

D. 在泵出口管路上，位於出口隔離閥的下游。

答案：C.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P326 (B323)

A positive displacement pump (PDP) is operating in an open system. PDP parameters are as follows:

PDP speed	= 1,000 rpm
PDP discharge pressure	= 2,000 psig
PDP suction pressure	= 50 psig
PDP flow rate	= 150 gpm

Which one of the following changes will cause PDP flow rate to exceed 200 gpm?

A. A second identical discharge path is opened.

B. PDP speed is increased to 1,500 rpm.

C. PDP suction pressure is increased to 120 psig.

D. Downstream system pressure is decreased to 1,000 psig.

ANSWER: B.

一正排量泵(PDP)於一開放系統中運轉，相關參數如下所示：

PDP轉速	＝1,000 rpm
PDP出口壓力	＝2,000 psig
PDP進口壓力	＝50 psig
PDP流量	＝150 gpm

下列何項改變將導致PDP流量超過200 gpm？

A. 開放第二條相同的出口路線。

B. PDP速度增加至1,500 rpm。

C. PDP進口壓力增加至120 psig

D. 下游系統壓力降低至1,000 psig。

答案：B.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P826 (B1123)

If the fully-open discharge valve of a reciprocating positive displacement pump is throttled closed approximately 10%, pump flow rate will _____ and pump head will _____. (Assume "ideal" pump response.)

A. decrease; increase

B. remain constant; increase

C. decrease; remain constant

D. remain constant; remain constant

ANSWER: B.

若一往復式正排量泵(reciprocating positive displacement pump)之出口閥節流關閉約10%，則泵流量將會_____，而泵水頭將會_____(假設為「理想」的泵反應。)

A. 減小；增加

B. 維持不變；增加

C. 減小；維持不變

D. 維持不變；維持不變

答案：B.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P925

A variable-speed positive displacement pump is operating at 100 rpm with a flow rate of 60 gpm in an open system. To decrease pump flow rate to 30 gpm, pump speed must be decreased to approximately...

A. 25 rpm.

B. 35 rpm.

C. 50 rpm.

D. 71 rpm.

ANSWER: C.

變速式正排量泵以 100 rpm 的速度，於開放系統中運轉，流量為 60 gpm。欲將泵流量降至 30 gpm，泵速約略得降至……

A. 25 rpm

B. 35 rpm

C. 50 rpm

D. 71 rpm

答案：C.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P1026

Which one of the following conditions will result in the greatest increase in volumetric flow rate through a positive displacement pump?

A. Doubling the pump speed

B. Doubling pump net positive suction head

C. Reducing downstream system pressure by one-half

D. Positioning the discharge valve from half open to full open

ANSWER: A.

下列何種狀況將導致通過正排量泵的體積流量(volumetric flow)增額最大？

A. 泵速加倍。

B. 泵的淨正吸水頭加倍。

C. 下游系統壓力減半。

D. 出口閥從半開移至全開。

答案：A.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P1126

Which one of the following describes single-speed pump operating characteristics?

A. Centrifugal pumps deliver a variety of flow rates at a constant head.

B. Centrifugal pumps deliver a constant head over a variety of flow rates.

C. Positive displacement pumps deliver a variety of flow rates at a constant head.

D. Positive displacement pumps deliver a constant flow rate over a variety of heads.

ANSWER: D.

下列何者描述了單轉速泵的運轉特色？

A. 離心泵於固定水頭處，傳送不同的流量。

B. 離心泵利用不同流量，傳送固定水頭。

C. 正排量泵於固定水頭處，傳送不同流量。

D. 正排量泵在不同水頭上，傳送一定流量。

答案：D.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P1526 (B1525)

A positive displacement pump (PDP) is operating in an open system. PDP parameters are as follows:

PDP speed	= 480 rpm
PDP discharge pressure	= 1,000 psig
PDP suction pressure	= 10 psig
PDP flow rate	= 60 gpm

Which one of the following changes will cause PDP flow rate to exceed 100 gpm?

A. PDP speed is increased to 900 rpm.

B. A second identical discharge path is opened.

C. PDP suction pressure is increased to 40 psig.

D. Downstream system pressure is decreased to 500 psig.

ANSWER: A.

一正排量泵(PDP)於開放系統中運轉。PDP參數如下所示：

PDP轉速	＝480 rpm
PDP出口壓力	＝1,000 psig
PDP進口壓力	＝10 psig
PDP流量	＝60 gpm

下列何項改變將導致PDP流量超過100 gpm？

A. PDP轉速增加至900 rpm。

B. 開放第二條相同的出口路線。

C. PDP進口壓力增加至40 psig。

D. 下游系統壓力降低至500 psig。

答案：A.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P1726 (B1919)

An ideal (no slip) reciprocating positive displacement pump is operating to provide makeup water to a reactor coolant system that is being maintained at 2,200 psig. The discharge valve of the pump was found to be throttled to 80% open.

If the valve is subsequently fully opened, pump flow rate will _____ and pump head will _____.

A. increase; decrease

B. remain constant; decrease

C. increase; remain constant

D. remain constant; remain constant

ANSWER: B.

一理想(無滑移)之往復式正排量泵，為維持在2,200 psig之反應爐冷卻水系統提供補給水，此泵之出口閥目前節流至80%開度。

若此閥後來全開，則泵流量將會_____，而泵水頭將會_____。

A. 增加；減小

B. 維持不變；減小

C. 增加；維持不變

D. 維持不變；維持不變

答案：B.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P2126 (B1824)

A variable-speed positive displacement pump is operating at 100 rpm with a flow rate of 60 gpm in an open system. To decrease pump flow rate to 25 gpm, pump speed must be decreased to approximately...

A. 17 rpm.

B. 33 rpm.

C. 42 rpm.

D. 64 rpm.

ANSWER: C.

一變速正排量泵於一開放系統中，在轉速100 rpm，流量60 gpm下運轉。為了降低流量至25 gpm，則泵轉速應該減小至大約……

A. 17 rpm

B. 33 rpm

C. 42 rpm

D. 64 rpm

答案：C.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P2526 (B2525)

Which one of the following conditions will result in the greatest increase in volumetric flow rate in a water system with one positive displacement pump operating at 400 rpm and a discharge pressure of 100 psig?

A. Increasing pump speed to 700 rpm

B. Decreasing pump discharge pressure to 40 psig

C. Starting a second identical positive displacement pump in series with the first

D. Starting a second identical positive displacement pump in parallel with the first

ANSWER: D.

於一在轉速400 rpm與出口壓力100 psig運轉的正排量泵之水系統中，下列何種狀況將導致體積流量(volumetric flow)增加最大？

A. 增加泵轉速至700 rpm。

B. 減少泵出口壓力至40 psig。

C. 起動與第一泵串聯之相同的第二正排量泵。

D. 起動與第一泵並聯之相同的第二正排量泵。

答案：D.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P2626 (B2624)

A section of reactor coolant piping is being hydrostatically tested to 2,900 psig using a positive displacement pump. The operating characteristics of the positive displacement pump are shown below, identifying ideal, expected, and actual pump performance.

Which one of the following could cause the observed difference between the expected and the actual pump performance?

A. Pump internal leakage is greater than expected.

B. Reactor coolant piping boundary valve leakage is greater than expected.

C. Available NPSH has decreased more than expected, but remains slightly above required NPSH.

D. A relief valve on the pump discharge piping has opened prior to its setpoint of 2,900 psig.

ANSWER: A.

反應器冷卻水管線的一段，正使用正排量泵進行水壓試驗至2,900 psig。下圖顯示了正排量泵的理想、預期與實際運轉特性。

下列何者係造成預期與實際泵性能產生差異的原因？

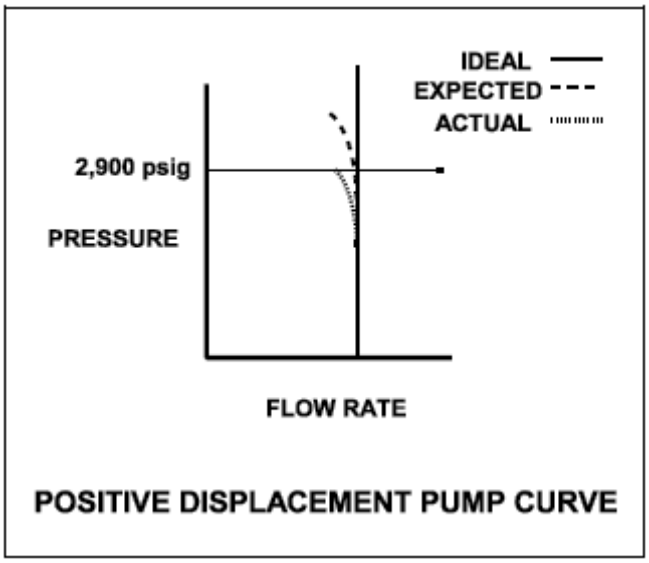
A. 泵內部洩漏超過預期。

B. 反應器冷卻水管線邊界閥洩漏超過預期。

C. 可用NPSH減少超過預期，但仍稍微大於所需NPSH。

D. 泵出口管路上的釋放閥，在抵達2,900 psig的設定值之前便開啟。

答案：A.



POSITIVE DISPLACEMENT PUMP CURVE

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P2726 (B2724)

Which one of the following conditions will result in the greatest increase in volumetric flow rate from a positive displacement pump operating at 300 rpm and a discharge pressure of 100 psig?

A. Increasing pump speed to 700 rpm

B. Decreasing pump discharge pressure to 40 psig

C. Starting a second identical positive displacement pump in series with the first

D. Starting a second identical positive displacement pump in parallel with the first

ANSWER: A.

