科目： 291004
知能類： K1.01 [3.2/3.2]
序號： B218 (P221)

Which one of the following changes in pump operating parameters will directly lead to pump cavitation in a centrifugal pump that is operating in an open system?
A. Steadily decreasing pump speed
B. Steadily increasing pump suction pressure
C. Steadily increasing pump discharge pressure
D. Steadily increasing pump inlet temperature
ANSWER: D.

在泵操作參數中，改變下列何者，會在一個開放系統運轉的離心水泵中，直接引起泵孔蝕現象？
A 不斷的降低水泵速率
B 不斷的增加水泵抽水壓力
C 不斷的增加水泵注水壓力
D 不斷的增加水泵入口溫度
答案： D.

科目： 291004
知能類： K1.01 [3.2/3.2]
序號： B320 (N/A)

Which one of the following changes in plant status will bring the reactor recirculation system closer to the condition in which the recirculation pump will cavitate?

A. During a plant shutdown, recirculation pump suction temperature decreases while reactor pressure remains constant.
B. Recirculation pump speed increases.
C. Reactor water level increases.
D. During reactor power operations, extraction steam to one of the high pressure feedwater heaters isolates.

ANSWER: B.

電廠狀態發生下列何種改變，會使反應爐再循環系統容易產生再循環水泵孔蝕現象？

A 在機組停機時，再循環水泵進口溫度下降，而反應爐的壓力維持不變
B 再循環水泵的速度增加
C 反應爐水位升高
D 在反應爐功率運轉時，隔離其中一個高壓飼水加熱器的抽汽

答案： B.

科目： 291004
知能類： K1.01 [3.2/3.2]
序號： B1018 (P1520)

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（相對於節流開啟）的狀況下啟動離心水泵，發生水泵過流量運轉的機率會____，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： 291004
知能類： K1.01 [3.2/3.2]
序號： B1218 (P1220)

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 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 impinge on downstream piping and cause water hammer.
ANSWER: B.

下列何者描述水泵孔蝕現象？
A 當水泵出口和水泵進口之間的熱焓差超過蒸汽的潛熱時產生氣泡
B 在水泵中心眼產生的氣泡，而且當進入水泵內較高壓力區域時，氣泡將會破裂
C 在現有溫度下，當局部壓力超過蒸汽壓力時產生蒸汽氣泡
D 水泵注水的蒸汽氣泡衝撞下游管路並引起水錘
答案： B.

科目： 291004
知能類： K1.01 [3.2/3.2]
序號： B1718 (P1820)

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.

如果在排水閥慢慢打開（相對於完全打開）的狀況下啟動離心水泵，發生水泵溢流(run out)的機率會____，發生水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： 291004
知能類： K1.01 [3.2/3.2]
序號： B2118 (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.

在正常流量運轉的離心水泵中，下列何者會立即引起孔蝕現象？
A 排列再循環管路流程
B 隔離再循環管路流程
C 水泵進口閥完全關閉
D 水泵出口閥完全關閉
答案： C.

科目： 291004
知能類： K1.02 [2.8/2.8]
序號： B18

Venting a centrifugal pump prior to operating it ensures that...
A. pump runout will not occur.
B. pump internal corrosion is reduced.
C. gas binding is reduced.
D. starting load is minimized.
ANSWER: C.

在操作離心水泵之前先排氣，可以確保____。
A 不會發生水泵溢流(run out)
B 降低水泵內部的侵蝕
C 降低氣鎖
D 啟動負荷降至最低
答案： C.

科目： 291004
知能類： K1.02 [2.8/2.8]
序號： B219

Gas binding in a centrifugal pump can be prevented by _____ prior to pump start.
A. venting the pump
B. lowering suction pressure
C. throttling the discharge valve
D. shutting the discharge valve
ANSWER: A.

在啟動離心水泵之前，____，可以避免水泵內的空氣滯留。
A 將水泵排氣
B 降低進口壓力
C 節流出口閥
D 關閉出口閥
答案： A.

科目： 291004
知能類： K1.02 [2.8/2.8]
序號： B1821 (P1927)

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.

為使離心水泵保持最佳排氣狀況，並在運轉中及停止後都不會有空氣滯留的現象，下列何者為有效的方法？

A 在水泵的出口管路中安裝限流孔板。
B 從水泵的出口管路安裝一條水泵再循環管路到水泵的進口管路。
C 在低於取水水位處安裝水泵。
D 在水泵的出口管路中安裝逆止閥。

答案： C.

科目： 291004
知能類： K1.03 [2.8/2.9]
序號： B518

Which one of the following describes gas binding of a centrifugal pump?
A. Pump capacity is reduced due to the presence of steam or air in the pump impeller.
B. Pump capacity is reduced due to windage losses between the pump impeller and pump casing.
C. Pump motor current increases due to the compression of gases in the pump volute.
D. Pump motor current increases due to the high head requirements for pumping a fluid saturated with dissolved gases.
ANSWER: A.

下列何者描述離心水泵的氣鎖？
A 存在水泵葉輪的蒸汽或空氣會降低水泵容積。
B 存在水泵葉輪和水泵外殼間的氣流修正量減少，會降低水泵容積。
C 渦螺殼內的氣體壓縮會增加水泵馬達的電流。
D 抽唧溶有飽和氣體之液體的高壓需求會增加水泵馬達的電流。
答案： A.

科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B19

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 damage, because the pump and motor are designed to operate with the discharge valve shut
B. Pump overheating, cavitating, and ultimately pump failure
C. Excessive motor current, damage to motor windings, and ultimately motor failure
D. Pump and motor overspeed and tripping on high motor current
ANSWER: B.

過久運轉一個出口閥關閉且沒有再循環流的馬達驅動離心水泵，會導致下列何種情形？
A 沒有損害，因為水泵和馬達都是為出口閥關閉而設計的。
B 水泵過熱、產生孔蝕、最終導致水泵損壞。
C 過量的馬達電流，損害馬達線圈，最終導致馬達損壞。
D 水泵和馬達超速，在馬達過電流下跳脫。
答案： B.

科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B319 (P321)

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.

當出口壓力達到水泵關斷水頭(shutoff head)時，應停止無再循環流路的馬達驅動離心水泵，以避免____
A 水泵過熱。
B 馬達過熱。
C 水泵外殼爆炸。
D 下游管路產生水錘現象。
答案： A.

科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B423 (P23)

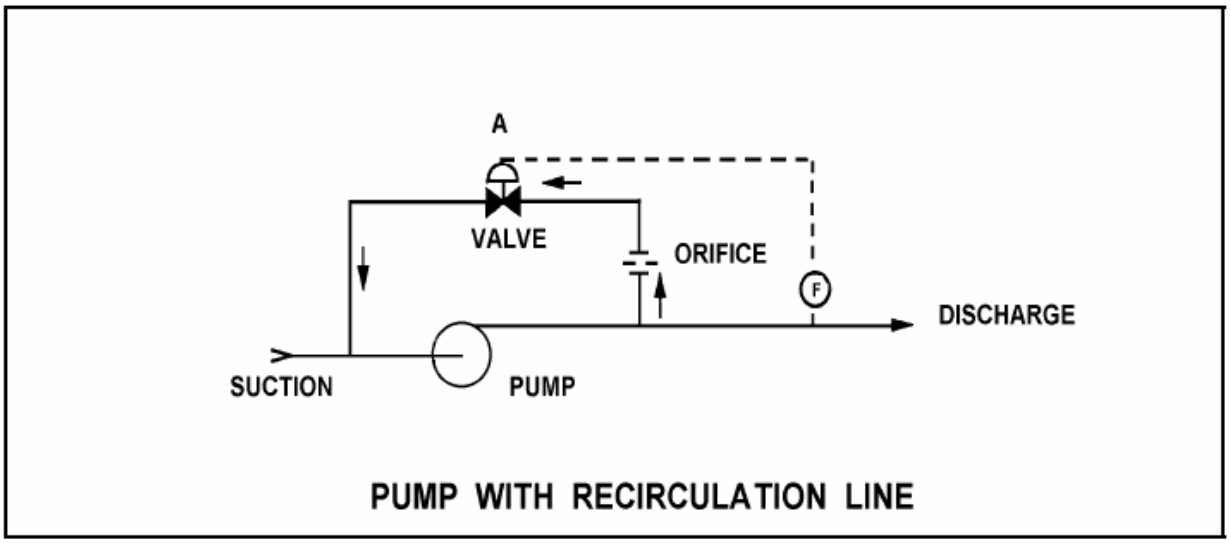
Operating a motor-driven centrifugal pump for an extended period of time under no flow conditions will cause...
A. pump failure from overspeed.
B. pump failure from overheating.
C. motor failure from overspeed.
D. motor failure from overheating.
ANSWER: B.

在沒有流量情況管制之下，逾時運轉馬達驅動之離心水泵會導致____
A 水泵因過速而失效(failure)。
B 水泵因過熱而失效(failure)。
C 馬達因過速而失效(failure)。
D 馬達因過熱而失效(failure)。
答案： B.

科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B1219 (P2221)

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.

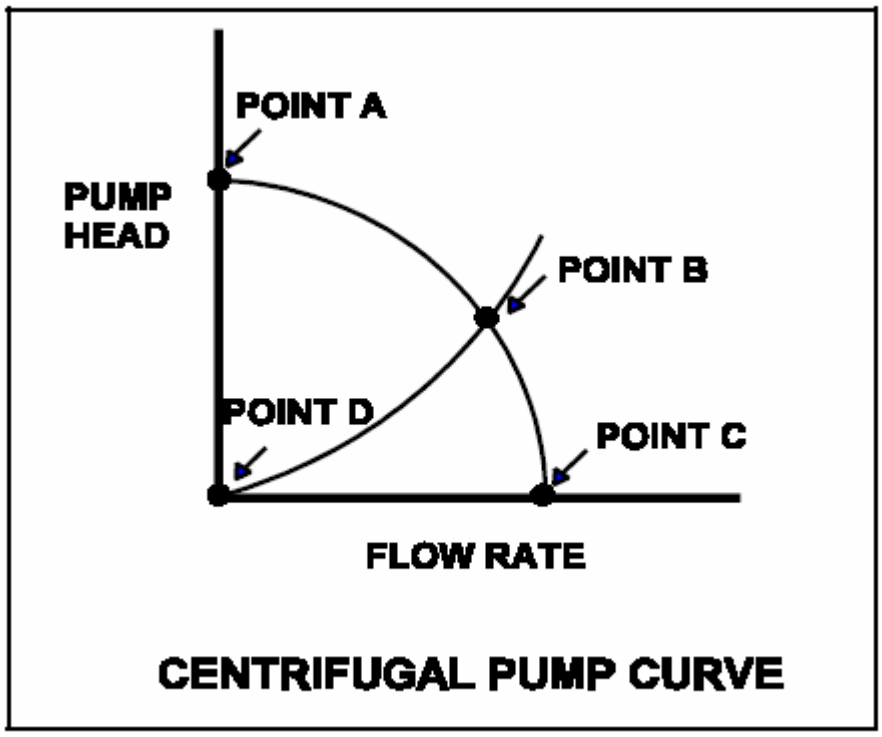
參考設有再循環管路的水泵圖（見下圖）。
當水泵____時，A閥會打開。
A 出口壓力增加，超過設定值
B 出口壓力降低，低於設定值
C 流量增加，超過設定值
D 流量降低，低於設定值
答案： D.



科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B1319 (P119)

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.

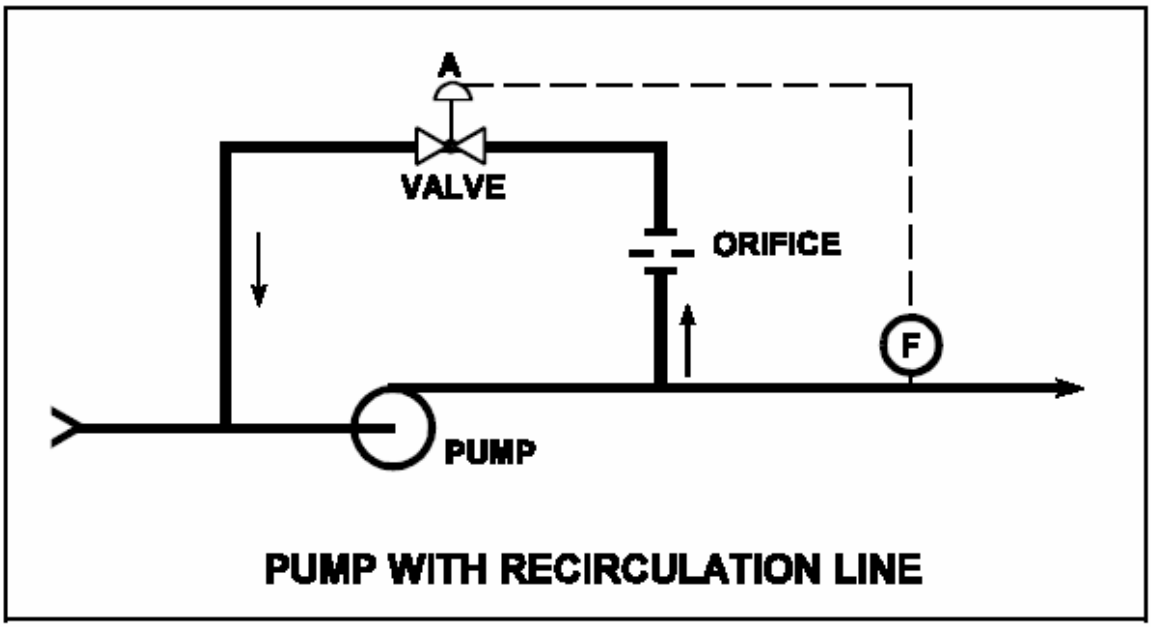
參考離心水泵特性曲線圖（見下圖）。
哪一點代表水泵在關斷水頭(shutoff head)運轉？
A. A點
B. B點
C. C點
D. D點
答案： A.



科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B1917 (P1320)

Refer to the drawing of a pump with recirculation line (see figure below).
The flow path through valve A is designed to...
A. prevent pump runout by creating a recirculation flow path.
B. provide an adequate pump cooling flow rate 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.

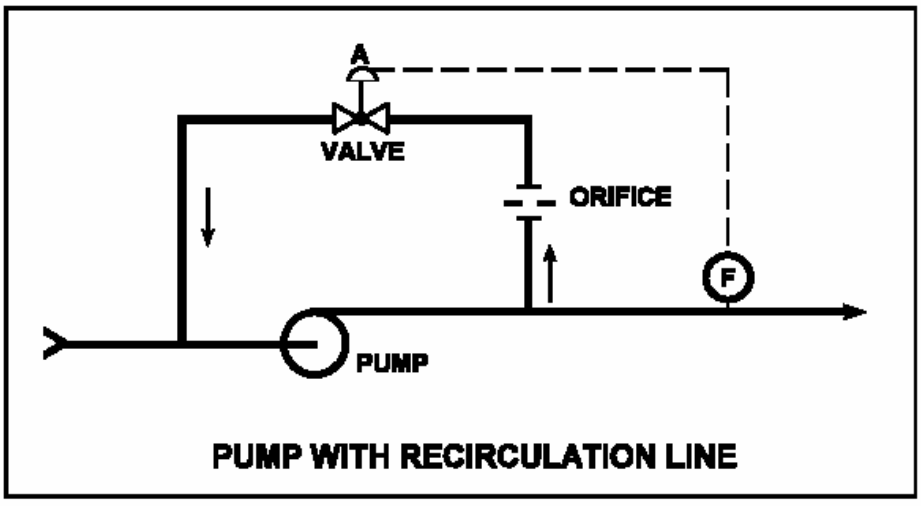
參考設有再循環管路的水泵圖（見下圖）。
通過A閥的流量路徑是設計來____
A 產生一條再循環流量路徑，以避免水泵溢流(run out)。
B 在發生關斷水頭(shutoff head)狀況時，提供充足的水泵冷卻流量。
C 導入小量的水給水泵抽取，以提高淨正吸水頭（NPSH）的淨值。
D 避免出口管路在無流量狀況時超過設計壓力。
答案： B.