一以轉速300 rpm、出口壓力100 psig運轉的正排量泵，下列何種狀況將會導致體積流量增加最大？

A. 增加泵轉速至700 rpm。

B. 減少泵出口壓力至40 psig。

C. 起動與第一泵串聯之相同的第二正排量泵。

D. 起動與第一泵並聯之相同的第二正排量泵。

答案：A.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P2926 (B2925)

An ideal (no slip) reciprocating positive displacement pump is operating in an open system to provide makeup water to a coolant system that is being maintained at 800 psig. The discharge valve of the pump is full open.

If the pump discharge valve is subsequently throttled to 80% open, pump flow rate will _____ and pump head will _____.

A. decrease; increase

B. decrease; remain constant

C. remain constant; increase

D. remain constant; remain constant

ANSWER: C.

一運轉於開放系統的理想(無滑移)往復式正排量泵，提供補給水給維持於800 psig的冷卻水系統，此泵之出口閥全開。

若此閥後來節流至80%開度，則泵流量將會_____，而泵水頭將會_____。

A. 減小；增加

B. 減小；維持不變

C. 維持不變；增加

D. 維持不變；維持不變

答案：C.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P3024 (B3025)

A pump is needed to supply fuel oil from a day tank to a diesel fuel injection system. The pump must maintain a nearly constant flow rate with a minimum of discharge pressure fluctuations as system pressure varies between 200 psig and 1,900 psig.

Which one of the following types of pumps would typically be used in this application?

A. Axial flow centrifugal

B. Radial flow centrifugal

C. Rotary positive displacement

D. Reciprocating positive displacement

ANSWER: C.

一泵從一日用油槽中，供應燃料油至柴油燃料噴射系統，此泵必須在系統壓力於200 psig與1,900 psig間變化時，於出口壓力變動最小下，維持近似的固定流量。

下列何種型式的泵，通常能用於此種用途？

A. 軸向流離心泵。

B. 徑向流離心泵。

C. 旋轉式正排量泵。

D. 往復式正排量泵。

答案：C.

科目： 191004
知能類：K1.22 [2.3/2.5]
序號： P3525 (B1680)

A positive displacement pump is pumping to a system operating at 100 psig. Assume a constant pump speed, zero pump slip, and a pump backpressure that remains within normal pump operating limits.

If system pressure increases to 200 psig, the pump head will _____ and pump flow rate will _____.

A. increase; remain the same

B. increase; decrease

C. remain the same; remain the same

D. remain the same; decrease

ANSWER: A.

一正排量泵正抽送液體至在100 psig下運轉的系統，假設泵轉速固定且無泵滑移，同時泵背壓維持在正常泵運轉限制內。

系統壓力若增至200 psig，則泵水頭將會_____，而泵流量將會_____。

A. 增加；維持不變

B. 增加；減小

C. 維持不變；維持不變

D. 維持不變；減小

答案：A.

科目： 191004
知能類：K1.23 [2.8/2.9]
序號： P526

When starting a positive displacement pump, why must the pump discharge valve be fully open?

A. Prevents pump cavitation.

B. Reduces motor starting current.

C. Minimizes the potential for water hammer.

D. Ensures integrity of the pump and system piping.

ANSWER: D.

啟動正排量泵時，為什麼其出口閥必須全開？

A. 防範泵孔蝕。

B. 降低馬達啟動電流。

C. 將發生水錘的可能性降至最低。

D. 確保泵與系統管路的完整。

答案：D.

科目： 191004
知能類：K1.24 [3.0/3.1]
序號： P626 (B2425)

What is the purpose of the safety/relief valve located between the pump outlet and the discharge isolation valve of most positive displacement pumps?

A. Protect the pump and suction piping from overpressure if the discharge valve is open during system startup.

B. Protect the pump and suction piping from overpressure if the suction valve is closed during pump operation.

C. Protect the pump and discharge piping from overpressure if the discharge valve is closed during pump operation.

D. Protect the pump and discharge piping from overpressure due to thermal expansion of pump contents when the pump is shutdown with its suction valve closed.

ANSWER: C.

大部分正排量泵中，位於泵出口與出口隔離閥之間之安全/釋壓閥，其目的為何？

A. 若出口閥在系統起動時開啟，保護泵及進口管路不致超壓。

B. 若進口閥在泵運轉時關閉，保護泵及進口管路不致超壓。

C. 若出口閥在泵運轉時關閉，保護泵及出口管路不致超壓。

D. 泵停機且進口閥關閉時，保護泵以及出口管路，不致因為泵內容物發生熱膨脹而超壓。

答案：C.

科目： 191004
知能類：K1.24 [3.0/3.1]
序號： P1722 (B1724)

A positive displacement pump should be started with its suction valve _____ and its discharge valve _____.

A. fully open; throttled

B. fully open; fully open

C. throttled; throttled

D. throttled; fully open

ANSWER: B.

正排量泵應該在進口閥_____、出口閥_____的情況下起動。

A. 全開；節流

B. 全開；全開

C. 節流；節流

D. 節流；全開

答案：B.

科目： 191004
知能類：K1.24 [3.0/3.1]
序號： P1923 (B525)

A positive displacement pump should be started with its suction valve _____ and its discharge valve _____.

A. open; open

B. open; closed

C. closed; open

D. closed; closed

ANSWER: A.

正排量泵應該在進口閥_____、出口閥_____的情況下起動。

A. 開啟；開啟

B. 開啟；關閉

C. 關閉；開啟

D. 關閉；關閉

答案：A.

科目/題號：191004/1 (2016新增)
知能類：K1.04 [3.3/3.4]
序號：P6910 (B6910)

The discharge valve for a radial-flow centrifugal cooling water pump is closed in preparation for starting the pump.
After the pump is started, the following stable pump pressures are observed:
Pump discharge pressure = 30 psig
Pump suction pressure = 10 psig
With the discharge valve still closed, if the pump speed is doubled, what will be the new pump discharge pressure?
A. 80 psig
B. 90 psig
C. 120 psig
D. 130 psig
ANSWER: B.

在準備啟動徑流式離心泵前，先將泵的出口閥關閉。當該泵啟動後，觀察到穩定的泵壓力如下：
泵出口壓力 = 30 psig
泵進口壓力 = 10 psig
若泵出口閥保持關閉狀態，當泵轉速提升一倍，則泵出口壓力變成：
A.80 psig
B.90 psig
C.120 psig
D.130 psig

答案： B

科目/題號：191004/2 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P5211 (B5210)

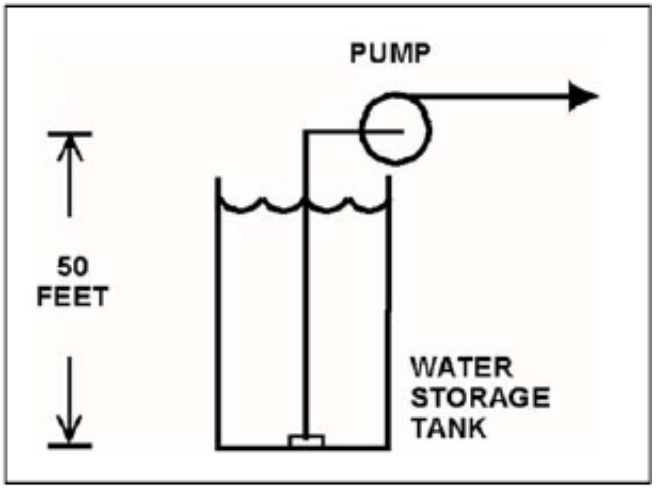
Consider a centrifugal pump that is taking suction from the bottom of an open water storage tank. (See figure below.)
Given:
- The tank contains 60°F water.
- The eye of the pump impeller is located 50 feet above the bottom of the tank.
- The pump requires a minimum net positive suction head of 4 feet.

Which one of the following describes the effect on pump operation if tank water level is allowed to continuously decrease?
A. The pump will operate normally until tank water level decreases below approximately 20 feet, at which time the pump will cavitate.
B. The pump will operate normally until tank water level decreases below approximately 16 feet, at which time the pump will cavitate.
C. The pump will operate normally until the pump suction becomes uncovered, at which time the pump will cavitate.
D. The pump will operate normally until the pump suction becomes uncovered, at which time the pump will become air bound.

ANSWER: A.

考量一台離心泵從一座開放式儲水槽的底部取水(見下圖)。
已知：
●水槽水溫 60°F
●泵葉輪眼高於水槽底座 50 feet
●該水泵所需最小淨正吸水頭為 4 feet
如果水槽水位允許連續下降，下列何者描述為其對水泵運轉的影響？
A.水泵將正常運轉，直到當水槽水位降至約 20 feet，水泵開始出現孔蝕現象。
B.水泵將正常運轉，直到當水槽水位降至約 16 feet，水泵開始出現孔蝕現象。
C.水泵將正常運轉，直到當水位低於水泵吸水點，水泵開始出現孔蝕現象。
D.水泵將正常運轉，直到當水位低於水泵吸水點，水泵開始出現氣鎖現象。

答案： A



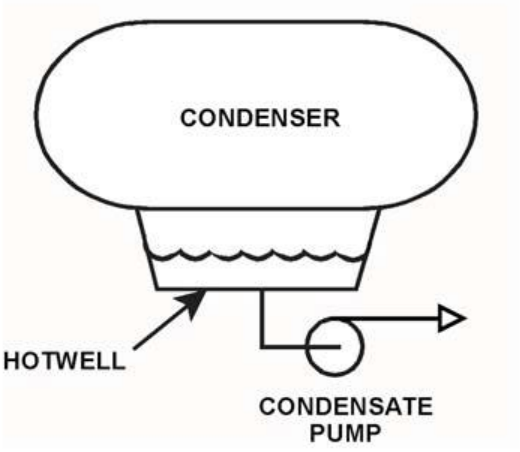
科目/題號：191004/3 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P5511 (B5510)

Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).
Given the following:
- The eye of the pump impeller is located 6.0 feet below the bottom of the hotwell.
- The pump requires 10.0 feet of net positive suction head (NPSH).
- Condenser pressure is 1.2 psia.
- Hotwell water temperature is 90°F.
- Pump suction head losses are zero.

What is the minimum hotwell water level necessary to provide the required NPSH?
A. 1.2 feet
B. 2.8 feet
C. 4.0 feet
D. 5.2 feet
ANSWER: B.

參考下圖所示之蒸汽冷凝器、熱井、及冷凝水泵。
已知：
●冷凝水泵葉輪眼低於熱井底部 6 feet
●冷凝水泵所需之淨正吸水頭為 10 feet
●冷凝器壓力為 1.2 psia
●熱井水溫為 90°F
●冷凝水泵之吸水頭損失為 0
請問熱井的最低必要水位是多少，才能提供冷凝水泵所需的 NPSH？
A. 1.2 feet
B. 2.8 feet
C. 4.0 feet
D. 5.2 feet

答案： B



科目/題號：191004/4 (2016 新增)
知能類：K1.06 [3.2/3.3]
序號：P5611 (B5610)

A centrifugal pump is taking suction on a water storage tank and delivering the makeup water to a cooling water system. The pump will have the lowest net positive suction head requirement if the pump is operated at a relatively _____ speed with a _____ discharge flow control valve.
A. high; fully open
B. high; throttled
C. low; fully open
D. low; throttled
ANSWER: D.

一台離心式泵從一儲水槽取水，補水給冷卻水系統。當該水泵在一個比較_____的轉速運轉，且水泵出口流量控制閥是在_____狀態時，此水泵所需之淨正吸水頭最低。
A.高；全開
B.高；節流
C.低；全開
D.低；節流

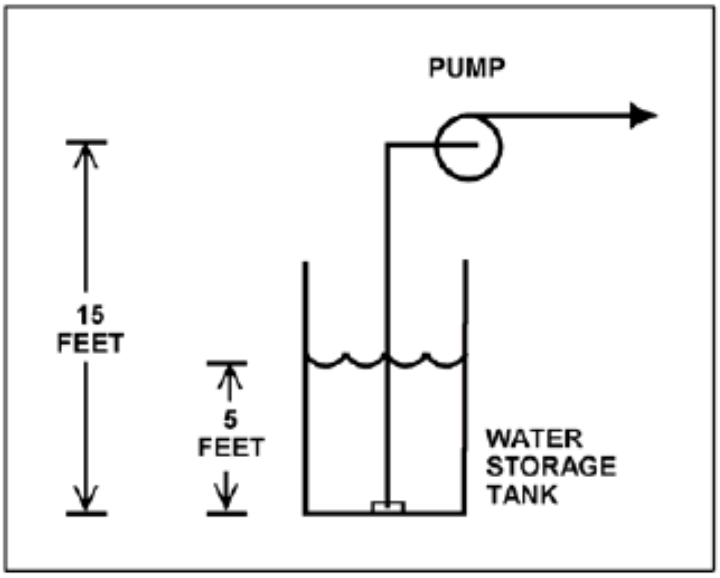
答案： D

科目/題號：191004/5 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P5810 (B5810)

Refer to the drawing below of a centrifugal pump taking suction from the bottom of an open storage tank containing water at 75°F. Pump and water level elevations are indicated in the figure. Assume standard atmospheric pressure.
Assuming that pump suction head loss is negligible, what is the approximate value of net positive suction head available to the pump.
A. 5 feet
B. 10 feet
C. 17 feet
D. 23 feet
ANSWER: D.

參考一台離心泵從一座開放式儲水槽的底部抽水，水槽水溫 75°F 圖(見下圖)。水泵的安裝高程與水槽水位均標示於圖上。假設在一標準大氣壓下，泵的吸水頭損失可忽略，請問泵的可用淨正吸水頭值大約為何？
A. 5 feet
B. 10 feet
C. 17 feet
D. 23 feet

答案： D

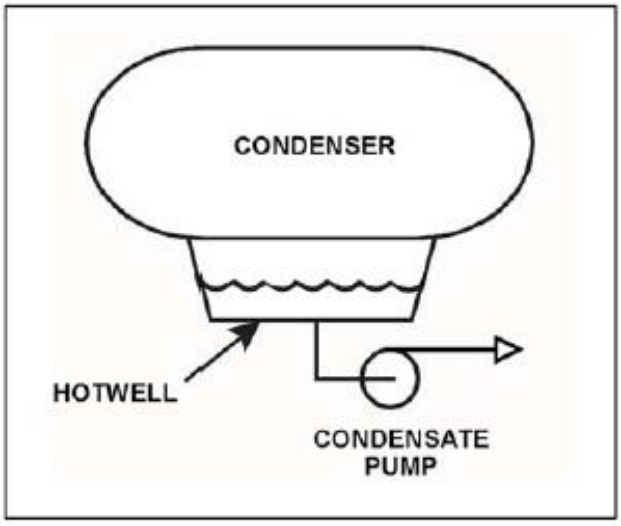


科目/題號：191004/6 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P5910 (B5911)

Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).
Given the following initial conditions:
Condenser pressure is 1.2 psia.
Condensate temperature is 96°F.
Hotwell level is 10 feet above the condensate pump suction.
Which one of the following will provide the greatest increase in NPSH available to the condensate pump? (Assume that condenser pressure does not change.)
A. Hotwell level decreases by 6 inches.
B. Hotwell level increases by 6 inches.
C. Condensate temperature decreases by 6°F.
D. Condensate temperature increases by 6°F.
ANSWER: B.

參考下圖中所示之蒸汽冷凝器、熱井、及冷凝水泵。
已知下列初始狀態：
●冷凝器壓力為 1.2 psia
●冷凝水溫度為 96°F
●熱井水位比冷凝水泵的取水點高 10 feet
●假設冷凝器的壓力不變，下列何者將提供冷凝水泵之可用淨正吸水頭(NPSH)的最大增量？
A.熱井水位降低 6- inch
B.熱井水位上升 6- inch
C.冷凝水溫降低 6°F
D.冷凝水溫上升 6°F

答案：B



科目/題號：191004/7 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P6211 (B6211)

A centrifugal pump is taking suction on a water storage tank and discharging through a flow control valve. The pump will have the highest net positive suction head requirement if the pump is operated at a _____ speed with a _____ discharge flow control valve.
A. high; fully open
B. high; throttled
C. low; fully open
D. low; throttled
ANSWER: A.

一台離心泵從一儲水槽取水，其出水流經一只流量控制閥。當該泵在一個比較_____的轉速運轉，且泵出口流量控制閥是在_____狀態時，此泵所需之淨正吸水頭最高。
A.高；全開
B.高；節流
C.低；全開
D.低；節流

答案：A

科目/題號：191004/8 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P6410 (B6410)

An operating centrifugal pump has a net positive suction head (NPSH) requirement of 150 feet. Water at 300°F is entering the pump. Which one of the following is the lowest listed pump inlet pressure that will provide adequate NPSH for the pump?
A. 60 psia
B. 83 psia
C. 108 psia
D. 127 psia
ANSWER: D.

一台運轉中的離心泵，其所需之淨正吸水頭(NPSH)為 150 feet，進入此泵之水溫為 300°F。下列何者是能提供泵足夠的 NPSH 之最低泵進口壓力？
A. 60 psia
B. 83 psia
C. 108 psia
D. 127 psia

答案： D

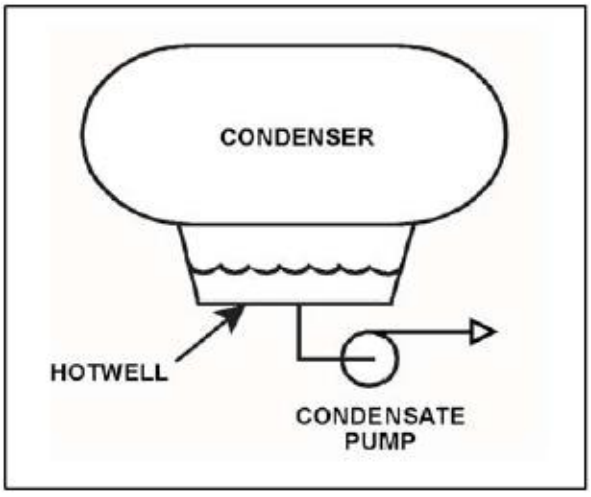
科目/題號：191004/9 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P6510 (B6510)

Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).
Given the following:
- The eye of the pump impeller is located 6.0 feet below the bottom of the hotwell.
- Hotwell water level is 6.0 feet.
- Hotwell water temperature is 90°F.
- Condenser pressure is 1.3 psia.
- Fluid velocity and friction head losses are zero.

What is the net positive suction head available to the condensate pump?
A. 6.0 feet
B. 7.4 feet
C. 12.0 feet
D. 13.4 feet
ANSWER: D.

參考下圖中所示之蒸汽冷凝器、熱井、及冷凝水泵。
已知：
●冷凝水泵葉輪眼低於熱井底部 6 feet
●熱井水位為 6 feet
●熱井水溫為 90°F
●冷凝器壓力為 1.3 psia
●流體之流速與磨擦水頭損失為 0
請問冷凝水泵之可用淨正吸水頭為何？
A. 6.0 feet
B. 7.4 feet
C. 12.0 feet
D. 13.4 feet

答案： D



科目/題號：191004/10 (2016 新增)
知能類：K1.06 [3.2/3.3]
序號：P6810 (B6811)

The current conditions for a centrifugal water pump are as follows:
Pump suction pressure = 140 psia
Pump suction temperature = 300°F
The pump requires a net positive suction head (NPSH) of 150 feet for pumping water at 300°F. Which one of the following is the lowest listed pump suction pressure that will provide the required NPSH for the current pump suction temperature?
A. 132 psia
B. 128 psia
C. 73 psia
D. 67 psia
ANSWER: B.