科目： 291004
知能類： K1.04 [3.0/3.1]
序號： B2225 (P3122)

Refer to the drawing of a pump with a recirculation line (see figure below).
Valve "A" will close 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: C.

參考設具有再循環管路的水泵圖（見下圖）。
當水泵____時，A閥會關閉。
A 出口壓力增加且超過設定值
B 出口壓力降低，低於設定值
C 流量增加且超過設定值
D 流量降低且低於設定值
答案： C.



PUMP WITH RECIRCULATION LINE

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B3820 (P3822)

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.

啟動一個交流電馬達驅動的離心水泵時，馬達電流停在高峰2秒鐘，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 水泵的軸卡住，馬達的斷路器打開。
B 水泵在開始時往反向轉動。
C 水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，馬達軸和水泵軸間的偶合沒有固定。
答案： D.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B20

A centrifugal pump is operating at rated speed with an output head of 240 psig. The speed of the pump is then decreased until the power consumption is 1/64 of its original value. What is the approximate new output head?
A. 3.75 psig
B. 15 psig
C. 30 psig
D. 60 psig
ANSWER: B.

一離心水泵在額定轉速下運轉，其輸出水頭為240psig。若水泵的速率逐漸下降，直到功率消耗變成原來的1/64。則新的輸出水頭約變為____
A. 3.75 psig
B. 15 psig
C. 30 psig
D. 60 psig
答案： B.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B102

The discharge head of a centrifugal pump will decrease if the...
A. pump suction pressure is increased.
B. speed of the pump increases.
C. discharge valve is throttled closed.
D. temperature of the fluid being pumped increases.
ANSWER: D.

下列何者情況下，離心水泵的出水水頭會降低？
A 水泵的抽取壓力增加。
B 水泵的速率增加。
C 出口閥慢慢關上。
D 泵送的液體溫度上升。
答案： D.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B106

A multispeed centrifugal pump is operating at 1800 rpm, providing a flow of 400 gpm at 20 psig.
If the pump speed is increased to 3600 rpm, the new pump discharge pressure will be...
A. 160 psig.
B. 80 psig.
C. 60 psig.
D. 40 psig.
ANSWER: B.

一個可變速的離心水泵運轉在1800 rpm的轉速時，其出口水頭及流量分別為20psig及400gpm。如果水泵的轉速提高到3600 rpm，則出口水頭會變成____
A. 160 psig.
B. 80 psig.
C. 60 psig.
D. 40 psig.
答案： B.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B112

A variable-speed centrifugal pump is running with its drive motor at 1800 rpm. The initial flow ate is 1000 gpm, total head is 100 feet, and work input is 500 hp.
If the flow rate is changed to 1200 gpm, which one of the following will be the correct value for ew work input?
A. 550 hp
B. 778 hp
C. 864 hp
D. 912 hp
ANSWER: C.

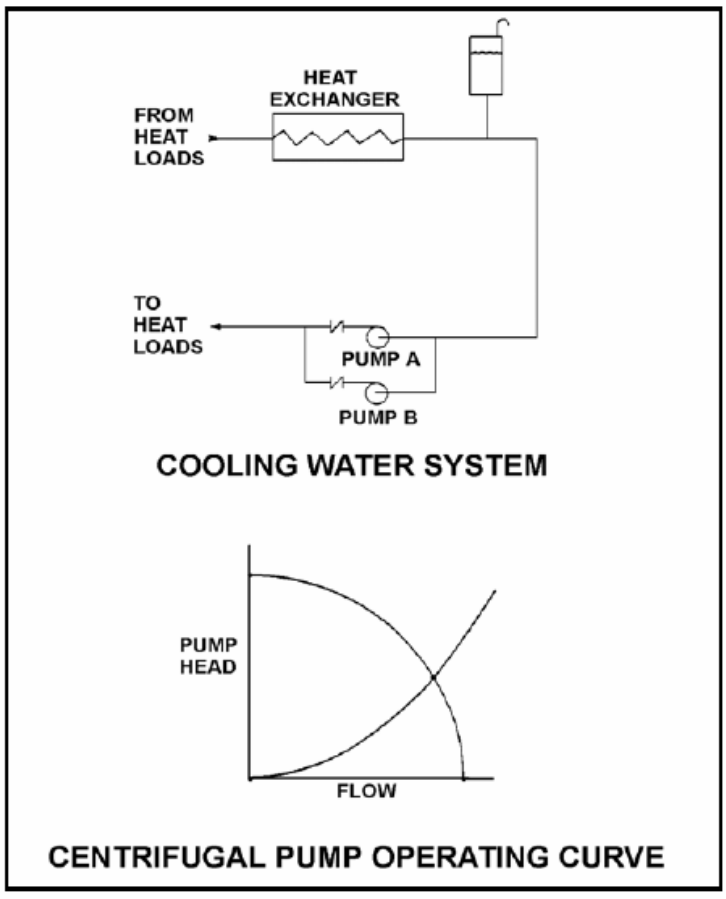
一個多轉速的離心水泵運轉在1800 rpm的轉速時，起始流量為1000 gpm，總水頭為100 feet，輸入功率為500 hp。
如果流量變成1200 gpm，則輸入功率約變為多少？
A. 550 hp
B. 778 hp
C. 864 hp
D. 912 hp

答案： C.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B1020 (P3323)

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

參考冷卻水系統以及相關的離心水泵運轉曲線圖（見下圖）。水泵A和水泵B為相同的單轉速離心水泵，開始時只有水泵A在運轉。
接著水泵B開始運轉，等到系統穩定之後，系統流量會____
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： 291004
知能類： K1.05 [2.8/2.9]
序號： B1221

A centrifugal pump is operating with the following parameters:
Pump head: 50 psid
Flow rate: 200 gpm
Power input: 3 kW
Pump speed is increased and flow rate increases to 400 gpm. Which one of the following is the
value of the new power consumption?
A. 6 kW
B. 9 kW
C. 24 kW
D. 27 kW
ANSWER: C.

一離心水泵以下列的參數運轉：
水泵出口水頭：50 psid
流量：200 gpm
輸入功率：3 kW
若提高水泵的轉速，流量增加到400 gpm，則輸入功率約變為多少？
A. 6 kW
B. 9 kW
C. 24 kW
D. 27 kW
答案： C.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B1320

The discharge head of a variable-speed centrifugal pump will increase if the...
A. pump suction pressure is increased.
B. speed of the pump decreases.
C. pump discharge valve is opened farther.
D. temperature of the fluid being pumped increases.
ANSWER: A.

變速離心水泵的出口水頭會在____時提高。
A 水泵進口壓力提高
B 水泵轉速降低
C 水泵注水閥開大一點
D 水泵抽取的流體溫度提高
答案： A.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B1519

A centrifugal pump is operating with the following parameters:
Pump head: 60 psid
Flow rate: 300 gpm
Power input: 4 kW
Pump speed is increased and flow rate increases to 400 gpm.
Which one of the following is the approximate value of the new power consumption?
A. 5.3 kW
B. 7.1 kW
C. 9.5 kW
D. 11.7 kW
ANSWER: C.

一離心水泵以下列的參數運轉：
水泵水頭：60 psid
流量：300 gpm
輸入功率：4 kW
提高水泵的轉速，流量增加到400 gpm。則輸入功率約變為多少？
A. 5.3 kW
B. 7.1 kW
C. 9.5 kW
D. 11.7 kW
答案： C.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B1619

A multispeed centrifugal pump is operating with a flow rate of 3,000 gpm. Which one of the ollowing approximates the new flow rate if the speed is decreased from 3,600 rpm to 2,400 pm?
A. 1,000 gpm
B. 1,500 gpm
C. 2,000 gpm
D. 2,500 gpm
ANSWER: C.

多轉速離心水泵以3000 gpm的流量運轉。若轉速由3,600 rpm降低到2,400 rpm，則流量將變為多少？
A. 1,000 gpm
B. 1,500 gpm
C. 2,000 gpm
D. 2,500 gpm
答案： C.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B1719

A centrifugal pump is operating with the following parameters:
Speed = 1,800 rpm
Current = 40 amperes
Pump head = 20 psi
Pump flow rate = 400 gpm
Which one of the following contains the approximate values of pump head and current if pump peed is decreased to 1,200 rpm?
A. 13 psi, 18 amps
B. 13 psi, 12 amps
C. 9 psi, 18 amps
D. 9 psi, 12 amps
ANSWER: D.

離心水泵以下列參數運轉：
轉速=1,800 rpm
電流=40 amperes
水泵水頭=20 psi
水泵流量=400 gpm
如果水泵轉速降低至1,200 rpm，下列何者為水泵水頭和電流的約略值？
A. 13 psi, 18 amps
B. 13 psi, 12 amps
C. 9 psi, 18 amps
D. 9 psi, 12 amps
答案： D.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B2321 (P2329)

A multispeed centrifugal pump is operating with a flow rate of 3000 gpm. Which one of the ollowing approximates the new flow rate if the speed is decreased from 3600 rpm to 3000 rpm?
A. 1000 gpm
B. 1500 gpm
C. 2000 gpm
D. 2500 gpm
ANSWER: D.

多轉速離心水泵在3600rpm轉速下，其流量為3000 gpm。如果轉速由3600 rpm降低至3000 rpm，下列何者為新的流量約略值？
A. 1000 gpm
B. 1500 gpm
C. 2000 gpm
D. 2500 gpm
答案： D.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B2419 (P2424)

A centrifugal pump is operating with the following parameters:
Pump head: 60 psid
Flow rate: 300 gpm
Power input: 4 KW
Pump speed is increased and flow rate increases to 400 gpm.
Which one of the following is the approximate value of the new power consumption?
A. 5.3 KW
B. 7.1 KW
C. 9.5 KW
D. 11.7 KW
ANSWER: C.

離心水泵以下列參數運轉：
水泵水頭：60 psid
流量：300 gpm
輸入功率：4 KW
水泵轉速增加，流量提高到400 gpm。
下列何者為新的功率消耗約略值？
A. 5.3 KW
B. 7.1 KW
C. 9.5 KW
D. 11.7 KW
答案： C.

科目： 291004
知能類： K1.05 [2.8/2.9]
序號： B2718 (P2723)

Refer to the drawing showing two operating points for the same centrifugal pump (see figure elow).
Operating point A was generated from pump performance data taken six months ago. Current ump performance data was used to generate operating point B. Which one of the following ould cause the observed difference between operating points A and B?

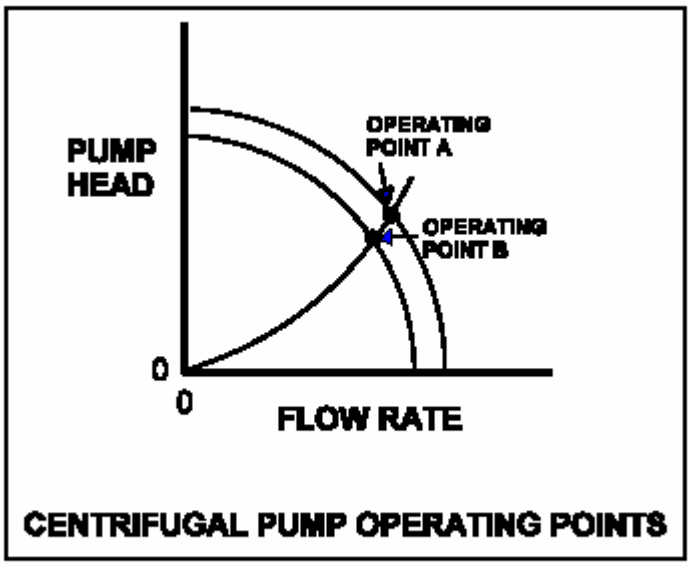
A. The pump discharge valve was more open when data was collected for operating point A.
B. The pump discharge valve was more closed when data was collected for operating point A.
C. The pump internal components have worn since data was collected for operating point A.
D. The system piping head loss has increased since data was collected for operating point A.

ANSWER: C.

參考同一個離心水泵的兩個運轉點圖（見下圖）。
運轉點A是從六個月前的運轉資料產生的。運轉點B是由現在的水泵運轉資料產生的。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，水泵的出口閥開度較大。
B 收集運轉點A的資料時，水泵的出口閥開度較小。
C 在收集完運轉點A的資料之後，水泵內部元件有磨損。
D 在收集完運轉點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： 291004
知能類： K1.05 [2.8/2.9]
序號： B3419 (P1429)
Pump speed = 400 rpm
Motor current = 40 amps
Pump head = 60 psid
A. 240 psid
B. 480 psid
C. 960 psid
D 1,440 psid
ANSWER: C.

以下為用交流馬達驅動的變速離心水泵初始狀況：
水泵轉速=400 rpm
馬達電流= 40 amps
水泵水頭= 60 psid
如果水泵轉速增加到1,600 rpm，新的水泵水頭為何？
A. 240 psid
B. 480 psid
C. 960 psid
D 1,440 psid
答案： C.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B21 (N/A)

Which one of the following will increase reactor recirculation pump available net positive
suction head? (Assume all other parameters remain constant.)
A. Loss of feedwater heating while at 80% power
B. Increase in reactor coolant temperature from 100˚F to 200˚F during a reactor startup
C. Decrease in reactor pressure during a normal reactor shutdown
D. Decrease in reactor water level from the normal level to just below the low-level alarm level
ANSWER: A.

下列何者會增加反應爐再循環泵可用的淨正吸水頭？(假設其他所有的參數保持不變。)
A 在功率80%時，喪失飼水加熱
B 在反應爐啟動時，反應爐冷卻水的溫度由100˚F增加到200˚F
C 在反應爐正常停機時，降低反應爐的壓力
D 反應爐的水位從正常水位降到稍低於低水位警報設定之水位
答案： A.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B25

What will occur by operating a positive displacement pump with insufficient net positive suction
head?
A. Slip
B. Decreased pump speed
C. Water hammer
D. Vapor binding
ANSWER: D.

如果在淨正吸水頭不足的狀況下操作正排量泵(positive displacement pump)，會發生什麼狀況？
A 滑移(slip)
B 泵轉速降低
C 水錘現象
D 氣鎖現象(vapor binding)
答案： D.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B121 (P1120)

Which one of the following operations in a closed system will cause a decrease in available net
positive suction head for a centrifugal pump?
A. Decreasing the inlet fluid temperature
B. Increasing the pump discharge pressure
C. Throttling open the pump suction valve
D. Throttling open the pump discharge valve
ANSWER: D.

在封閉系統中的何種運轉會導致離心泵的可用淨正吸水頭降低？
A 降低進口流體的溫度
B 增加泵注水壓
C 節流開啟泵的進口閥
D 節流開啟(open)泵的出口閥
答案： D.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B222 (N/A)

Which one of the following conditions will result in a decrease in the available net positive
suction head of a reactor recirculation pump?
A. Carryunder decreases.
B. Feedwater flow increases.
C. Recirculation flow rate increases.
D. Feedwater inlet subcooling increases.
ANSWER: C.

下列何種情況會使反應爐再循環泵的可用淨正吸水頭降低？
A 騰帶(carry under)降低
B 飼水流量增加
C 再循環流量增加
D 飼水進口次冷度(subcooling)提高
答案： C.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B720 (N/A)

Which one of the following will decrease the available net positive suction head to the reactor recirculation pumps? (Assume all other parameters remain constant.)