一台離心泵目前的運轉情況如下：
泵進口壓力 = 140 psia
泵進口水溫 = 300°F
進口水溫 300°F 時，該泵所需之淨正吸水頭(NPSH)為 150 feet。以目前泵進口溫度，下列何者是能提供水泵所需 NPSH 之最低泵進口壓力？
A.132 psia
B.128 psia
C.73 psia
D.67 psia

答案： B

科目/題號：191004/11 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P6911 (B6911)

A centrifugal pump is taking suction from an open water storage tank. The pump is located at the base of the tank, takes a suction from the bottom of the tank, and discharges to a pressurized system.
Given:
- The tank is filled to a level of 26 feet with 60°F water.
- The pump is currently operating at 50 gpm.
- The pump requires 30 feet of net positive suction head.

Which one of the following describes the current pump status, and how the pump flow rate will be affected as the level in the storage tank decreases?
A. The pump is currently cavitating; pump flow rate will decrease continuously as tank level decreases.
B. The pump is currently cavitating; pump flow rate will remain about the same until the tank empties.
C. The pump is currently not cavitating; pump flow rate will gradually decrease with tank level and then rapidly decrease when cavitation begins at a lower tank level.
D. The pump is currently not cavitating; pump flow rate will gradually decrease with tank level and then rapidly decrease as the pump becomes air bound when the tank empties.

ANSWER: D.

一台離心泵從一座開放式儲水槽取水，其安裝在水槽底座。泵從水槽的底部取水再注入一個加壓的系統內。
已知：
●水槽水位已達 26 feet，水溫 60°F
●水泵現正運轉中，其流量率為 50 gpm
●該水泵所需淨正吸水頭為 30 feet
下列何者描述為該泵目前的狀態，以及儲水槽水位下降對水泵流量率的影響？
A.泵目前出現孔蝕現象；當水槽水位下降，泵流量率將持續降低。
B.泵目前出現孔蝕現象；在水槽水抽乾前，泵將保持現在流量率。
C.泵目前並未出現孔蝕現象；泵流量率會隨著水槽水位下降而逐漸降低，但當水槽水位降至泵出現孔蝕現象時，泵流量率急劇降低。
D.泵目前並未出現孔蝕現象；泵流量率會隨著水槽水位下降而逐漸降低，但當水槽的水被抽乾，泵產生氣鎖時，泵流量率急劇降低。

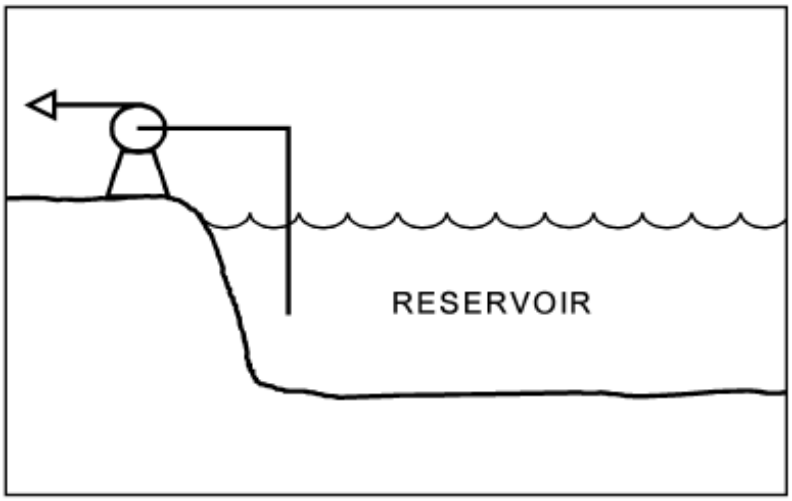
答案： D

科目/題號：191004/12 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P7110 (B7112)

Refer to the drawing of a centrifugal pump taking suction from a reservoir.
The pump is located on shore, with the eye of the pump 4 feet higher than the reservoir water level. The pump's suction line extends 4 feet below the surface of the reservoir. Which one of the following modifications would increase the pump's available net positive suction head? (Assume the reservoir is at a uniform temperature and ignore any changes in suction line head loss due to friction.)
A. Raise the pump and suction line by 2 feet.
B. Lower the pump and suction line by 2 feet.
C. Lengthen the suction line to take a suction from 2 feet deeper.
D. Shorten the suction line to take a suction from 2 feet shalwer.
ANSWER: B.

參考一台離心泵從一個儲水池取水(見下圖)。該泵安裝在水池岸邊，泵葉輪眼比池面高出 4 feet。
泵之進口管路取水點在池面下 4 feet。假設儲水池水溫是均勻的，且管路因磨擦所造成的吸水頭損失變化量可忽略，請問下列何者改變可提升泵之可用淨正吸水頭？
A.泵及進口管路均提高 2 feet
B.泵及進口管路均降低 2 feet
C.延長進口管路，使新取水點較目前深 2 feet
D.縮短進口管路，使新取水點較目前淺 2 feet

答案： B

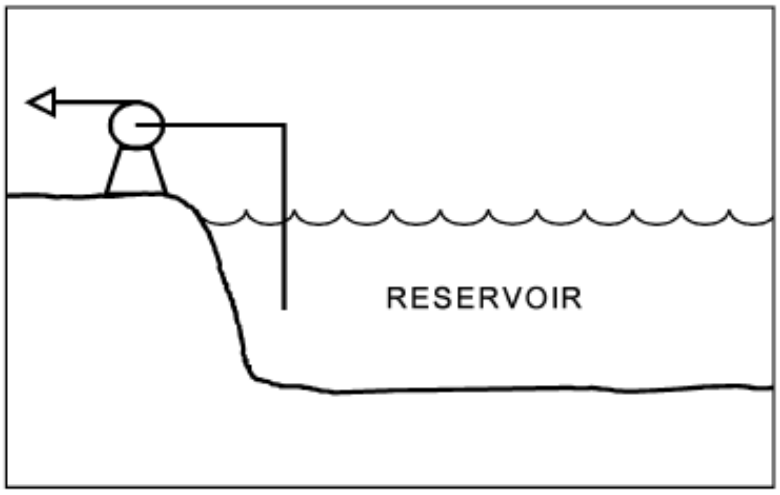


科目/題號：191004/13 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P7624 (B7624)

Refer to the drawing of a centrifugal pump taking suction from a reservoir (see figure below).
The pump is located on shore, with the eye of the pump 4 feet higher than the reservoir water level. The pump's suction line extends 4 feet below the surface of the reservoir. Which one of the following modifications would decrease the pump's available net positive suction head? (Assume the reservoir is at a uniform temperature and ignore any changes in suction line head loss due to friction.)
A. Raise the pump and suction line by 2 feet.
B. Lower the pump and suction line by 2 feet.
C. Lengthen the suction line to take a suction from 2 feet deeper.
D. Shorten the suction line to take a suction from 2 feet shallower.
ANSWER: A.

參考一台離心泵從一個儲水池抽水(見下圖)。該泵安裝在水池岸邊，泵葉輪眼比池面高出 4 feet。
泵之進口管路取水點在池面下 4 feet。假設儲水池水溫是均勻的，且管路因磨擦所造成的吸水頭損失變化量可忽略，請問下列何者改變可降低泵之可用淨正吸水頭？
A.泵及進口管路均提高 2 feet
B.泵及進口管路均降低 2 feet
C.延長進口管路，使新取水點較目前深 2 feet
D.縮短進口管路，使新取水點較目前淺 2 feet

答案： A

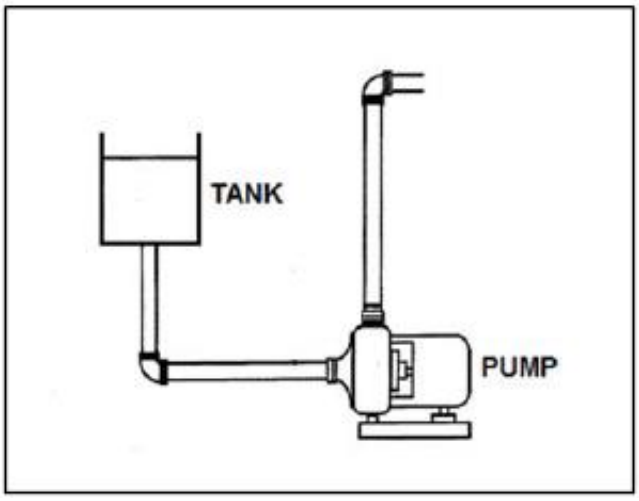


科目/題號：191004/14 (2016新增)
知能類：K1.06 [3.2/3.3]
序號：P7643 (B7643)

Refer to the drawing of a centrifugal pump with a water storage tank for its suction source. The storage tank is open to the atmosphere and contains 20 feet of water at 60°F. The pump is currently stopped.
If the temperature of the water in the storage tank and pump suction piping increases to 80°F, with the accompanying water expansion, the suction head for the pump will _____; and the available net positive suction head for the pump will _____.
A. increase; increase
B. increase; decrease
C. remain the same; increase
D. remain the same; decrease
ANSWER: B.

參考一台離心泵從一個開放式儲水槽取水圖(見下圖)，儲水槽水位 20feet，水溫 60°F。泵目前為停止狀態。
倘若儲水槽及泵進口管路內的水溫升高至 80°F，水的體積因此膨脹，該泵的吸水頭將_____；且該泵之可用淨正吸水頭將_____。
A.升高；升高
B.升高；降低
C.不變；升高
D.不變；降低

答案： B



科目/題號：191004/15 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P3822 (B3820)

An AC motor-driven centrifugal water pump was just started. During the start, motor current remained peaked for 2 seconds, and then decreased and stabilized at about one-fifth the standard running current. Normally, the starting current peak lasts about 4 seconds.
Which one of the following could have caused the abnormal start indications above?
A. The pump shaft was initially seized and the motor breaker opened.
B. The pump was initially rotating slowly in the reverse direction.
C. The pump was initially air bound, and then primed itself after 2 seconds of operation.
D. The coupling between the motor and pump shafts was left disconnected after maintenance.
ANSWER: D.

啟動一個交流電馬達驅動的離心泵時，馬達電流停在峰值2秒鐘，然後降低，並穩定在額定運轉電流五分之一處。正常狀況下，啟動電流應持續在峰值約4秒鐘。
下列何者可能是導致上述不正常啟動現象發生的原因？
A.泵的軸卡住，馬達的斷路器跳脫
B.泵一開始緩慢反向轉動
C.泵一開始有氣鎖現象，運轉2秒鐘後自動排氣(Prime)
D.維修後，馬達軸和水泵軸間的未耦合

答案： D

科目/題號：191004/16 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P4811 (B4811)

A radial-flow centrifugal cooling water pump is driven by an AC induction motor. The pump can supply cooling water to several heat loads, all of which are in parallel alignment. The following pump conditions initially exist:

Pump motor current = 100 amps
Pump flow rate = 400 gpm
Pump suction temperature = 70°F

Four hours later, the motor is drawing 95 amps. Which one of the following could be responsible for the observed decrease in motor amps?

A. The temperature of the cooling water being pumped decreased to 60°F with no change in pump flow rate.
B. The temperature of the cooling water being pumped increased to 80°F with no change in pump flow rate.
C. Cooling water flow was established to an additional heat load with no change in the temperature of the cooling water being pumped.
D. Cooling water flow was isolated from an out-of-service heat load with no change in the temperature of the cooling water being pumped.

ANSWER: D.

一台徑流式離心泵由一只交流感應馬達驅動。該泵提供冷卻水給數組並聯的熱負載，泵的初始狀況如下：

水泵馬達電流 = 100 amps
水泵流量率 = 400 gpm
水泵進口溫度 = 70°F

4 小時以後，馬達電流降至 95 amps。下列何者是導致馬達電流下降的原因？

A.冷卻水水溫降至 60°F，但泵流量率不變
B.冷卻水水溫升至 80°F，但泵流量率不變
C.冷卻水水溫不變，但系統新增一組熱負載，由該泵供應冷卻水
D.冷卻水水溫不變，但系統內其中一組熱負載停止運轉，冷卻水被隔離

答案： D

科目/題號：191004/17 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P6310 (B6311)

A radial-flow centrifugal cooling water pump is driven by an AC induction motor. The pump can supply cooling water to several heat loads, all of which are in parallel alignment. The following pump conditions initially exist:

Pump motor current = 100 amps
Pump flow rate = 400 gpm
Pump suction temperature = 70°F

Four hours later, the motor is drawing 105 amps. Which one of the following could be responsible for the observed increase in motor current?

A. The temperature of the cooling water being pumped decreased to 60°F with no change in pump flow rate.
B. The temperature of the cooling water being pumped increased to 80°F with no change in pump flow rate.
C. Cooling water flow was established to an additional heat load with no change in the temperature of the cooling water being pumped.
D. Cooling water flow was isolated from an out-of-service heat load with no change in the temperature of the cooling water being pumped.

ANSWER: C.

一台徑流式離心泵由一只交流感應馬達驅動。該泵提供冷卻水給數組並聯的熱負載，泵的初始狀況如下：

泵馬達電流 = 100 amps
泵流量率 = 400 gpm
泵進口溫度 = 70°F

四小時以後，馬達電流升至 105 amps。下列何者是導致馬達電流上升的原因？

A.冷卻水水溫降至 60°F，但泵流量率不變
B.冷卻水水溫升至 80°F，但泵流量率不變
C.冷卻水水溫不變，但系統新增一組熱負載，由該泵供應冷卻水
D.冷卻水水溫不變，但系統內其中一組熱負載停止運轉，冷卻水被隔離

答案： C

科目/題號：191004/18 (2016新增)
知能類：K1.07 [2.9/2.9]
序號：P7512 (B1026)

A motor-driven centrifugal pump exhibited indications of pump failure while being started. Which one of the following pairs of observations indicate that the pump failure is a sheared impeller shaft?
A. Excessive duration of high starting current and motor breaker trips.
B. Excessive duration of high starting current and no change in system flow rate.
C. Lower than normal running current and motor breaker trips.
D. Lower than normal running current and no change in system flow rate.
ANSWER: D.

一台馬達驅動之離心泵在啟動時出現泵故障的現象。下列何者可以判斷此泵故障是因為泵葉輪軸斷裂？
A.高起動電流持續時間太長，馬達斷路器因而跳脫
B.高起動電流持續時間太長，系統流量率不變
C.馬達運轉電流比正常值低，馬達斷路器因而跳脫
D.馬達運轉電流比正常值低，系統流量率不變

答案： D

科目/題號：191004/19 (2016新增)
知能類：K1.12 [2.5/2.7]
序號：P5111 (B5111)

A flow-limiting venturi in the discharge piping of a centrifugal pump decreases the potential for the pump to experience...
A. runout
B. reverse flow
C. shutoff head
D. water hammer
ANSWER: A.

安裝在離心泵出口管路上的限流文氏管可降低該泵發生_____現象的可能性。
A.溢流(Runout)
B.逆流
C.關斷水頭
D.水錘

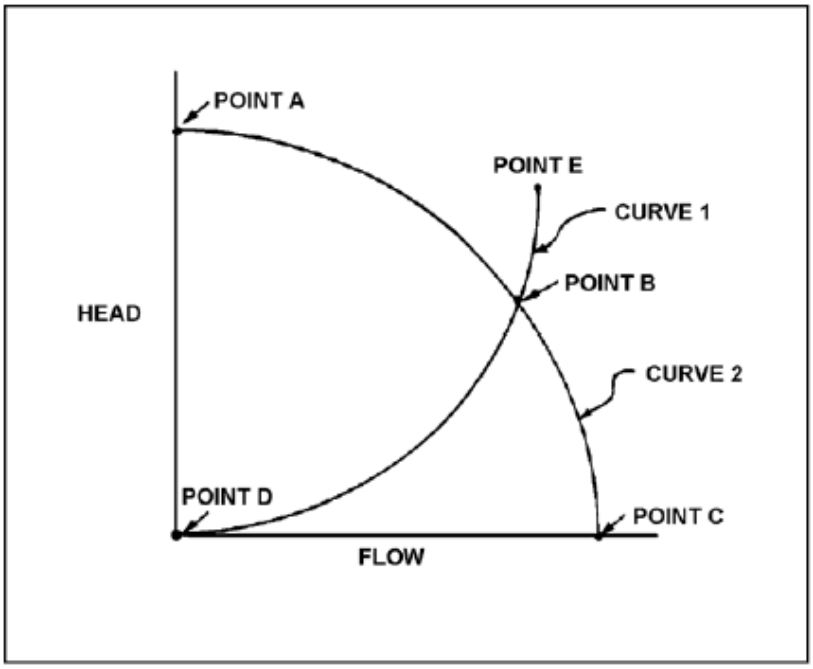
答案： A

科目/題號：191004/20 (2016新增)
知能類：K1.14 [2.4/2.5]
序號：P6711 (B6712)

A centrifugal pump is located adjacent to the bottom of an open water storage tank. The pump is taking suction from a river and discharging to the bottom of the tank. Initially the tank was empty and the pump was operating at point B on the drawing below.
When tank water level reaches 30 feet, the new pump operating point will be located on curve _____ closer to point _____. (Assume that no other changes occur in the system.)
A. 1; D
B. 2; A
C. 1; E
D. 2; C
ANSWER: B.

一台離心泵位於一座開放式儲水槽底座的旁邊，該泵從河流抽水，注水進入水槽底部。水槽的初始狀態為空槽，泵運轉在下圖中的 B 點。
假設系統中沒有其他的變化，當水槽水位達到 30 feet 時，泵的新運轉點落在下圖中曲線_____上，比較靠近_____點。
A. 1；D
B. 2；A
C. 1；E
D. 2；C

答案： B



科目/題號：191004/21 (2016 新增)
知能類：K1.14 [2.4/2.5]
序號：P7212 (B7210)

A centrifugal pump is used to provide makeup water to a storage tank that is 30 feet high. The pump is located at the base of the tank. The pump can be aligned to fill the tank via a top connection or a bottom connection using piping of equal lengths and diameters. The tank is currently half full.
With the pump in operation, the pump will have the highest discharge pressure if the pump is aligned to fill the tank via the _____ connection; and the tank will become full in the least amount of time if the pump is aligned to fill the tank via the _____ connection.
A. top; top
B. top; bottom
C. bottom; top
D. bottom; bottom
ANSWER: B.