A. Increase in reactor water level from the normal level to just below the high-level alarm
B. Increase in reactor coolant temperature from 100˚F to 200˚F during a reactor startup
C. Increase in reactor pressure during a reactor startup
D. Loss of feedwater heating while at 80% power

ANSWER: B.

下列何者會降低對反應爐再循環泵可用淨正吸水頭？(假設其他參數保持不變。)

A 將反應爐水位由正常增加到稍低於高水位警報設定之水位
B 在反應爐啟動時，反應爐冷卻水溫度由100˚F調高到200˚F
C 在反應爐啟動時反應爐壓力升高
D 在80％功率時，喪失飼水加熱

答案： B.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B1120 (P114)

When flow from a centrifugal pump is increased by opening the discharge valve further, required
net positive suction head (NPSH) _____, and available NPSH _____.
A. decreases; decreases
B. decreases; increases
C. increases; increases
D. increases; decreases
ANSWER: D.

若將出口閥開的較大而使離心泵的流量增加，所需的淨正吸水頭(NPSH)會____，可用的NPSH會____。
A 減少；減少
B 減少；增加
C 增加；增加
D 增加；減少
答案： D.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B1222 (N/A)

Which one of the following changes in plant status will bring the reactor recirculation system closer to the condition in which the recirculation pump will cavitate?

A. During a plant shutdown, reactor recirculation pump suction temperature decreases while reactor pressure remains constant.
B. Reactor recirculation pump speed is increased.
C. Reactor water level increases.
D. Extraction steam is isolated from one high-pressure feed water heater during power operations.

ANSWER: B.

下列何種狀況會讓反應爐再循環系統中的再循環泵容易產生孔蝕現象？

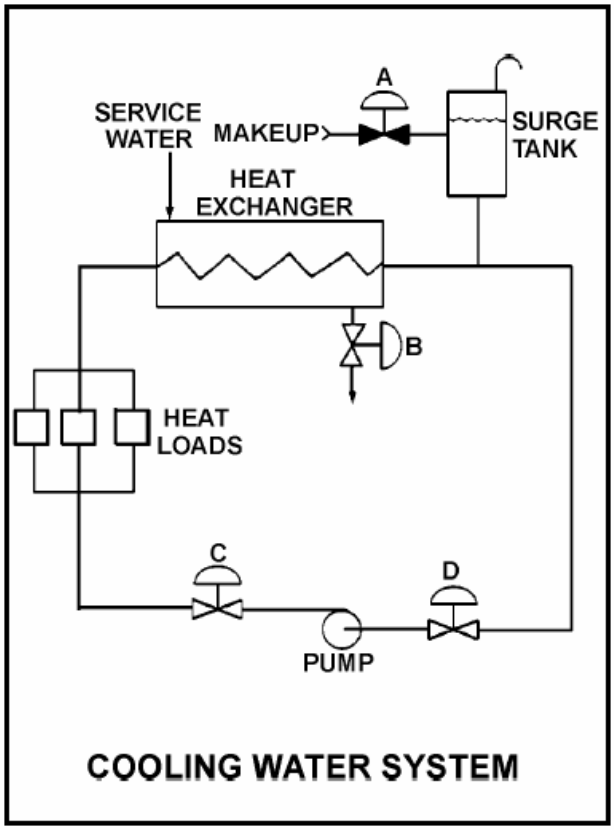
A 在電廠停機時，反應爐的再循環泵進水溫度下降，而反應爐壓保持不變。
B 反應爐再循環泵的轉速增加
C 反應爐水位升高
D 在功率運轉時，高壓飼水加熱器之抽汽被隔離。

答案： B.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B1621 (P1221)

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. Opening surge tank makeup valve A briefly
B. Throttling heat exchanger service water valve B partially closed
C. Throttling pump discharge valve C partially open
D. Throttling pump suction valve D partially closed
ANSWER: A.

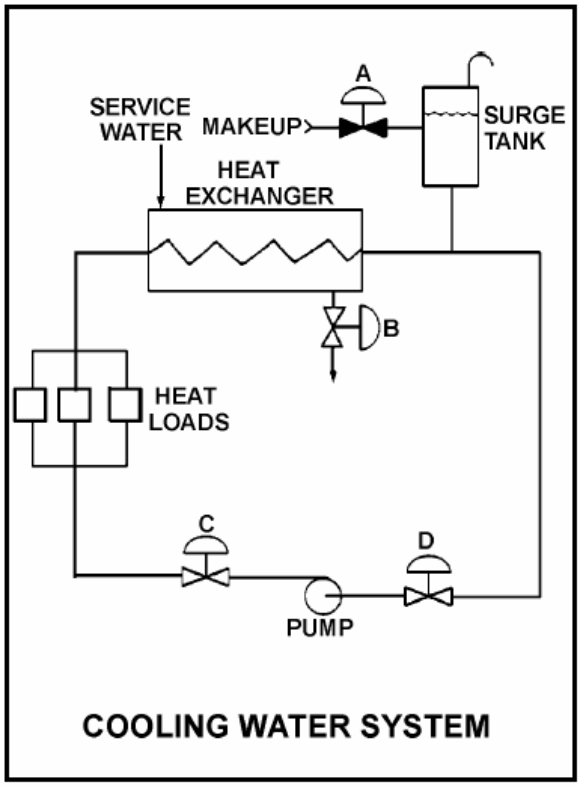
參考運轉中的冷卻水系統圖（見下圖）。
下列何者會提高離心泵的可用淨正吸水頭？
A 短暫開啟調節槽 (surge tank) 補水閥A
B 節流關閉(partially closed)熱交換器廠用水閥閥B
C 節流開啟(partially opened)泵出口閥C
D 節流關閉(partially closed)的泵進水閥D
答案： A.



科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B1918 (P1521)

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 service water valve "B" more open.
C. throttling pump discharge valve "C" more open.
D. reducing the heat loads on the cooling water system.
ANSWER: C.

參考冷卻水系統圖（見下圖）。
離心泵的可用淨正吸水頭會因____而降低。
A. 開啟調節槽(surge tank)補水閥A，升高水槽水位
B. 節流開啟熱交換器廠用水閥B至更大開度
C. 節流開啟泵出口閥C至更大開度
D. 降低冷卻水系統的熱負載
答案： C.



科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B2019 (P2025)

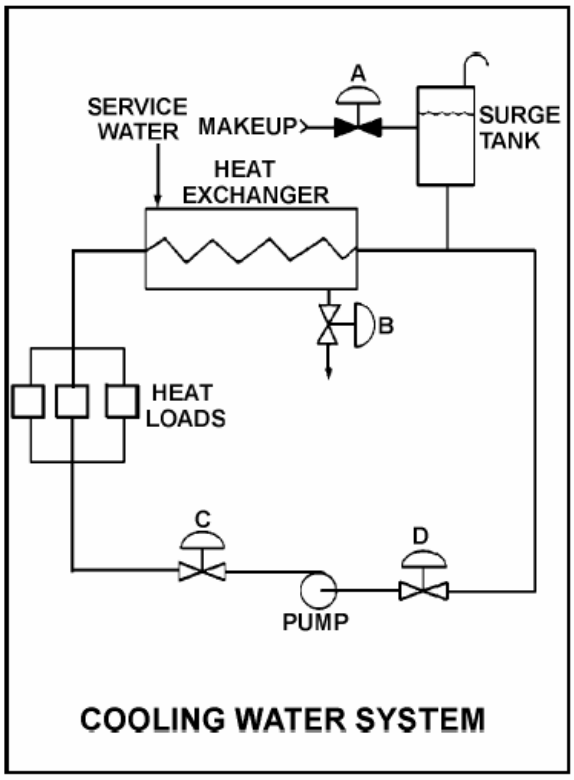
A variable-speed centrifugal pump is operating at rated speed in an open system. If the pump
speed is decreased by 50%, available net positive suction head (NPSH) will _____ and
required NPSH will _____.
A. increase; decrease
B. increase; remain the same
C. decrease; decrease
D. decrease; remain the same
ANSWER: A.

可變速離心泵在開放系統中以定速運轉。如果將泵的轉速降低50%，可用的淨正吸水頭(NPSH)將會____，而所需的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： 291004
知能類： K1.06 [3.3/3.3]
序號： B2119 (P1822)

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 centifugal
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.

參考運轉中的冷卻水系統圖（見下圖）。
下列何者會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. 減少熱交換器的廠用水閥B開度
C. 減少泵出口閥C開度減少
D. 減少泵進口閥D開度減少
答案： C.



科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B2223 (P2125)

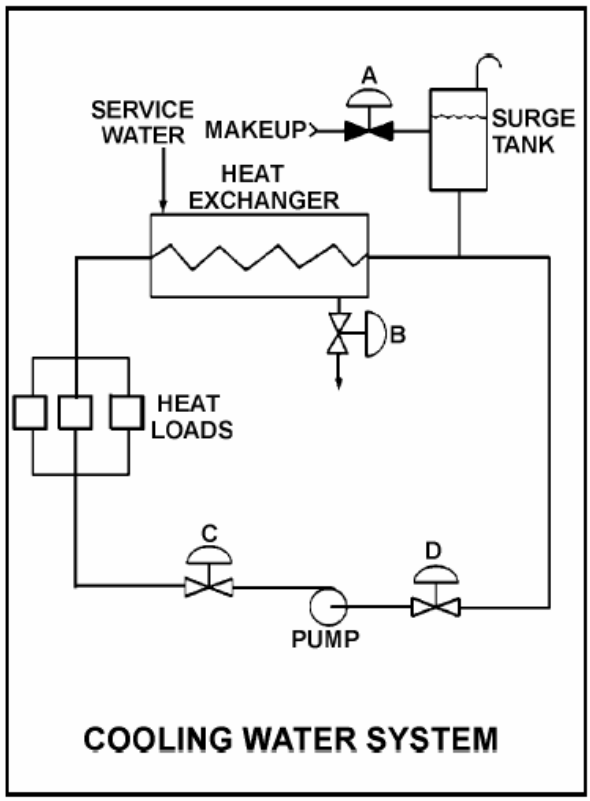
A motor-driven centrifugal pump is operating in an open system. If the pump discharge valve is
fully opened from a throttled position, available net positive suction head (NPSH) will _____ and required NPSH will _____.
A. increase; increase
B. increase; remain the same
C. decrease; increase
D. decrease; remain the same
ANSWER: C.

馬達驅動的離心泵在開放系統中運轉。如果泵的出口閥從節流位置完全打開，可用的淨正吸水頭（NPSH）將會____，而所需的NPSH將會____。
A. 增加；增加
B. 增加；維持不變
C. 降低；增加
D. 降低；維持不變
答案： C.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B2319 (P2323)

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.

參考運轉中的冷卻水系統圖（見下圖）。
下列何者會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開度
C. 增加泵出口閥C開度
D. 將冷卻水系統的熱負載降低10%
答案： C.



科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B2420 (P2424)

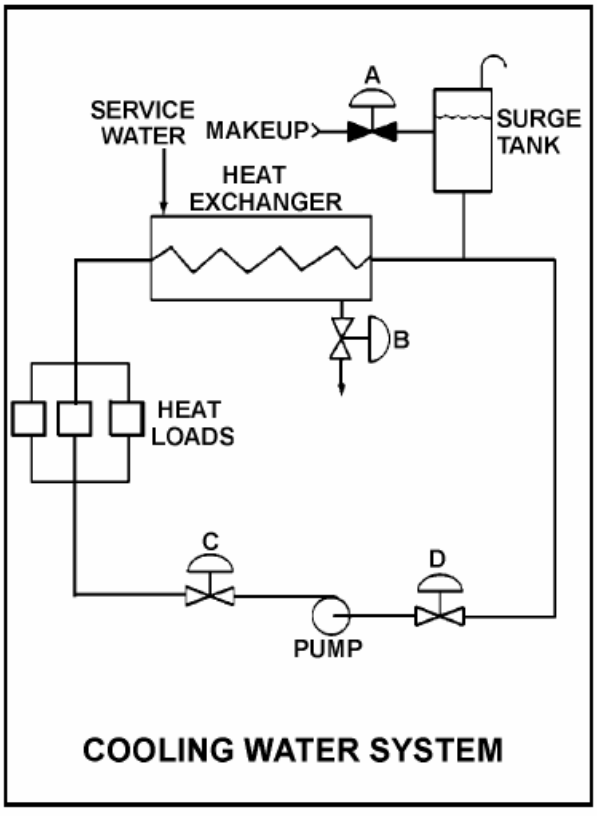
A variable speed motor-driven centrifugal pump is operating at 50% speed in an open system. If the pump speed is increased to 100%, available net positive suction head (NPSH) will _____ and required NPSH will _____.
A. increase; remain the same
B. increase; increase
C. decrease; remain the same
D. decrease; 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____，而所需的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： 291004
知能類： K1.06 [3.3/3.3]
序號： B2518 (P2222)

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 service 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.

參考冷卻水系統圖（見下圖）。
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. 熱交換器廠用水閥B節流開啟更大一點
C. 泵注水閥C節流關閉更小一點
D. 增加冷卻水系統的熱負載(Heat Loads)
答案： D.



科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B2621 (P2621)

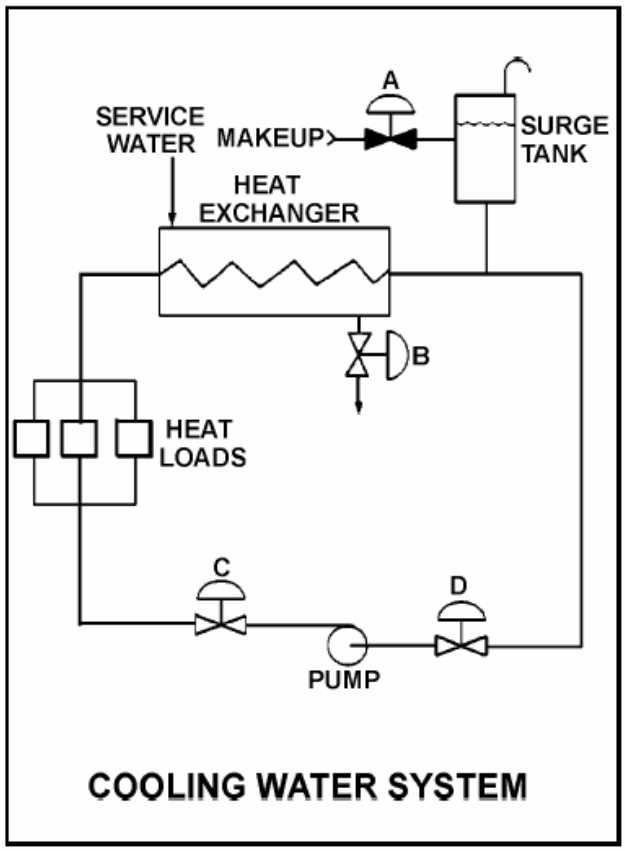
A cooling water pump is operating with pump suction parameters as follows:
Suction Temperature: 124˚F
Suction Pressure: 11.7 psia
What is the approximiate available net positive suction head (NPSH) for the pump? (Neglect the contribution of the suction fluid velocity to NPSH.)
A. 23 feet
B. 27 feet
C. 31 feet
D. 35 feet
ANSWER: A.

冷卻水泵正以下列泵進水參數運轉：
進水溫度：124˚F
進水壓：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： 291004
知能類： K1.06 [3.3/3.3]
序號： B2920 (P2921)

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.

參考運轉中的冷卻水系統圖（見下圖）。
下列何者會增加離心泵的淨正吸水頭？
A. 將調節槽放水，降低10%的水位
B. 減少廠用水閥B開度
C. 增加泵注水閥C開度
D. 減少冷卻水系統的熱負載
答案： D.