使用一台離心泵補水進入一座高 30 feet 的儲水槽，該泵安裝在儲水槽底座。補水進入儲水槽有兩種方式：從水槽上方連接進入或從水槽下方連接進入，兩種補水方式使用的管路尺寸與長度都相同。該儲水槽目前呈半滿狀態。
在水泵運轉的情況下，從_____水槽的補水方式其水泵出口壓力最高；而從_____水槽的補水方式能在最短時間內補滿水槽。
A.上方進入；上方進入
B.上方進入；下方進入
C.下方進入；上方進入
D.下方進入；下方進入

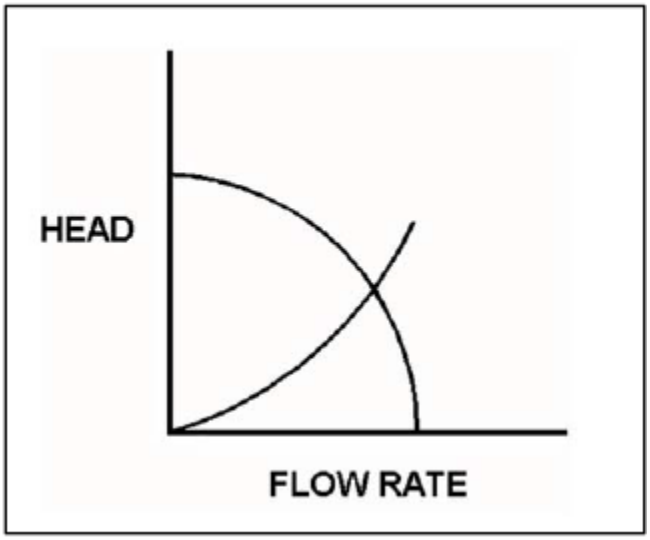
答案：B

科目/題號：191004/22 (2016新增)
知能類：K1.14 [2.4/2.5]
序號：P7310 (B7312)

Refer to the drawing of centrifugal pump and system operating curves (see figure below).
Which one of the following describes the value of head where the two curves cross?
A. The maximum amount of head that the pump can provide.
B. The amount of pump head that is required to avoid cavitation.
C. The amount of pump head that is converted to kinetic energy in the pump.
D. The amount of pump head that is converted to heat and other losses as the water circulates through the system.
ANSWER: D.

參考離心泵特性曲線與系統運轉曲線圖(見下圖)。
下列何者描述為這兩條曲線交叉點的水頭值？
A.是該泵所能提供的最大水頭值
B.泵需要達到該水頭值以避免水泵產生孔蝕
C.該水頭值轉變為泵動能
D.該水頭值轉變成流體在系統內流動所產生的熱與其他損失

答案： D

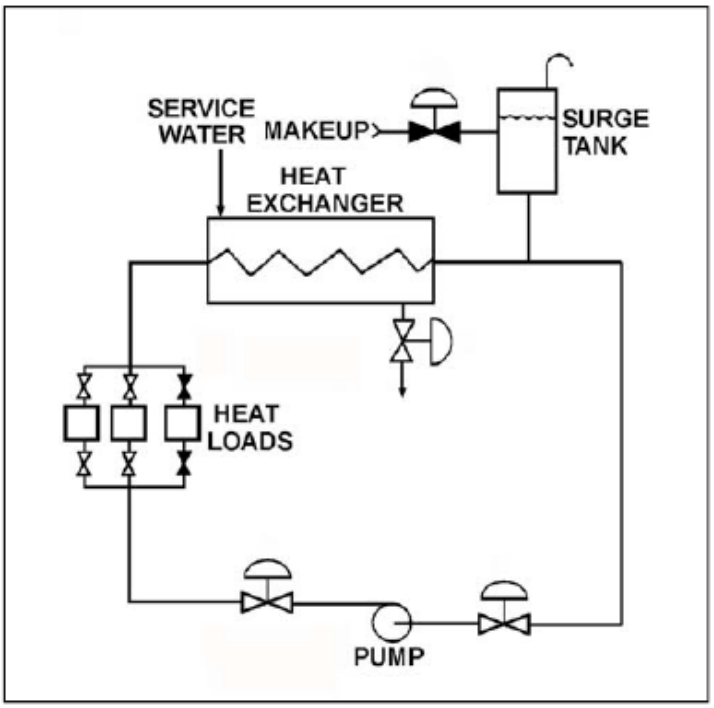


科目/題號：191004/23 (2016新增)
知能類：K1.14 [2.4/2.5]
序號：P7311 (B7311)

Refer to the drawing of an operating cooling water system (see figure below).
Which one of the following changes to the cooling water system will result in a lower cooling water pump flow rate and a higher pump discharge head?
A. Decrease pump speed by 20 percent.
B. Increase pump speed by 20 percent.
C. Isolate one of the two in-service heat loads.
D. Place the third system heat load in service.
ANSWER: C.

參考運轉中的冷卻水系統圖(見下圖)。下列何者改變會導致泵流量率減小同時提升泵的出口水頭？
A.將泵轉速降低20%
B.將泵轉速提升20%
C.隔離運轉中兩組熱負載的其中一組
D.將第三組熱負載置入運轉使用

答案： C



科目/題號：191004/24 (2016新增)
知能類：K1.14 [2.4/2.5]
序號：P7614 (B7614)

A centrifugal pump is used to provide makeup water to a vented storage tank that is 30 feet high. The pump is located at the base of the tank. The pump can be aligned to fill the tank via a top connection or a bottom connection using piping of equal lengths and diameters. The tank is currently half full.
With the pump in operation, the pump will have the lowest initial discharge pressure if the pump is aligned to fill the tank via the _____ connection; and the tank will require the longest amount of time to become completely full if the pump is aligned to fill the tank via the _____ connection.
A. top; top
B. top; bottom
C. bottom; top
D. bottom; bottom
ANSWER: C.

使用一台離心泵補水進入一座高 30 feet 有排氣裝置的儲水槽，該泵安裝在儲水槽底座。補水進入儲水槽有兩種方式：從水槽上方連接進入或從水槽下方連接進入，兩種補水方式使用的管路尺寸與長度都相同。該水槽目前呈半滿狀態。在泵運轉的情況下，從_____水槽的補水方式其泵初始出口壓力最低；而從_____水槽的補水方式補滿水槽耗時最久。
A.上方進入；上方進入
B.上方進入；下方進入
C.下方進入；上方進入
D.下方進入；下方進入

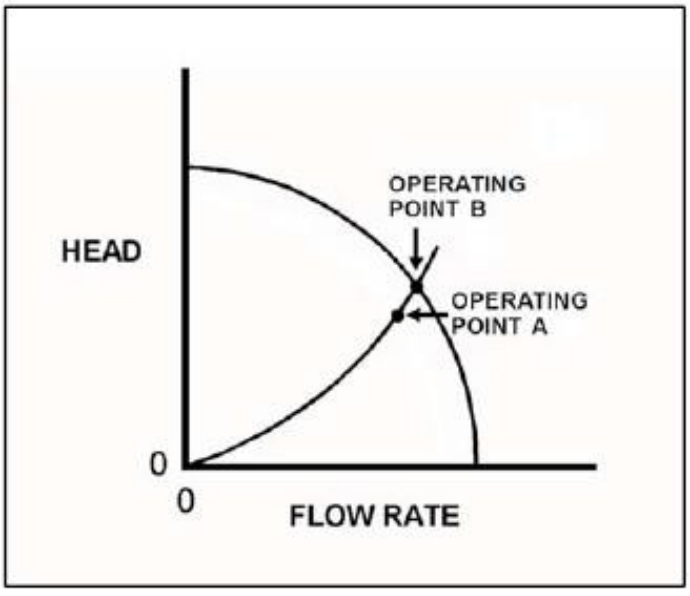
答案： C

科目/題號：191004/25 (2016新增)
知能類：K1.14 [2.4/2.5]
序號：P7604 (B7604)

Refer to the pump and system curves (see figure below) for a centrifugal pump operating in a cooling water system.
Operating point A existed when data was taken six months ago. Operating point B is the current operating point. Which one of the following could be responsible for the difference between the operating points?
A. The pump discharge valve was more open when the data was collected for operating point A.
B. The pump discharge valve was more closed when the data was collected for operating point A.
C. The pump was rotating faster when the data was collected for operating point A.
D. The pump was rotating slower when the data was collected for operating point A.
ANSWER: D.

參考裝設在一冷卻水系統中離心泵的特性曲線與系統曲線圖(見下圖)。A 點為根據六個月前所蒐集的運轉資料而得的運轉點，B 點為目前的運轉點。
下列何者是造成這運轉點變動的主要原因？
A.在蒐集A點的運轉資料時，泵出口閥的開度比現在大
B.在蒐集A點的運轉資料時，泵出口閥的開度比現在小
C.在蒐集A點的運轉資料時，泵轉速比現在快
D.在蒐集A點的運轉資料時，泵轉速比現在慢

答案： D



科目/題號：191004/26 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P4712 (B4710)

A centrifugal cooling water pump is operating in an open system with its discharge valve fully open. If the discharge valve is repositioned to 50 percent open, the pump's available net positive suction head (NPSH) will _____; and the pump's required NPSH will _____.
A. remain the same; decrease
B. remain the same; remain the same
C. increase; decrease
D. increase; remain the same
ANSWER: C.

一台離心冷卻水泵在一開放式系統中運轉，其出口閥全開。倘若調整泵出口閥的開度為 50%，則該泵的可用淨正吸水頭(NPSH)將_____；而所需的 NPSH 將_____。
A.維持不變；降低
B.維持不變；維持不變
C.升高；降低
D.升高；維持不變

答案： C

科目/題號：191004/27 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P4912 (B4911)

A centrifugal firewater pump is operating to pressurize a fire main. The pump takes suction from a water reservoir. A fire hose connected to the fire main is being used to suppress an elevated fire.
Given:
- The eye of the pump impeller is located 15 feet below the reservoir water level.
- The pump has a design shutoff head of 120 feet.
- The required net positive suction head (NPSH) for the pump is 15 feet.
- The reservoir water temperature is 60°F.

At which one of the following elevations above the reservoir water level will the fire hose spray nozzle first be unable to provide flow? (Disregard all sources of head loss.)
A. 91 feet
B. 106 feet
C. 121 feet
D. 136 feet
ANSWER: C.

一台離心式消防水泵從一座蓄水池抽水，用來加壓消防主管路。有一條連接自該消防主管路的消防水帶被用來撲滅高處火災。
已知：
●泵葉輪眼之高程低於水池水面 15 feet.
●泵之關斷水頭設計值為 120 feet.
●水泵所需之淨正吸水頭為 15 feet.
●水池水溫為 60°F
若不考慮其他水頭損失，當消防水帶噴嘴高於蓄水池水面多少高度時，該噴嘴開始噴不出水來？
A.91 feet.
B.106 feet.
C.121 feet.
D.136 feet.

答案： C

科目/題號：191004/28 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P5412 (B5412)

A motor-driven centrifugal pump is operating in a closed-loop cooling water system and is unable to achieve its rated volumetric flow rate due to cavitation. Which one of the following will enable the pump to achieve a higher volumetric flow rate before cavitation occurs?
A. Operate the system at a higher pressure.
B. Operate the system at a higher temperature.
C. Remove the existing pump motor and install a motor with a higher horsepower rating.
D. Remove the existing pump and install a same-capacity pump with a higher minimum required net positive suction head rating.
ANSWER: A.

一台馬達驅動之離心泵運轉在一密閉迴路冷卻水系統中，但由於泵出現孔蝕現象，該泵無法達到其額定體積流量率。下列何者可以在泵出現孔蝕現象前，提高泵之體積流量率？
A.系統在比較高的壓力下運轉
B.系統在比較高的溫度下運轉
C.拆下原泵馬達，另以比較高額定馬力的馬達替換
D.拆下原泵，另以相同容量但較高最小所需淨正吸水頭的泵替換

答案： A

科目/題號：191004/29 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P5712 (B5712)

Refer to the graph that represents the head-capacity characteristics for a single-speed centrifugal cooling water pump (see figure below).
Which one of the following lists a pair of parameters that could be represented by curves A and B? (Note: NPSH is net positive suction head.)

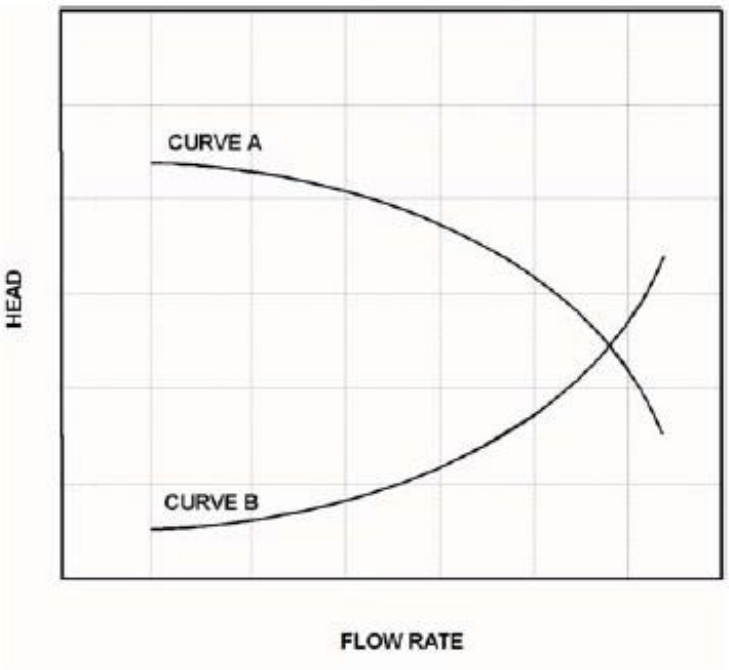
	Curve A	Curve B
A.	Pump Head	Available NPSH
B.	Available NPSH	Required NPSH
C.	Required NPSH	System Head Loss
D.	System Head Loss	Pump Head

ANSWER: B.

下圖顯示一台單一轉速之離心泵的水頭-容量特性(見下圖)。
下列何組參數可以代表 A 曲線與 B 曲線？(註：NPSH 即淨正吸水頭)

	A 曲線	B 曲線
A.	泵水頭	可用 NPSH
B.	可用 NPSH	所需 NPSH
C.	所需 NPSH	系統水頭損失
D.	系統水頭損失	泵水頭

答案： B



科目/題號：191004/30 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P5813 (B5812)

Centrifugal pumps A and B are identical except that pump A uses a single-suction impeller while pump B uses a double-suction impeller. If both pumps are pumping water at the same inlet temperature, inlet pressure, and flow rate, single-suction pump A typically will have the _____ impeller axial thrust and the _____ required net positive suction head.
A. greater; greater
B. greater; smaller
C. smaller; greater
D. smaller; smaller
ANSWER: A.

兩台離心泵大致相同，惟 A 泵使用單吸式葉輪，而 B 泵則使用雙吸式葉輪。假設這兩台水泵同時抽水，其進口水溫、進口壓力、流量率均相同，則通常 A 泵會產生_____的葉輪軸向推力，以及_____的所需淨正吸水頭。
A.比較大；比較大
B.比較大；比較小
C.比較小；比較大
D.比較小；比較小

答案： A

科目/題號：191004/31 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P6512 (B6511)

A motor-driven centrifugal pump is operating normally in a closed cooling water system. When the pump discharge flow control valve is opened further, the pump is unable to provide the desired volumetric flow rate due to cavitation. Which one of the following will enable a higher pump volumetric flow rate before cavitation occurs?
A. Remove the existing motor and install a motor with a lower horsepower rating.
B. Remove the existing motor and install a motor with a higher horsepower rating.
C. Remove the existing pump and install a same-capacity pump with a lower minimum net positive suction head requirement.
D. Remove the existing pump and install a same-capacity pump with a higher minimum net positive suction head requirement.
ANSWER: C.

一台馬達驅動之離心泵正常運轉在一密閉迴路冷卻水系統中。當該泵的出口流量控制閥開得更大時，由於泵出現孔蝕現象，該泵無法達到所要求的體積流量率。下列何者可以在泵出現孔蝕現象前，提高泵之體積流量率？
A.拆下原泵馬達，另以比較低額定馬力的馬達替換
B.拆下原泵馬達，另以比較高額定馬力的馬達替換
C.拆下原泵，另以相同容量但較低最小所需淨正吸水頭的泵替換
D.拆下原泵，另以相同容量但較高最小所需淨正吸水頭的泵替換

答案： C

科目/題號：191004/32 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P6613

A nuclear power plant is shut down with core decay heat being removed by the residual heat removal (RHR) system. The reactor coolant system (RCS) has been drained to a mid-loop water level of 20 inches in both the hot and cold legs. The operating RHR pump is taking suction from a hot leg and discharging 3,000 gpm to a cold leg.
A loss of RHR flow rate due to vortexing will become more likely if the water level in the hot leg is _____ by six inches or if the RHR system flow rate is _____ by 500 gpm.
A. raised; decreased
B. raised; increased
C. lowered; decreased
D. lowered; increased
ANSWER: D.

某核電廠處於停機狀態，其爐心衰變熱正由餘熱移除系統(RHR)移除。反應爐冷卻水系統(RCS)已洩水至半迴路水位，熱端及冷端水位均為 20 -inch。運轉中的 RHR 泵由 RCS 熱端管路取水，以 3,000 gpm 流量率注入 RCS 冷端管路。如果熱端管路水位_____6- inch，或者 RHR 系統流量率_____500 gpm，就較可能發生因渦流效應(vortexing)而導致喪失 RHR 流量率。
A.升高；減少
B.升高；增加
C.降低；減少
D.降低；增加

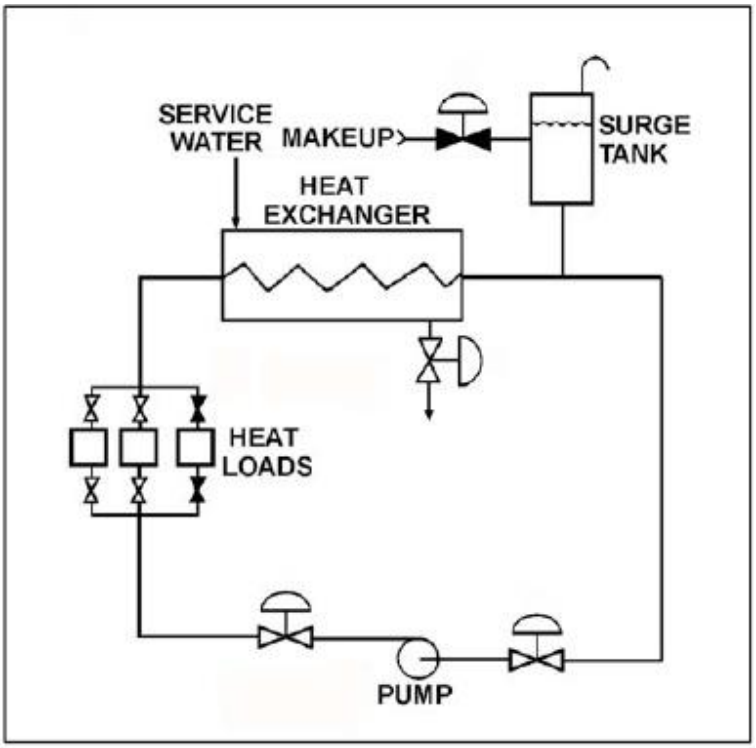
答案： D

科目/題號：191004/33 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P7012 (B7012)

Refer to the drawing of an operating cooling water system (see figure below).
The pump is unable to achieve its rated volumetric flow rate due to cavitation. Which one of the following will enable the pump to achieve a higher volumetric flow rate before cavitation occurs?
A. Decrease the service water flow rate.
B. Operate the system at a lower pressure.
C. Move the surge tank connection closer to the suction of the pump.
D. Remove the existing pump motor and install a motor with a higher horsepower rating.
ANSWER: C.