科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B3219

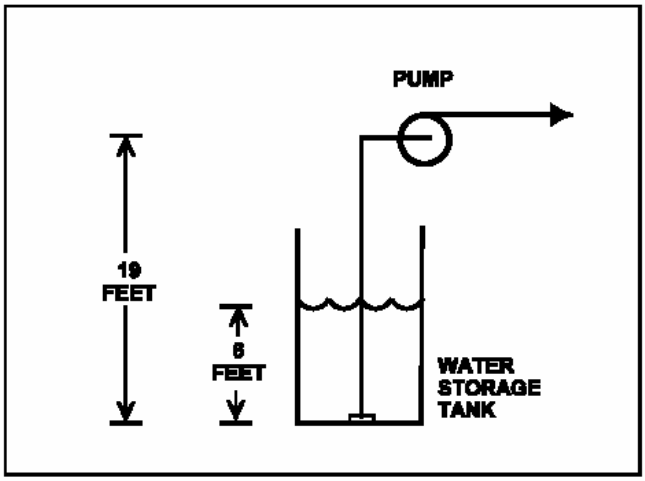
A centrifugal pump is taking suction on an open storage tank that has been filled to a level of 40 feet with 10,000 gallons of 60˚F water. The pump is located at the base of the tank, takes a suction from the bottom of the tank, and discharges through a fire hose.
Given:
• The pump is currently operating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

離心泵由開放的儲水槽進水，水槽水位40 feet，有60˚F的水10,000加侖。泵位於水槽底，從底部進水，由消防水管注水。
給定以下條件：
• 泵正以設計流量200 gpm運轉，其總水頭(total developed head)為150 feet。
• 泵需要4 feet的淨正吸水頭 (NPSH).
當儲水槽水位下降時，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 feet時發生孔蝕現象。
B. 流量維持不變，直到泵在水槽空了之後發生氣鎖。
C. 流量逐漸降低，直到泵在水槽水位達4 feet時發生孔蝕現象。
D. 流量逐漸降低，直到泵在水槽空了之後發生氣鎖。
答案： D.

科目： 291004
知能類： K1.06 [3.3/3.3]
序號： B4011 (P4010)

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，泵和水位高度都如圖所示。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： 291004
知能類： K1.07 [2.8/2.8]
序號： B115 (P1924)

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(shutoff head)且無再循環流量時，
答案： D.

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B119

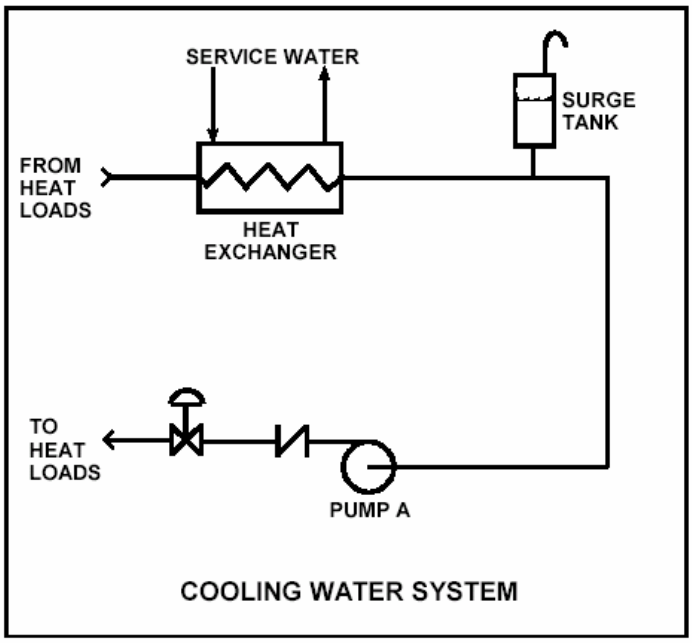
A centrifugal pump is operating at normal discharge pressure and flow conditions with the discharge valve fully open. The discharge valve is throttled to the 50% open position. Which one of the following parameters will change for this throttled condition?
A. Pump motor current decreases.
B. Pump flow rate increases.
C. Pump discharge head decreases.
D. Available net positive suction head decreases.
ANSWER: A.

離心泵在注水閥完全開啟下，以正常注水壓力和流量運轉。若將注水閥節流關閉至50%開度的位置，下列的參數中，何者會因此而改變？
A. 泵馬達電流減少。
B. 泵流量增加。
C. 泵出口水頭降低。
D. 可用淨正吸水頭降低。
答案： A.

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B419 (P424)

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 shaft speed has increased
D. increased; pump shaft speed has increased
ANSWER: A.

參考冷卻水系統圖（見下圖）。
離心泵在100˚F水溫循環水流下運轉。數小時後，水溫增加到200˚F。假設系統流量(gpm)不變，泵馬達電流強度將會____，因為____。
A. 降低；水密度降低
B. 增加；水密度降低
C. 降低；泵軸速增加
D. 增加；泵軸速增加
答案： A.



科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B922 (P1622)

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 amps。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 amps
B. 96 amps
C. 104 amps
D. 116 amps
答案： C.

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B2020 (P2023)

A reactor recirculation pump is circulating reactor coolant at 150˚F. After several hours the reactor coolant temperature has increased to 200˚F.
Assuming recirculation pump flow rate (gpm) is constant, recirculation pump 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.

反應爐再循環泵在150˚F水溫下循環反應爐冷卻水。在數小時後，反應爐冷卻水的溫度提高到200 F。
假設再循環泵的流量(gpm)不變，再循環泵馬達的電流強度amps將會____，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： 291004
知能類： K1.07 [2.8/2.8]
序號： B2219 (P1420)

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. increased; motor efficiency
C. decreased; water density
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。假設系統流量不變，泵馬達電流強度將會____，因為____增加。
A. 增加；水密度
B. 增加；馬達效率
C. 降低；水密度
D. 降低；馬達效率
答案： A.

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B2423 (P2124)

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.

冷卻水系統中的離心泵以180˚F循環水流，馬達電流強度為200 amps。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 amps
B. 206 amps
C. 218 amps
D. 236 amps
答案： B.

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B2520 (P2520)

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. 使用最大流量
B. 以過流(runout)流量運轉
C. 啟動加速到正常轉速
D. 在關斷水頭(shutoff head)時且無再循環流量
答案： C.

科目： 291004
知能類： K1.07 [2.8/2.8]
序號： B2822 (P2821)

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. 泵的注水逆止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： 291004
知能類： K1.07 [2.8/2.8]
序號： B2921 (P2925)

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 amps。數小時之後，系統溫度改變，水密度因而增加6%。
假設泵水頭和容積流量沒有改變，下列何者為新的泵馬達電流？
A. 203 amps
B. 206 amps
C. 212 amps
D. 224 amps
答案： C.

科目： 291004
知能類： K1.08 [2.8/2.8]
序號： B519

Many large centrifugal pumps are interlocked so that the pump will not start unless its discharge valve is at least 90% closed. This interlock is provided to minimize the...
A. duration of the pump motor starting current.
B. required net positive suction head.
C. loading on the pump thrust bearing.
D. pump discharge pressure.
ANSWER: A.

許多大型的離心泵設有連鎖，也就是除非泵的出口閥至少關閉90%，否則泵無法啟動。這種連鎖裝置是為了將____降至最低。
A. 泵馬達運轉在啟動電流的時間(duration)
B. 所需的淨正吸水頭
C. 泵止推軸承的負荷
D. 泵的注水壓力
答案： A.

科目： 291004
知能類： K1.08 [2.8/2.8]
序號： B619

Which one of the following pumps should be started with its discharge valve throttled?
A. Centrifugal
B. Gear
C. Reciprocating
D. Screw
ANSWER: A.

下列何種泵在啟動時，必須將出口閥節流(throttled)？
A. 離心(centrifugal)
B. 齒輪傳動(gear)
C. 往復傳動(reciprcating)
D. 螺旋(screw)
答案： A.

科目： 291004
知能類： K1.08 [2.8/2.8]
序號： B821 (P2622)

Which one of the following contains two reasons for starting a centrifugal pump with the discharge piping filled 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，必須將出口管裝滿，並關閉出口閥的兩個理由？
A. 避免泵過流量運轉(runout)，避免馬達超速
B. 避免泵過流量運轉(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： 291004
知能類： K1.08 [2.8/2.8]
序號： B1822 (P1325)

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...
A. pump discharge pressure.
B. heating of the pumped fluid.
C. the potential for cavitation at the pump suction.
D. the duration of the pump motor starting current.
ANSWER: D.

有些大型離心泵之連鎖設計為：除非泵的注水閥至少完全關閉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. 泵之進水口產生孔蝕現象的可能性
D. 泵馬達的運轉在啟動電流的時間(duration)
答案： D.

科目： 291004
知能類： K1.08 [2.8/2.8]
序號： B2120 (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 duration of motor starting current
B. Discharge valve throttled to reduce duration of motor starting current
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.

在啟動大型離心泵時，下列何者為正確的泵注水閥位置，及其原因？
A. 出口閥完全打開，以降低馬達運轉在啟動電流的時間(duration)
B. 節流出口閥，以降低馬達運轉在啟動電流的時間(duration)
C. 出口閥完全打開，以確保充足的泵淨正吸水頭
D. 節流出口閥，以確保充足的泵淨正吸水頭
答案： B.

科目： 291004
知能類： K1.11 [2.4/2.5]
序號： B520 (P2322)

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. The fire hose nozzle is raised to an elevation that prevents any flow.
B. Suction temperature is increased to the point that gas binding occurs.
C. Pump speed is adjusted to the value at which cavitation occurs.
D. Suction pressure is adjusted until available net positive suction head is reduced to zero feet.

ANSWER: A.

一離心消防水泵在一開放儲槽取水，並透過消防水管注水。下列何者將會導致此泵在關斷水頭(shutoff head)下操作？

A. 消防水管噴嘴提高至某一高度，而阻止任何流動
B. 進口溫度增加到某點而使氣鎖發生
C. 泵速度調整到某數值而使孔蝕發生
D. 進口壓力調整直到可用的淨正吸水頭的淨值降低至0呎

答案： A.

科目： 291004
知能類： K1.11 [2.4/2.5]
序號： B1823 (P109)

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(shutoff head)下操作，其操作是在_____流量，以及_____排放水頭。
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： 291004
知能類： K1.11 [2.4/2.5]
序號： B2018 (P2022)

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 pump prevents pump flow.
D. Pump speed is decreased until is insufficient to cause flow.
ANSWER: D.

一變速離心消防水泵在一開放儲水槽取水，同時經由四吋直徑的消防水管，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(shutoff head)下操作？
A. 消防水管以六吋直徑之消防水管取代
B. 消防水管以兩吋直徑之消防水管取代
C. 泵速度增加直到在泵眼(the eye of the pump)形成蒸汽而阻止泵內之水流流動
D. 泵速度減少直到泵排放壓力不足以讓水流動
答案： D.

科目： 291004
知能類： K1.11 [2.4/2.5]
序號： B2121 (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(shutoff head)情況下的操作參數？
A. 高出口壓力，低流量，低功率需求
B. 高出口壓力，高流量，低功率需求
C. 低出口壓力，低流量，高功率需求
D. 低出口壓力，高流量，高功率需求
答案： A.

科目： 291004
知能類： K1.11 [2.4/2.5]
序號： B2721 (P2721)

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.

一離心消防水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閉水頭(shutoff head)情況下操作？
A. 消防隊員不小心將消防水管切斷(severs the fire hose)
B. 消防水管在防火門變成完全捲皺(crimped)
C. 消防水儲水槽水位下降至泵吸水管路之下
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： 291004
知能類： K1.11 [2.4/2.5]
序號： B3320 (P2820)

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:B.

一離心消防水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(shutoff head)下操作？
A. 消防隊員不小心將消防水管切斷(severs the fire hose)
B. 消防水管在防火門變成部分捲皺(crimped)
C. 消防水儲槽水位下降至泵吸水龍頭之下
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： B.

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B23

Which one of the following will occur if a motor-driven centrifugal pump is operated continuously at runout conditions?
A. Pump failure due to excessive pump cavitation
B. Pump failure due to overheating caused by the increased impeller-to-casing friction
C. Motor failure due to excessive current being drawn through the motor windings
D. Motor failure due to overheating caused by increased windage losses
ANSWER: C.

若一馬達驅動之離心泵持續在過流狀況下操作，下列何者會發生？
A. 泵失效，因為泵孔蝕過量
B. 泵失效，因為葉輪至外殼的摩擦增加而發生過熱
C. 馬達失效，因為從馬達線圈得到之電流過量
D. 馬達失效，因為增加之繞組損失(windage loss)而導致過熱
答案： C.

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B321

A centrifugal pump is operating at rated conditions in an open system. If a system transient results in the pump operating at runout, which one of the following indications will be present?
A. Increased discharge pressure
B. Decreased pump motor current
C. Increased pump vibration
D. Decreased pump flow rate
ANSWER: C.

一離心泵於一開放系統中以額定狀況下運轉。若系統暫態造成泵在過流(runout)情況下運轉，則下列何項狀況將會出現？
A. 出口壓力增加
B. 泵馬達電流降低
C. 泵振動增加
D. 泵流量降低
答案： C.

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B424

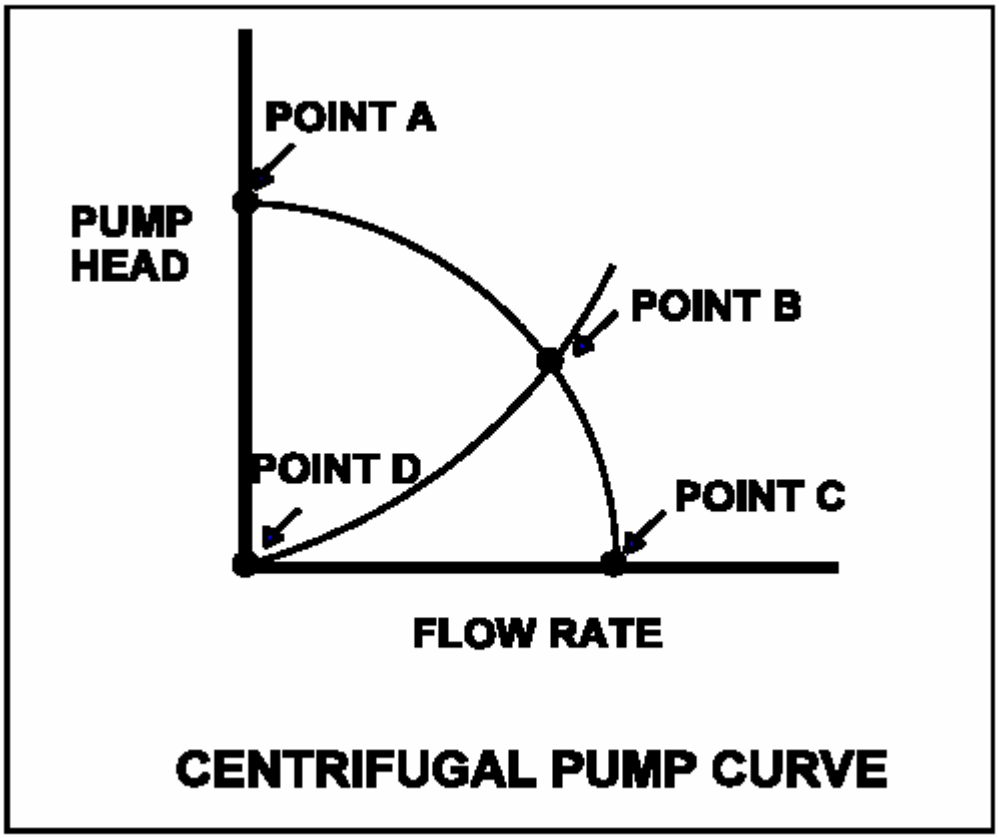
Operating a motor-driven centrifugal pump under "pump runout" conditions causes...
A. pump overheating, cavitation, and ultimately pump failure.
B. excessive motor current to be drawn, damage to the motor windings, and ultimately motor failure.
C. excessive motor current to be drawn, overheating of pump and motor bearings, and ultimately pump failure.
D. no damage, because most pumps and motors are designed to operate without failure under pump runout conditions.
ANSWER: B.

如果馬達驅動泵在「泵過流」(runout)情況下操作會導致
A. 泵過熱，孔蝕，最後泵失效
B. 馬達電流過高，造成馬達線圈發生損害，最後馬達失效
C. 馬達電流過高，造成泵與馬達軸承過熱，最後泵失效
D. 沒有損害，因為大部分泵與馬達設計能夠在泵過流(runout)下操作而不失效
答案： B.

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B1024 (P1721)

Refer to the drawing of a centrifugal pump operating curve (see figure below).
At which operating point will pump runout occur?
A. Point A
B. Point B
C. Point C
D. Point D
ANSWER: C.

參考一離心泵運轉曲線圖示（見下圖）。在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.



CENTRIFUGAL PUMP CURVE

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B1323 (P1623)

A centrifugal pump is operating at maximum design flow rate, delivering water through two
parallel valves. Valve A is 1/2 open, and valve B is 1/4 open.
Which one of the following will occur if both valves are fully opened?
A. The pump will immediately operate at shutoff head.
B. The pump available net positive suction head (NPSH) will increase.
C. The pump required NPSH will decrease.
D. The pump will immediately 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. 泵會立即在關斷水頭下運轉
B. 泵可用的淨正吸水頭將會增加
C. 泵需要的淨正吸水頭將會減少
D. 泵會立即在過流狀況下運轉
答案： D.

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B1425

What is caused by operating a motor-driven centrifugal pump under runout conditions?
A. Pump failure due to overspeed of the pump impeller
B Pump failure due to excessive pump cavitation
C Motor failure due to excessive motor winding current
D Motor failure due to loss of cooling from pumped fluid
ANSWER: C.

一馬達驅動之離心泵在過流情況下操作，會導致下列何種狀況？
A. 泵失效，因為泵葉輪轉速過大
B. 泵失效，因為泵孔蝕過多
C. 馬達失效，因為馬達線圈之電流過量
D. 馬達失效，因為被抽取流體的冷卻減少
答案： C.

科目： 291004
知能類： K1.12 [2.8/2.8]
序號： B1920 (P1123)

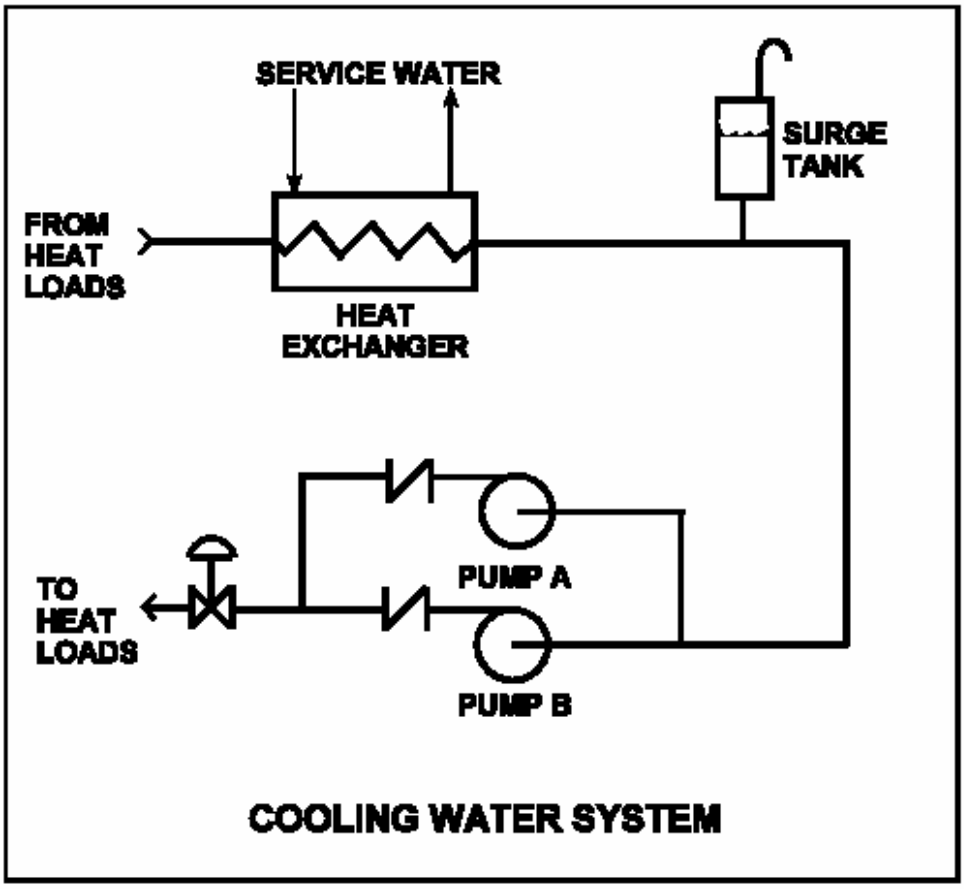
Which one of the following describes centrifugal pump runout conditions?
A. High discharge pressure, low flow, high power demand
B. High discharge pressure, high flow, low power demand
C. Low discharge pressure, low flow, low power demand
D. Low discharge pressure, high flow, high power demand
ANSWER: D.

下列何者描述了離心泵過流狀況？
A. 高出口壓力，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： 291004
知能類： K1.12 [2.8/2.8]
序號： B3910 (P3910)

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.

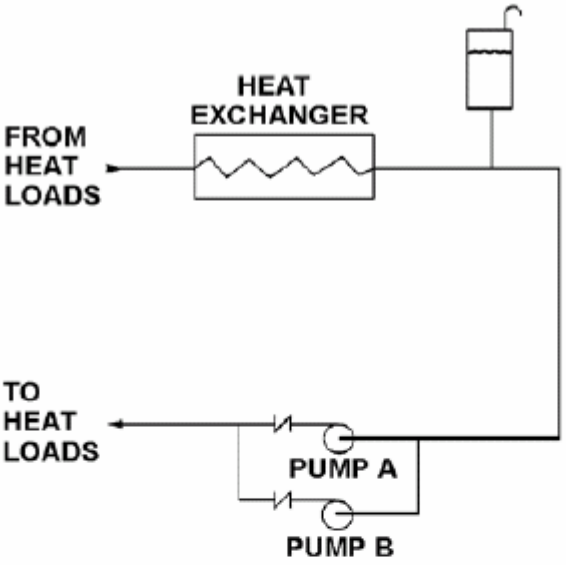
參考一冷卻水系統如圖示，其中只有泵A在運轉，而泵之出口閥目前開度為90%。若因冷卻水系統中一異常之熱負載，導致泵A在接近過流情況下運轉。下列何者會導致泵A在更遠離過流狀況下運轉？（假設一直維持足夠的可用的淨正吸水頭的淨值。）
A. 啟動泵B
B. 將出口閥調整成100%開啟
C. 提高調節槽水位2呎
D. 降低熱交換器冷卻水流量10%
答案： A.


SERVICE WATER
SURGE TANK
FROM HEAT LOADS
HEAT EXCHANGER
PUMP A
TO HEAT LOADS
PUMP B
COOLING WATER SYSTEM

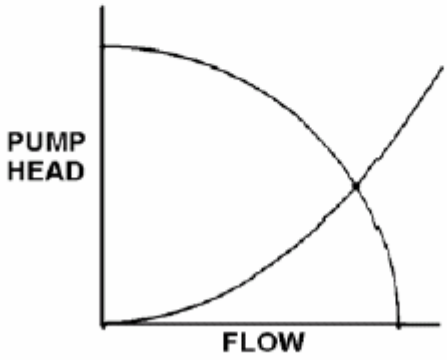
科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B325

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, 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.

參考冷卻水系統以及相關之離心泵操作曲線圖示（見下圖）。泵A與B乃相同之單速離心泵，而只有泵A在運轉。若泵B啟動，系統流量將會_____，而出口集管之壓力將會_____。
A. 不變；升高
B. 升高；不變
C. 不變；不變
D. 升高；升高
答案： D.



COOLING WATER SYSTEM



CENTRIFUGAL PUMP OPERATING CURVE

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B521 (P2224)

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. Available net positive suction head (NPSH) decreases, and pump differential pressure decreases.
C. Total developed head increases and available NPSH decreases.
D. The potential for pump cavitation decreases, and pump differential pressure decreases.

ANSWER: B.

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. 可用的淨正吸水頭減小，泵差壓減小
C. 出口水頭增加，可用的淨正吸水頭減小
D. 泵孔蝕可能性減小，泵差壓減小

答案： B.

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B622

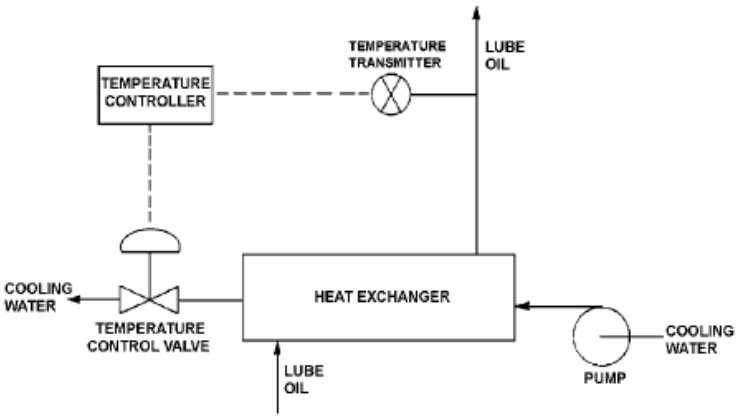
A centrifugal pump is operating at rated conditions in an open system with all valves fully open.
If the pump discharge valve is throttled to 50% closed, pump discharge pressure will _____ and pump motor current will _____.
A. decrease; decrease
B. decrease; increase
C. increase; increase
D. increase;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

一離心泵於一開放系統中在額定狀況下運轉，所有閥全開。若將此泵注水閥開度降低至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.

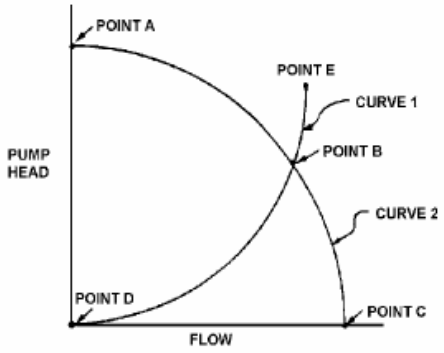
科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B722 (P723)

Refer to the drawing of a lube oil temperature control system and the associated centrifugal pump/system operating curves (see figure below) with the temperature control valve at midposition.
If the temperature control valve modulates farther closed, the centrifugal pump operating point will move along curve _____, and become closer to point _____. (Assume that no other system component changes occur.)
A. 1; D
B. 2; A
C. 1; E
D. 2; C
ANSWER: B.

參考一潤滑油溫度控制系統以及與其相關之離心泵／系統運轉曲線圖示（見下圖），其溫度控制閥閥位處於中點。若溫度控制閥朝關閉方向調整，則此離心泵之運轉點將會沿著曲線_____移動，而比較靠近點_____。（假設沒有其他系統元件改變發生。）
A. 1; D
B. 2; A
C. 1; E
D. 2; C
答案： B.



LUBE OIL TEMPERATURE CONTROL SYSTEM



CENTRIFUGAL PUMP OPERATING CURVE

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B823

Which one of the following actions will correct a cavitating centrifugal pump?
A. Increasing the pump speed
B. Lowering the pump suction pressure
C. Lowering the pump suction temperature
D. Cycling the pump off and on a few times
ANSWER: C.

下列何者能夠改正一發生孔蝕之離心泵？
A. 增加泵速度
B. 降低泵進水口壓力
C. 降低泵進水口溫度
D. 使泵開、關循環多次
答案： C.

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B1122

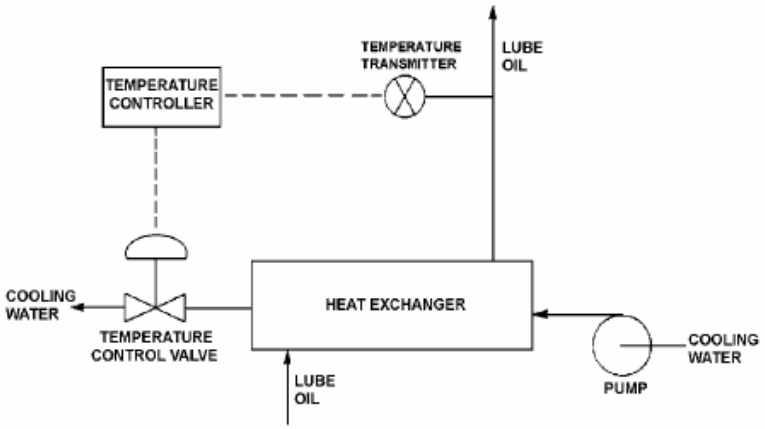
A centrifugal pump is operating at rated conditions in an open system. If the pump discharge valve is fully closed, pump discharge pressure will _____ and motor current will _____.
A. increase; decrease
B. decrease; decrease
C. increase; increase
D. decrease; increase
ANSWER: A.

一離心泵於一開放系統中在額定狀況下運轉。若此泵出口閥全關，泵出口壓力將會_____，而馬達電流將會_____。
A. 增加；減小
B. 減小；減小
C. 增加；增加
D. 減小；增加
答案： A.

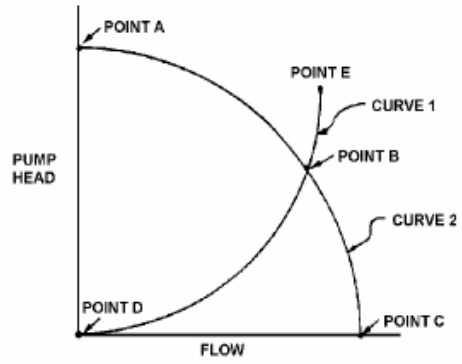
科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B1423 (P623)

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 open, operating point B will be located on curve _____, closer to point _____. (The options below refer to curves 1 and 2 exactly as shown in the figure.)
A. 1; D
B. 2; A
C. 1; E
D. 2; C
ANSWER: D.

參考一潤滑油溫度控制系統以及與其相關之離心泵運轉曲線圖（見下圖），此泵在運轉曲線上之B點運轉。若溫度控制閥朝開啟方向調整，運轉點B將會落在曲線_____上，而比較靠近點_____。（考慮下列選項時請完全依照圖示曲線1,2。）
A. 1; D
B. 2; A
C. 1; E
D. 2; C
答案： D.



LUBE OIL TEMPERATURE CONTROL SYSTEM



CENTRIFUGAL PUMP OPERATING CURVE

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B1522

Which one of the following components of a centrifugal pump has the specific primary function of increasing the kinetic energy of a fluid?
A. Volute
B. Impeller
C. Diffuser
D. Discharge nozzle
ANSWER: B.

對一離心泵，下列哪一個組件其主要功能為增加流體之動能？
A. 渦旋(volute)
B. 葉輪(impeller)
C. 擴散孔(diffuser)
D. 出口噴嘴(discharge nozzle)
答案： B.