參考一運轉中的冷卻水系統圖(見下圖)。由於泵出現孔蝕現象，該泵無法達到其額定體積流量率。下列何者可以在泵出現孔蝕現象前，提高泵之體積流量率？
A.降低廠用水流量率
B.讓系統在比較低的壓力下運轉
C.將調節槽的管路連接點移到比較靠近泵進口處
D.拆下原泵馬達，另以比較高額定馬力的馬達替換

答案： C



科目/題號：191004/34 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P7412 (B7411)

Refer to the drawing of an operating cooling water system (see figure below). The pump discharge valve is partially throttled to produce the following initial pump operating parameters:

Pump discharge pressure = 45 psig
Pump suction pressure = 15 psig
Pump flow rate = 120 gpm

After a few hours of operation, the current pump operating parameters are as follows:

Pump discharge pressure = 48 psig
Pump suction pressure = 18 psig
Pump flow rate: = 120 gpm

Which one of the following could be responsible for the change in pump operating parameters?

A. The pump speed increased with no other changes to the system.
B. The surge tank level increased with no other changes to the system.
C. The pump discharge valve was closed further while pump speed increased.
D. The pump discharge valve was closed further while surge tank level increased.

ANSWER: B.

參考運轉中的冷卻水系統圖(見下圖)。調節泵的出口閥開度以產生下列泵初始運轉參數：

泵出口壓力 = 45 psig
泵進口壓力 = 15 psig
泵流量率 = 120 gpm

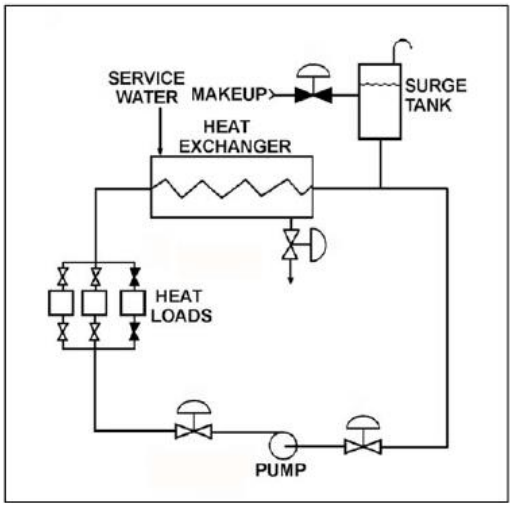
運轉幾個小時後，水泵的運轉參數如下：

泵出口壓力 = 48 psig
泵進口壓力 = 18 psig
泵流量率 = 120 gpm

下列何者是造成泵運轉參數改變的主要原因？

A.系統沒有其他的變動下，泵轉速提升
B.系統沒有其他的變動下，調節槽水位升高
C.當水泵轉速增加時，將水泵出口閥關得更小
D.當調節槽水位升高時，將水泵出口閥關得更小

答案： B

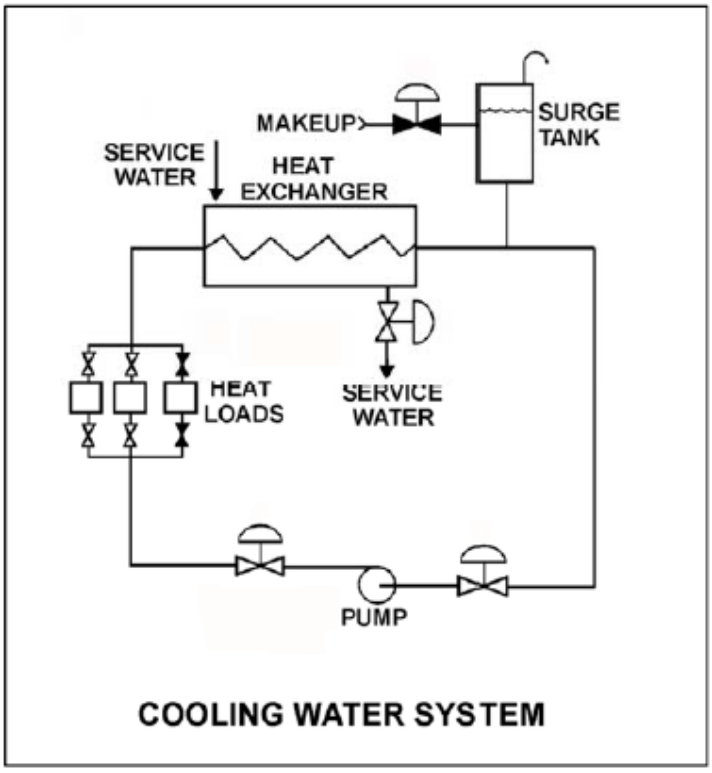


科目/題號：191004/35 (2016新增)
知能類：K1.15 [2.5/2.8]
序號：P7634 (B7634)

Refer to the drawing of an operating cooling water system (see figure below).
The pump is unable to achieve its rated volumetric flow rate due to cavitation. Which one of the following will enable the pump to achieve a higher volumetric flow rate before cavitation occurs?
A. Decrease the surge tank water level.
B. Increase the service water flow rate to the heat exchanger.
C. Move the surge tank connection closer to the discharge of the pump.
D. Remove the existing pump motor and install a motor with a higher horsepower rating.
ANSWER: B.

參考一運轉中的冷卻水系統圖(見下圖)。由於泵出現孔蝕現象，該泵無法達到其額定體積流量率。下列何者可以在泵出現孔蝕現象前，提高泵之體積流量率？
A.降低調節槽的水位
B.提高熱交換器的廠用水流量率
C.將調節槽的管路連接點移到比較靠近泵出口處
D.拆下原泵馬達，另以比較高額定馬力的馬達替換

答案： B

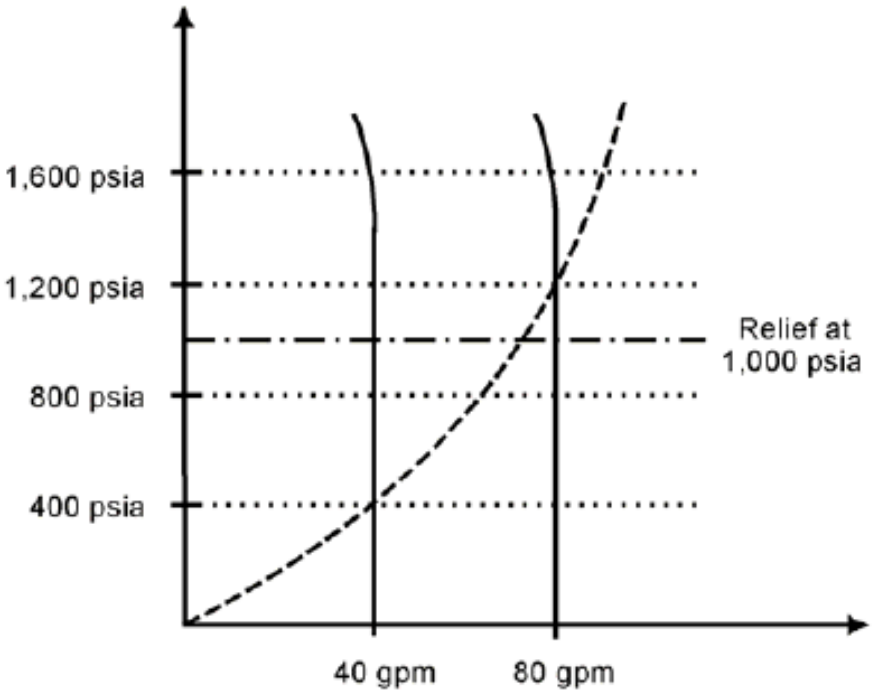


科目/題號：191004/36 (2016新增)
知能類：K1.22 [2.3/2.5]
序號：P5012 (B5013)

Use the following drawing of system and pump operating curves for a positive displacement pump with discharge relief valve protection to answer the following question.
A positive displacement pump is initially supplying water at 40 gpm with a pump discharge pressure of 400 psia. If pump speed is increased until pump flow rate is 80 gpm, what is the new pump discharge pressure?
A. 800 psia
B. 1,000 psia
C. 1,200 psia
D. 1,600 psia
ANSWER: B.

一只正排量泵的出口安裝釋壓閥作保護，系統與該泵之運轉曲線顯示如下圖。該泵一開始的流量率為 40 gpm，泵出口壓力為 400 psia。倘若提高泵的轉速，一直到泵流量率達到 80 gpm，此時泵出口壓力變成_____？
A. 800 psia
B. 1,000 psia
C. 1,200 psia
D. 1,600 psia

答案： B



科目/題號：191004/37 (2016新增)
知能類：K1.22 [2.3/2.5]
序號：P5313 (B5313)

Use the following drawing of system and pump operating curves for an operating positive displacement pump with relief valve protection to answer the following question.
A positive displacement pump is initially supplying water at 40 gpm with a pump discharge pressure of 200 psia. If pump speed is increased until pump flow rate is 80 gpm, what is the new pump discharge pressure?
A. 400 psia
B. 800 psia
C. 1,000 psia
D. 1,600 psia
ANSWER: B.

一只正排量泵的出口安裝釋壓閥作保護，系統與該泵之運轉曲線顯示如下圖。該泵一開始的流量率為 40 gpm，泵出口壓力為 200 psia。倘若提高泵的轉速，一直到泵流量率達到 80 gpm，此時泵出口壓力變成_____？
A. 400 psia
B. 800 psia
C. 1,000 psia
D. 1,600 psia

答案： B