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B1722 (P1725)

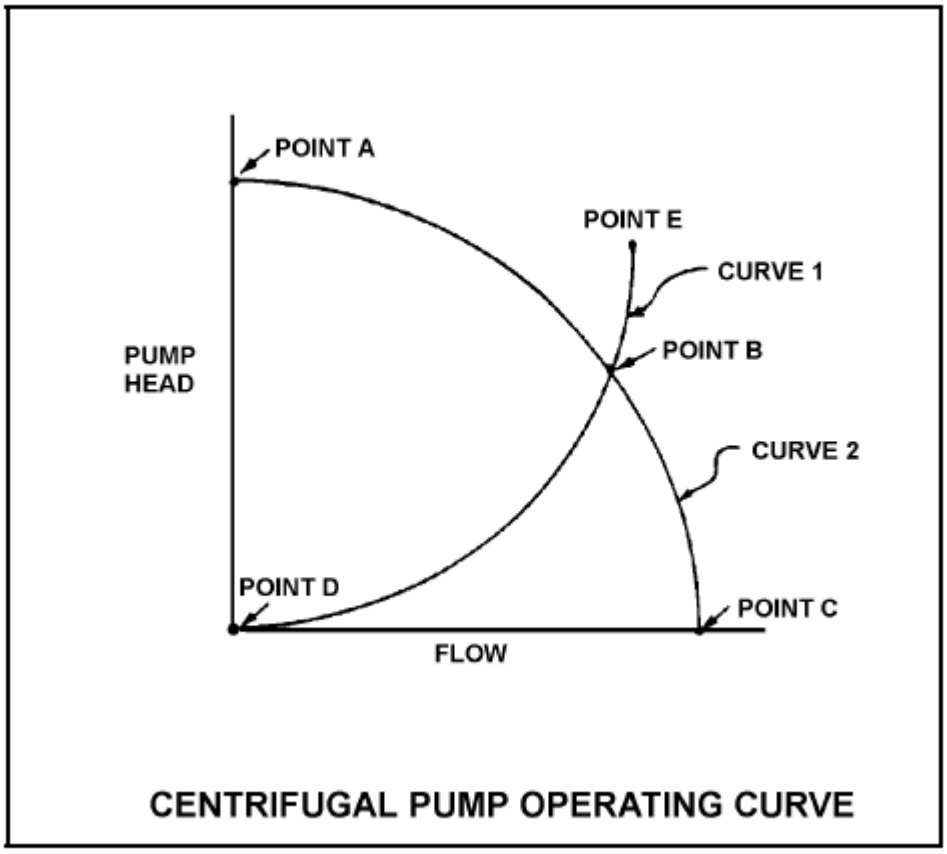
A typical single-stage radial-flow centrifugal pump is being returned to service following maintenance on its ac motor. Which one of the following will occur when the pump is started if two of the three motor power leads were inadvertently swapped during restoration?
A. The motor breaker will trip on instantaneous overcurrent.
B. The motor will not turn and will emit a humming sound.
C. The pump will rotate in the reverse direction with reduced or no flow rate.
D. The pump 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. 此馬達斷路器將因瞬間過電流超載而跳脫
B. 此馬達無法轉動，且將發出低鳴聲
C. 此馬達將會以反向運轉，流量降低或無流量
D. 此馬達將會以正常方向運轉，流量降低
答案： C.

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B2323 (P2325)

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.

參考離心泵之運轉曲線如下圖。一離心泵在B點上運轉。若泵速度降低一半，則新的運轉點將會落在曲線_____上，而比較靠近點_____。（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.

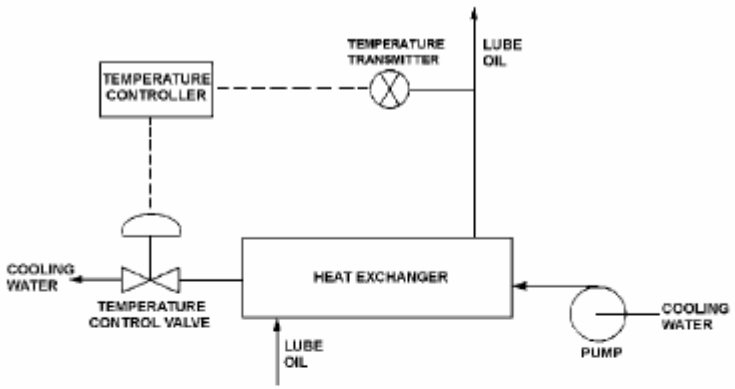


CENTRIFUGAL PUMP OPERATING CURVE

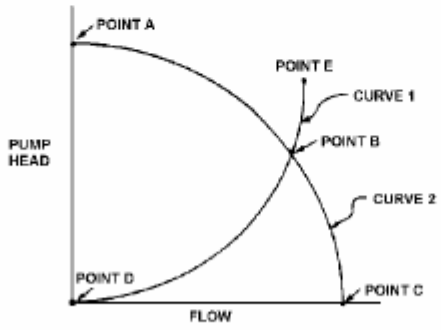
科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B2524 (P2523)

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, how will the operating point change if the temperature controller setpoint is decreased by 10^{o}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.

參考一潤滑油溫度控制系統，與相關之離心泵運轉曲線圖（見下圖），此泵在B點運轉。現若將此溫度控制器設定點減小10^{o}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

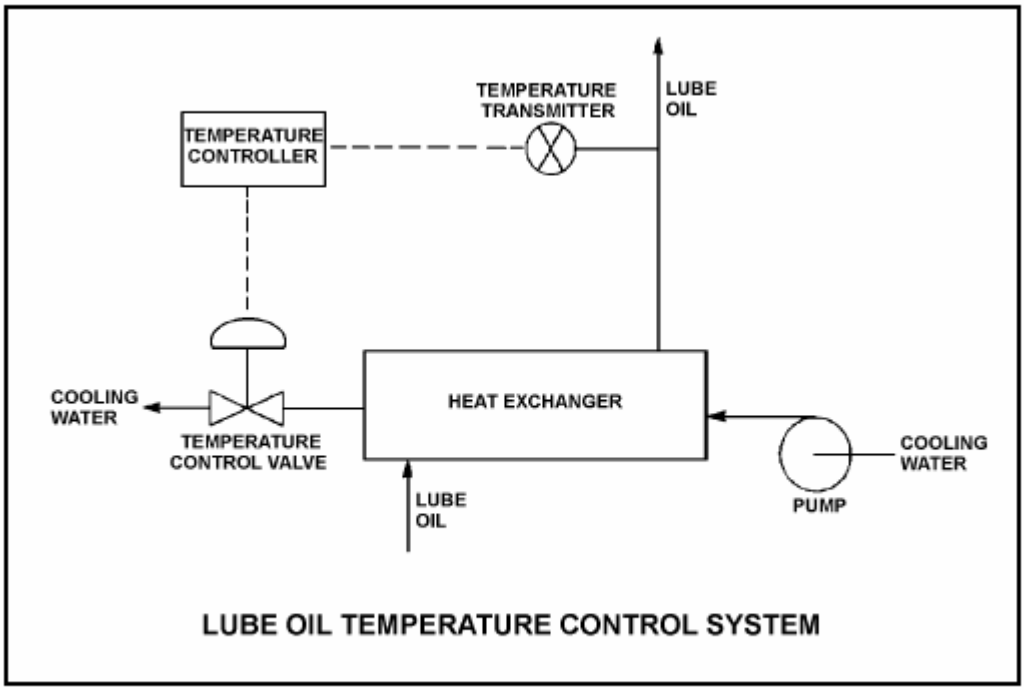


CENTRIFUGAL PUMP OPERATING CURVE

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B2422 (P2422)

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.

參考一潤滑油溫度控制系統圖示（見下圖）。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會_____，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： 291004
知能類： K1.13 [2.6/2.7]
序號： B2622 (P2624)

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？

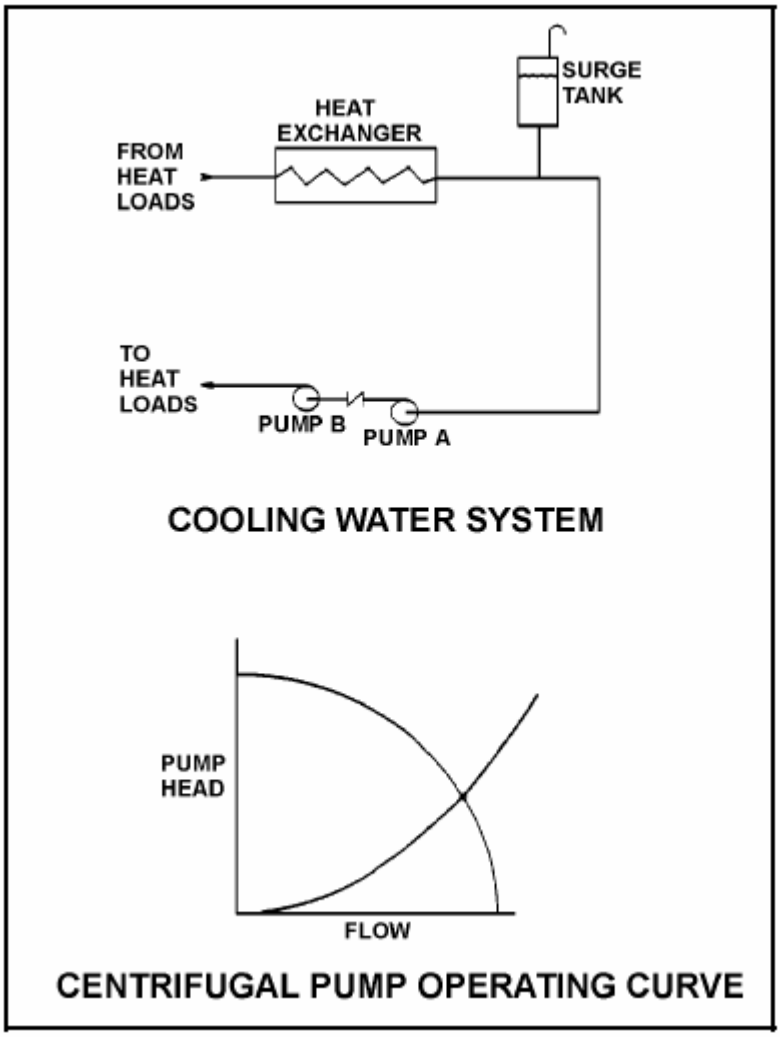
A. 藉由增加泵進水處之速度水頭而增加總泵水頭
B. 藉由減少泵水頭損失而增加泵之差壓
C. 藉由減小在泵進口處的水頭損失而增加可用的淨正進口水頭
D. 藉由減小泵進口處的擾流而增加泵流量

答案： C.

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B2623

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 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. less than one-half the original flow.
D. the same; only the pump head will change.
ANSWER: A.

參考一冷卻水系統，與附隨之離心泵運轉曲線圖示（見下圖）。泵A與B為相同之單級式離心泵，同時兩泵均在運轉中。若泵B跳脫，則在系統穩定之後，系統流量將會
A. 超過原流量的一半
B. 是原流量的一半
C. 少於原流量的一半
D. 不變；只有泵水頭會改變
答案： A.


SURGE
TANK
HEAT
EXCHANGER
FROM
HEAT
LOADS
TO
HEAT
LOADS
PUMP B
PUMP A
COOLING WATER SYSTEM
PUMP
HEAD
FLOW
CENTRIFUGAL PUMP OPERATING CURVE

科目： 291004
知能類： K1.13 [2.6/2.7]
序號： B3022 (P3020)

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一水噴灑系統中。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的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： 291004
知能類： K1.13 [2.6/2.7]
序號： B3522

A single-speed centrifugal pump is needed to supply river water to a storage facility. The pump must be capable of providing a very high flow rate at a low discharge pressure. Which one of the following types of centrifugal pumps is best suited for this application?
A. Single-stage, axial flow
B. Single-stage, radial flow
C. Multiple-stage, axial flow
D. Multiple-stage, radial flow
ANSWER: A.

一單速離心泵將河水泵送至一儲存設備。此泵必須能夠在低出口壓力下，提供非常高之流量。下列何種形式之離心泵最適合此項工作？
A. 單級，軸流式
B. 單級，徑流式
C. 複級，軸流式
D. 複級，徑流式
答案： A.

科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B24

A single-speed centrifugal fire pump takes suction on a water storage tank and discharges through a flexible fire hose. Which one of the following describes the response of the pump discharge flow rate?
A. Decreases as the level in the storage tank decreases
B. Increases as the height of the fire hose nozzle is increased
C. Remains constant as the level in the storage tank decreases
D. Remains constant as the height of the fire hose nozzle is increased
ANSWER: A.

一單速離心消防泵從一儲水槽中取水，並透過一消防水帶噴水。下列敘述何者正確？
A. 當儲水槽水位降低時，流量降低
B. 當消防水帶噴嘴高度增加時，流量增加
C. 當儲水槽水位降低時，流量不變
D. 當消防水帶噴嘴高度增加時，流量不變
答案： A.

科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B623

A centrifugal pump is operating at rated conditions in an open system with all valves fully open.
If the pump suction valve is throttled to 50% closed, pump suction pressure will _____ and pump flow rate will _____.
A. increase; decrease
B. decrease; remain the same
C. increase; remain the same
D. decrease; decrease
ANSWER: D.

一開放系統中，一離心泵在額定情況下運轉，其出口閥全開。若此泵進口閥節流至50%開度，則泵進口壓力將會_____而泵流量將會_____。
A. 增加；減小
B. 減小；維持不變
C. 增加；維持不變
D. 減小；減小
答案： D.

科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B723 (P724)

A centrifugal pump is operating normally 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.

一離心泵於一開放系統中正常運轉。若此泵之再循環(最小流量閥)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： 291004
知能類： K1.14 [2.5/2.5]
序號： B1123 (P826)

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」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： 291004
知能類： K1.14 [2.5/2.5]
序號： B1421 (P1421)

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，則泵進口壓力將會_____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： 291004
知能類： K1.14 [2.5/2.5]
序號： B2722 (P2722)

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，則將發生下列何事？
A. 泵會在關斷水頭(shutoff head)下操作
B. 泵會在過流狀況下運轉
C. 泵可用的淨正吸水頭會增加
D. 泵需要的淨正吸水頭會增加
答案： C.

科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B2825 (P2224)

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. Motor current decreases and total developed head decreases.
B. Available net positive suction head (NPSH) decreases, and pump differential pressure decreases.
C. Total developed head increases and available NPSH decreases.
D. The potential for pump cavitation decreases, and pump differential pressure decreases.

ANSWER: B.

一馬達驅動之離心泵運轉在一開放系統中運，其出口閥節流至50%開度。若出口閥全開，則對泵有何影響？

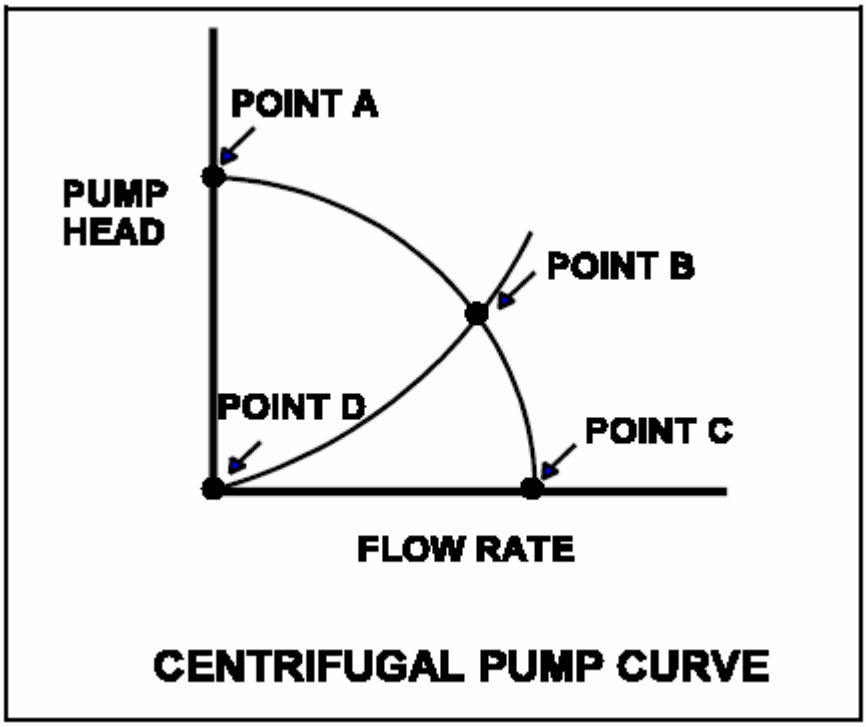
A. 馬達電流減小，泵出口水頭(total developed head)減小
B. 可用的淨正進口水頭值減小，泵差壓減小
C. 泵出口增加，可用的淨正吸水頭減小
D. 泵孔蝕可能性減小，泵差壓減小

答案： B.

科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B2924 (P2924)

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.

一離心泵在冷卻水系統中運轉，其運轉曲線如圖示。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. 點 A
B. 點 B
C. 點 C
D. 點 D
答案： D.



科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B3623 (P3623)

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 shutoff head of 100 feet.
• The required net positive suction head (NPSH) for the pump is 15 feet.
• The reservoir water temperature is 60EF.
• 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.

一離心消防水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。且
• 此泵之關斷水頭為100呎
• 泵需要之淨正進口水頭為15呎
• 水池水溫為60度F
• 消防水帶連接至消防主水管用以撲滅一高處火災
請問於下列何高度（以海平面為準）時，消防水帶噴嘴將首次無法提供水流？（忽略在消防主水管以及消防水帶中之水頭損失）
A. 86呎
B. 101呎
C. 116呎
D. 135呎
答案： B.

科目： 291004
知能類： K1.14 [2.5/2.5]
序號： B3911 (P3912)

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.

一離心消防水泵為一消防主水管加壓。此泵從一水池取水。消防水帶連接至消防主水管用以撲滅一高處火災。
且
• 泵中心位於水池水面上方5呎
• 此泵設計之關斷水頭(shutoff head)為120呎
• 泵必須之淨正進口水頭的淨值為15呎
• 水池水溫為60°F
於泵中心上方何高度時，消防水帶噴嘴將首次無法提供水流？（忽略所有系統摩擦水頭損失）
A. 111呎
B. 116呎
C. 121呎
D. 126呎
答案： B.

科目： 291004
知能類： K1.15 [2.9/2.9]
序號： B224

Failing to provide adequate minimum flow for a centrifugal pump can directly result in...
A. discharge piping overpressurization.
B. suction piping overpressurization.
C. excessive pump leakoff.
D. pump overheating.
ANSWER: D.

若一離心泵無法提供適當之最小流量，將會直接導致
A. 出口管線過壓
B. 取水管線過壓
C. 泵洩漏過量
D. 泵過熱
答案： D.

科目： 291004
知能類： K1.15 [2.9/2.9]
序號： B624

A centrifugal pump is susceptible to overheating and possible cavitation while operating with its discharge valve closed, unless...
A. the pump is steam driven.
B. the suction valve is also closed.
C. pump seal cooling is provided.
D. minimum flow protection is provided.
ANSWER: D.

一離心泵在其出口閥關閉情況下運轉容易過熱，並可能發生孔蝕現象，除非
A. 此泵為蒸汽驅動
B. 進口閥也關閉
C. 提供泵軸封(seal)冷卻
D. 提供最小流量保護
答案： D.

科目： 291004
知能類： K1.15 [2.9/2.9]
序號： B1623

Which one of the following describes the typical purpose of minimum flow piping for a centrifugal pump?
A. Prevent pump runout during high flow conditions.
B. Prevent vortexing at the pump suction during high flow conditions.
C. Ensure adequate net positive suction head during low flow conditions.
D. Ensure adequate pump cooling during low flow conditions.
ANSWER: D.

對一離心泵，下列何者描述了最小流量管線的設計目的？
A. 預防在高流量情況下發生過流(runout)
B. 預防在高流量情況下發生泵取水口之渦流現象
C. 確保在低流量情況下有足夠之淨正進口水頭
D. 確保在低流量情況下有足夠之泵冷卻
答案： D.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B323 (P326)

A positive displacement pump (PDP) is operating in an open system. PDP parameters are as follows:
PDP speed = 1000 rpm
PDP discharge pressure = 2000 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 1500 rpm.
C. PDP suction pressure is increased to 120 psig.
D. Downstream system pressure is decreased to 1000 psig.
ANSWER: B.

一正排量泵（Positive displacement pump）於一開放系統中運轉，相關參數如下所示：
泵速度＝1000rpm
泵出口壓力＝2000psig
泵進口壓力＝50psig
泵流量＝150gpm
下列何項改變將會導致泵流量超過200gpm？
A. 開放第二條相同的出口路線？
B. 泵速度增加至1500rpm
C. 泵進口壓力增加至120psig
D. 下游系統壓力降低至1000psig
答案： B.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B824

The volumetric flow rate of a positive displacement pump is directly proportional to the:
A. fluid density.
B. motor horsepower.
C. slip ratio.
D. pump speed.
ANSWER: D.

一正排量泵(Positive displacement pump)的體積流量(volume flow)正比於
A. 流體密度
B. 馬達馬力
C. 滑移率
D. 泵速度
答案： D.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B1021 (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.

一離心泵與一正排量泵(Positive displacement pump)於一開放水系統中並聯使用。兩泵之最大設計壓力相同。若兩泵出口壓力均增加至最大出口壓力，則離心泵將會在_____流量下運轉，而正排量泵將會在接近_____流量下運轉。
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： 291004
知能類： K1.16 [2.5/2.7]
序號： B1424

A positive displacement pump is operating at a constant speed in an open system with its suction and discharge valves fully open. Which one of the following will increase if the pump discharge valve is throttled to 50% closed?
A. Proximity to cavitation
B. Required net positive suction head
C. Pump flow rate
D. Pump slip
ANSWER: D.

一正排量泵(Positive displacement pump)於一開放系統下以定速運轉，其進口／出口閥均全開。若泵出口閥節流至50%開度，則下列何者會增加？
A. 近於發生孔蝕
B. 必須之淨正進口水頭
C. 泵流量
D. 泵滑移(pump slip)
答案： D.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B1525 (P1526)

A positive displacement pump (PDP) is operating in an open system. PDP parameters are as follows:
PDP speed = 480 rpm
PDP discharge pressure = 1000 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. A second identical discharge path is opened.
B. PDP speed is increased to 900 rpm.
C. PDP suction pressure is increased to 40 psig.
D. Downstream system pressure is decreased to 500 psig.
ANSWER: B.

一正排量泵（Positive displacement pump）於一開放系統中運轉。PDP參數如下所示：
PDP轉速＝480rpm
PDP注水壓力＝1000psig
PDP進水壓力＝10psig
PDP流量＝60gpm
下列何項改變將會導致PDP流量超過100gpm？
A. 開放第二條相同的注水路線
B. PDP轉速增加至900rpm
C. PDP進水壓力增加至40psig
D. 下游系統壓力降低至500psig
答案： B.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B1824 (P2126)

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. 41 rpm.
D. 62 rpm.
ANSWER: C.

一變速正排量泵(Positive displacement pump)於一開放系統中，在轉速100rpm，流量60gpm下運轉。為了降低流量至25gpm，則泵轉速應該減小至大約
A. 17 rpm.
B. 33 rpm.
C. 41 rpm.
D. 62 rpm.
答案： C.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B1919 (P1726)

An ideal (no slip) reciprocating positive displacement pump is operating to provide makeup water to a reactor coolant system that is being maintained at 2200 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）之往複式正排量泵(Positive displacement pump)為一維持在2200psig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： 291004
知能類： K1.16 [2.5/2.7]
序號： B2525 (P2526)

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400rpm與注水壓力100psig運轉的正排量泵(Positive displacement pump)之水系統中，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700rpm
B. 減少泵注水壓力至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： 291004
知能類： K1.16 [2.5/2.7]
序號： B2724 (P2724)

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.

於一在轉速300rpm與注水壓力100psig運轉的正排量泵(Positive displacement pump)中，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700rpm
B. 減少泵注水壓力至40 psig
C. 起動與第一泵串聯之相同的第二正排量泵(Positive displacement pump)
D. 起動與第一泵並聯之相同的第二正排量泵(Positive displacement pump)
答案： A.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B2925 (P2926)

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.

一運轉於開放系統之理想（無滑移）往複式正排量泵(Positive displacement pump)，提供一維持於800psig冷卻水系統之補水，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： 291004
知能類： K1.16 [2.5/2.7]
序號： B3224 (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. 33 rpm.
C. 50 rpm.
D. 71 rpm.
ANSWER: C.

一變速正排量泵(Positive displacement pump)於一開放系統中，在轉速100rpm，流量60gpm下運轉。為了降低流量至30gpm，則泵轉速應該減小至大約
A. 25 rpm.
B. 33 rpm.
C. 50 rpm.
D. 71 rpm.
答案： C.

科目： 291004
知能類： K1.16 [2.5/2.7]
序號： B3722 (P3730)

A rotary positive displacement pump (PDP) is being used to supply water to a piping system.
The PDP is driven by an ac induction motor. The initial parameters are:
System pressure: 500 psig
PDP flow rate: 50 gpm
PDP motor current: 40 amps
After several hours, the PDP motor speed is increased such that the new PDP flow rate is 100 gpm. If system pressure does not change, what is the approximate value of the PDP motor current at the 100 gpm flow rate?
A. 80 amps
B. 160 amps
C. 320 amps
D. 640 amps
ANSWER: A.

一正排量泵（Positive Displacement Pump），用以為一管線系統提供用水，此PDP由一交流感應馬達驅動。最初的參數為：
系統壓力：500psig
PDP流量：50gpm
PDP馬達電流：40amps
經過幾小時之後，此PDP馬達速度增加，因而使新的PDP流量成為100gpm。若系統壓力不變，則在100gpm 的流量下，PDP馬達電流大約是多少？
A. 80 amps
B. 160 amps
C. 320 amps
D. 640 amps
答案： A.

科目： 291004
知能類： K1.17 [2.5/2.6]
序號： B324 (P322)

The available net positive suction head for a pump may be expressed as...
A. discharge pressure minus saturation pressure of the fluid being pumped.
B. discharge pressure minus suction pressure.
C. suction pressure minus saturation pressure of the fluid being pumped.
D. suction pressure plus discharge pressure.
ANSWER: C.

對於一泵，可用的淨正吸水頭可以表示為
A. 出口壓力減去被泵送流體的飽和壓力
B. 出口壓力減去進口壓力
C. 進口壓力減去被泵送流體的飽和壓力
D. 進口壓力加上出口壓力
答案： C.

科目： 291004
知能類： K1.17 [2.5/2.6]
序號： B825

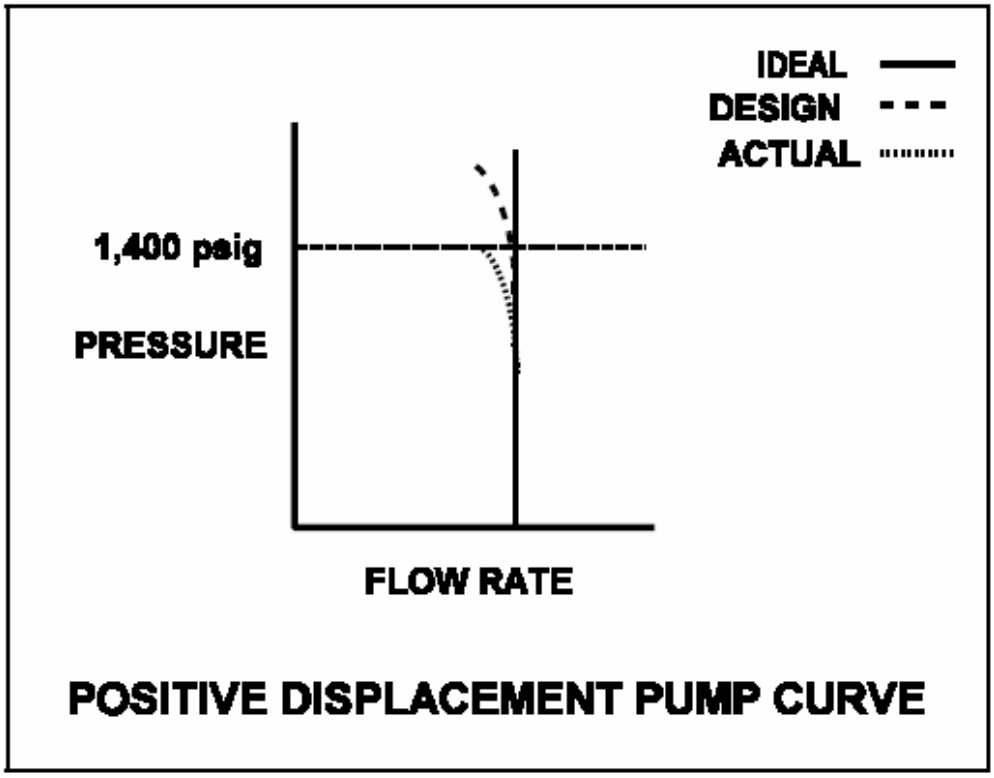
Which one of the following will occur as a direct result of operating a positive displacement pump with insufficient net positive suction head?
A. Increased slip
B. Decreased pump speed
C. Increased flow rate
D. Vapor binding
ANSWER: D.

在淨正進口水頭 (Net Positive Suction Header, NPSH) 不足情況下運轉一正排量泵(Positive displacement pump)，其結果為何？
A. 增加滑移
B. 降低泵轉速
C. 增加流量
D. 蒸汽氣鎖
答案： D.

科目： 291004
知能類： K1.17 [2.5/2.6]
序號： B2824 (P2826)

A section of reactor coolant piping is being hydrostatically tested to 1,400 psig using a positive displacement pump. The operating characteristics of the positive displacement pump are shown below identifying ideal, design, and actual pump performance during the test.
Which one of the following could have caused the observed difference between the design and the actual pump performance?
A. Available NPSH decreased to slightly above the required NPSH for the pump.
B. Available NPSH decreased to slightly below the required NPSH for the pump.
C. A relief valve on the pump discharge piping failed to open at its setpoint of 1,400 psig.
D. A relief valve on the pump discharge piping opened prior to its setpoint of 1,400 psig.
ANSWER: B.

反應器冷媒管線之一段正使用正排量泵(Positive displacement pump)進行流體靜力檢測至1,400psig。此PDP之理想、設計與實際運轉特性顯示如下圖。下列何者為導致設計與實際泵性能差異之原因？
A. 泵可用的淨正進口水頭淨值減少到稍微超過必須的淨正進口水頭淨值
B. 泵可用的淨正進口水頭淨值減少到稍微低於必須的淨正進口水頭淨值
C. 泵注水管線上之釋放閥在設定點1,400psig無法開啟
D. 泵注水管線上之釋放閥在設定點1,400psig達到之前便開啟
答案： B.



POSITIVE DISPLACEMENT PUMP CURVE

科目： 291004
知能類： K1.18 [3.3/3.3]
序號： B1125 (P1425)

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 discharge piping upstream of the discharge isolation valve
B. On the pump discharge piping downstream of the discharge isolation valve
C. On the pump suction piping upstream of the suction isolation valve
D. On the pump suction piping downstream of the suction isolation valve
ANSWER: A.

針對用以預防正排量泵(Positive displacement pump)與相關管線超出設計壓力之釋放閥適當位置，下列何者敘述正確？
A. 在泵出口管線上位於出口隔離閥的上游
B. 在泵出口管線上位於出口隔離閥的下游
C. 在泵進口管線上位於進口隔離閥的上游
D. 在泵進口管線上位於進口隔離閥的下游
答案： A.

科目： 291004
知能類： K1.18 [3.3/3.3]
序號： B2425 (P626)

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(Positive displacement pump)中，位於泵出口與出口隔離閥之間之安全／釋放閥之目的為何？

A. 若出口閥在系統起動時開啟，保護泵以及進口管線不致超壓
B. 若進口閥在系統運轉時關閉，保護泵以及進口管線不致超壓
C. 若出口閥在系統運轉時關閉，保護泵以及進口管線不致超壓
D. 當泵在停機且進口閥關閉時停機，保護泵以及進口管線不致因為泵內容物熱膨脹而超壓

答案： C.

科目： 291004
知能類： K1.19 [2.6/2.6]
序號： B1625

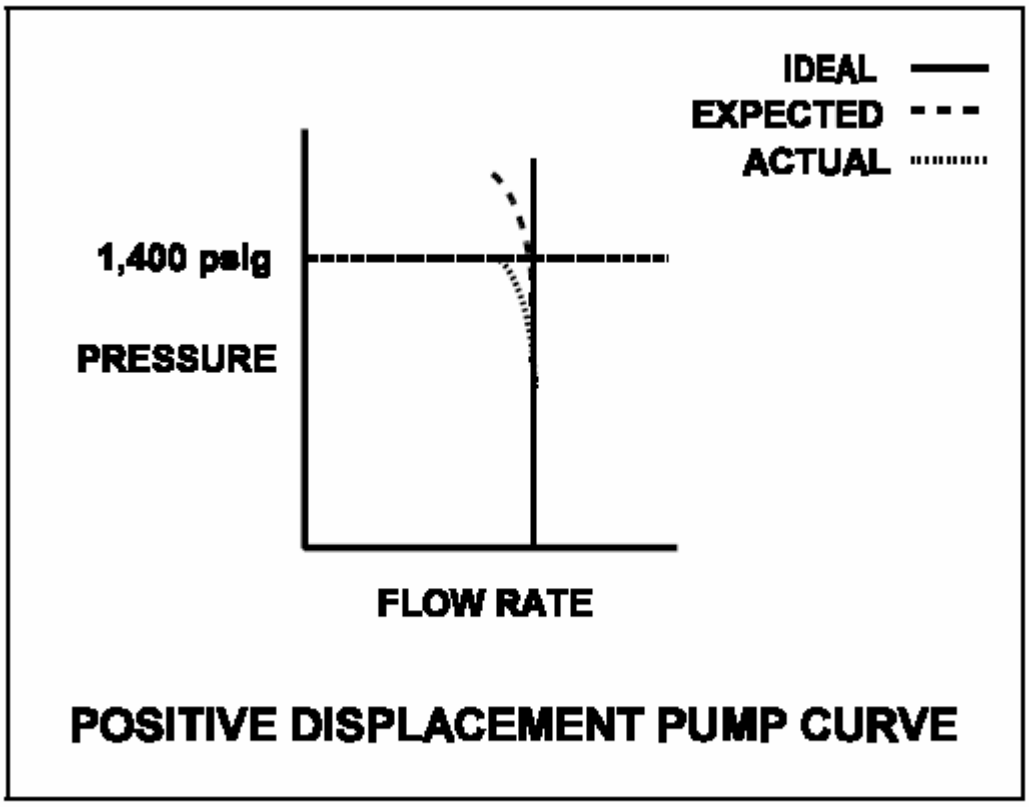
A pump that moves liquid by means of a piston within a cylinder that displaces a given volume of fluid for each stroke is a _____ pump.
A. centrifugal
B. screw
C. reciprocating
D. radial
ANSWER: C.

靠汽缸內之活塞在每次衝程中替換某一體積的液體而移動液體的泵稱為_____泵？
A. 離心(centrifugal)
B. 螺旋式(screw)
C. 往復式(reciprocating)
D. 徑向(radial)
答案： C.

科目： 291004
知能類： K1.19 [2.6/2.6]
序號： B2624 (P2626)

A section of reactor coolant piping is being hydrostatically tested to 1,400 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 1,400 psig.
ANSWER: A.

某一段反應器冷卻水管路正使用正排量泵(Positive displacement pump)進行靜水壓試驗至1,400psig。正排水泵對理想、設計與實際運轉特性顯示如下圖。下列何者為所觀察到的預期與實際泵性能差異之原因？
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. 可用的NPSH減少超過預期，但仍稍微大於必要的NPSH
D. 泵出口管線上之一釋放閥在設定點1,400psig之前便開啟
答案： A.



POSITIVE DISPLACEMENT PUMP CURVE

科目： 291004
知能類： K1.19 [2.6/2.6]
序號： B3025 (P3024)

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 1900 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一柴油燃料噴射系統，此泵必須要在系統壓力於200psig與1900psig間變化時，於一最低出口壓力變動情況下維持接近固定流量。下列何種型式的泵通常能夠用於此種用途？
A. 軸向流離心(Axial flow centrifugal)
B. 徑向流離心(Radial flow centrifugal)
C. 旋轉式正排量(Rotary positive displacement)
D. 往復式正排量(Reciprocating positive displacement)
答案： C.

科目： 291004
知能類： K1.20 [3.1/3.1]
序號： B117

Prior to starting a positive displacement pump, the discharge valve should be open to...
A. prevent rupturing the pump casing.
B. limit the pump motor starting time.
C. ensure the pump casing fills by backflow.
D. reduce pressure fluctuations in the discharge piping.
ANSWER: A.

在起動一正排量泵(Positive displacement pump)之前，出口閥應該開啟以
A. 預防泵外殼破裂
B. 限制泵馬達起動時間
C. 確保泵外殼由回流充滿
D. 降低注水管線的壓力波動
答案： A.

科目： 291004
知能類： K1.20 [3.1/3.1]
序號： B923

A _____ pump in a liquid system should be started with its discharge valve _____ to avoid rupturing the pump casing and/or discharge piping.
A. centrifugal; fully closed
B. centrifugal; fully open
C. positive displacement; fully closed
D. positive displacement; fully open
ANSWER: D.

於一液態系統中之_____泵應該在其出口閥_____情況下起動，以避免泵外殼與／或出口管線破裂。
A. 離心；全關
B. 離心；全開
C. 正排量 (Positive Displacement)；全關
D. 正排量 (Positive Displacement)；全開
答案： D.

科目： 291004
知能類： K1.21 [3.1/3.0]
序號： B525 (P1923)

A positive displacement pump should be started with its suction valve _____ and its discharge valve _____.
A. closed; closed
B. closed; open
C. open; closed
D. open; open
ANSWER: D.

一正排量泵(Positive displacement pump)應該在其進口閥_____與其出口閥_____情況下起動。
A. 關閉；關閉
B. 關閉；開啟
C. 開啟；關閉
D. 開啟；開啟
答案： D.

科目： 291004
知能類： K1.21 [3.1/3.1]
序號： B1724 (P1722)

A positive displacement pump should be started with its suction valve _____ and its discharge valve _____.
A. throttled; throttled
B. throttled; fully open
C. fully open; throttled
D. fully open; fully open
ANSWER: D.

一正排量泵(Positive displacement pump)應該在其進口閥_____與其出口閥_____情況下起動。
A. 節流；節流
B. 節流；全開
C. 全開；節流
D. 全開；全開
答案： D.

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(Positive displacement pump)正抽送液體至一在100psig下運轉的系統，假設泵轉速固定且無泵滑移，同時泵背壓維持在一正常泵運轉限制內，若系統壓力增加至200psig時，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/題號：291004/1 (2016新增)
知能類： K1.04 [3.0/3.1]
序號： B2017 (P2019)

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?

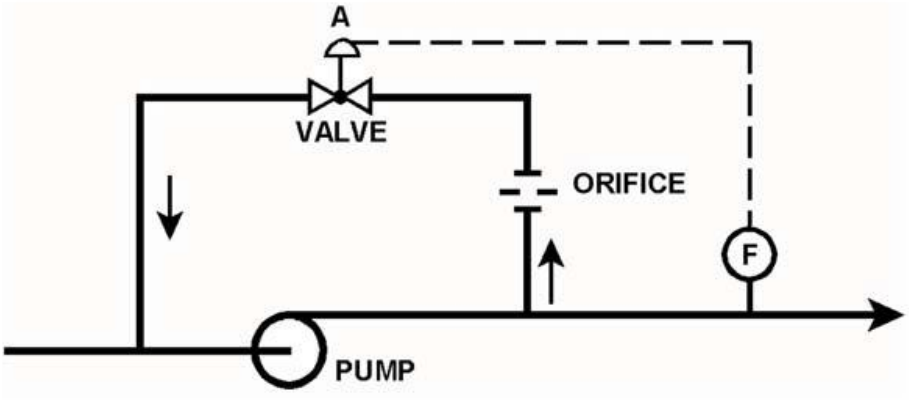
A. The pump will overheat after a relatively short period of time, due to a loss of both main flow and recirculation flow.
B. The pump will overheat after a relatively long period of time, due to a loss of main flow only.
C. The pump will overheat after a relatively long period of time, due to a loss of recirculation flow only.
D. The pump will be able to operate under these conditions indefinitely, due to sustained main flow.

ANSWER: B.

參考一台具有再循環管路的水泵圖(見下圖)。假設泵的出口管路在流量傳送器F的下游處完全被堵塞，下列何者為描述該泵的反應？

A. 由於同時喪失主管路與再循環管路的流量，經過一小段時間後，該泵便發生過熱現象
B. 由於只喪失主管路的流量，經過相當長的一段時間後，該泵才會發生過熱現象
C. 由於只喪失再循環管路的流量，經過相當長的一段時間後，該泵才會發生過熱現象
D. 由於主管路還維持主流量，該泵在這情況下還能持續運轉

答案：B

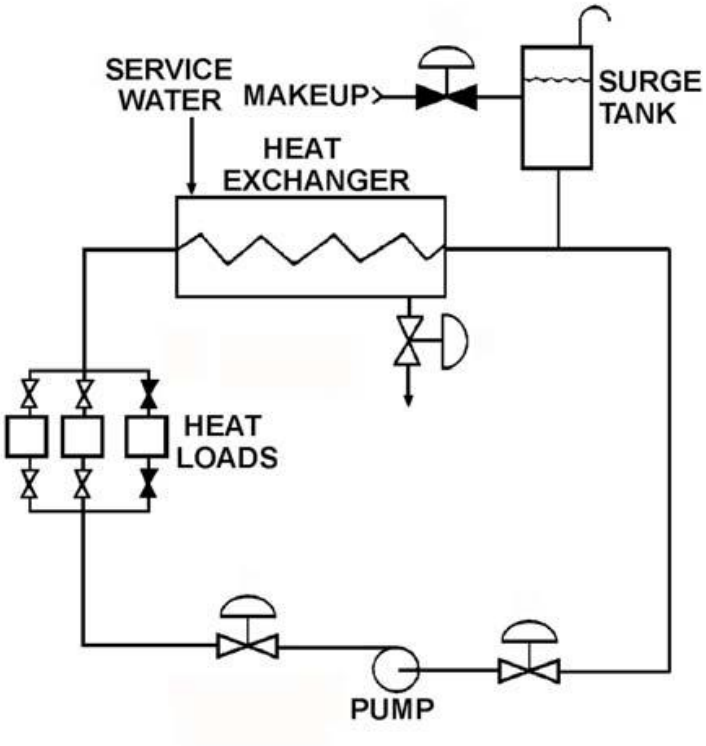


科目/題號：291004/2 (2016 新增)
知能類：K1.05 [2.8/2.9]
序號：B4211 (P4211)

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 higher cooling water pump flow rate and a reduced pump discharge head?
A. Increase pump speed by 20 percent.
B. Decrease 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: D.

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增加同時降低泵的出口水頭？
A.將水泵轉速提升20%
B.將水泵轉速降低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使用

答案： D



科目/題號：291004/3 (2016 新增)
知能類：K1.05 [2.8/2.9]
序號：B6910 (P6910)

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：291004/4 (2016 新增)
知能類：K1.05 [2.8/2.9]
序號：B7210 (P7212)

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

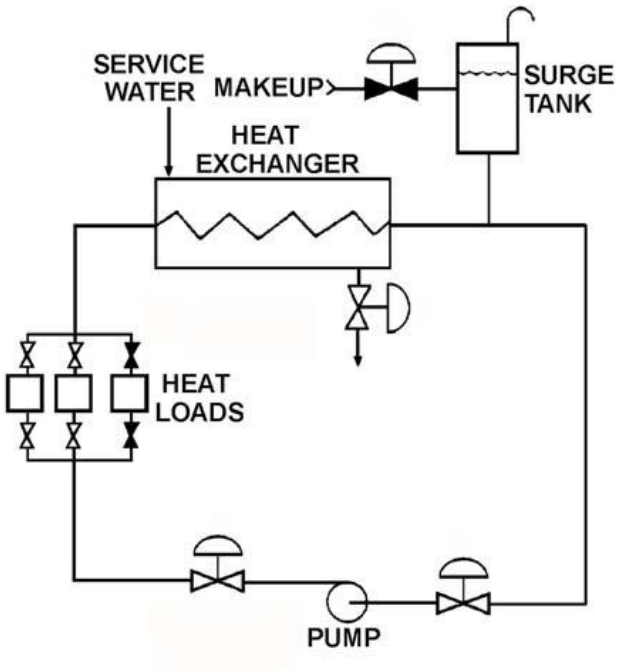
答案： B

科目/題號：291004/5 (2016 新增)
知能類：K1.05 [2.8/2.0]
序號：B7311 (P7311)

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：291004/6 (2016 新增)
知能類：K1.05 [2.8/2.9]
序號：B7411 (P7412)

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：

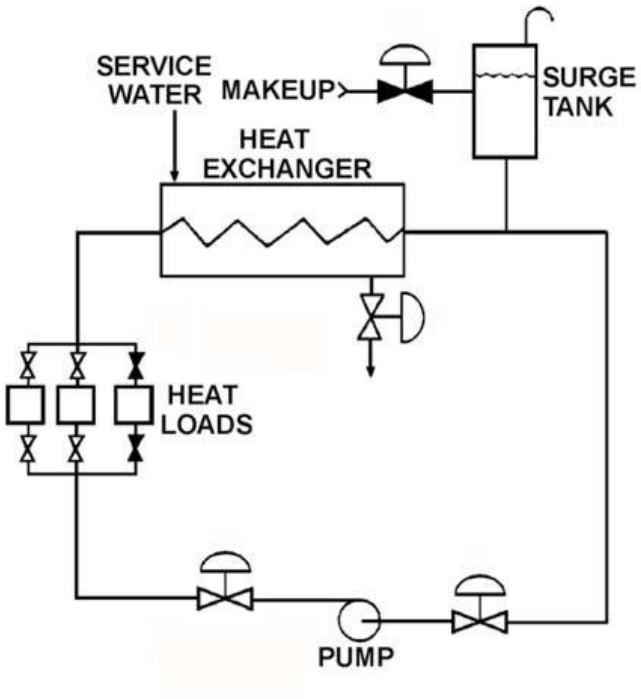
泵出口壓力 = 45 psig
泵進口壓力 = 15 psig
泵流量率 = 120 gpm

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

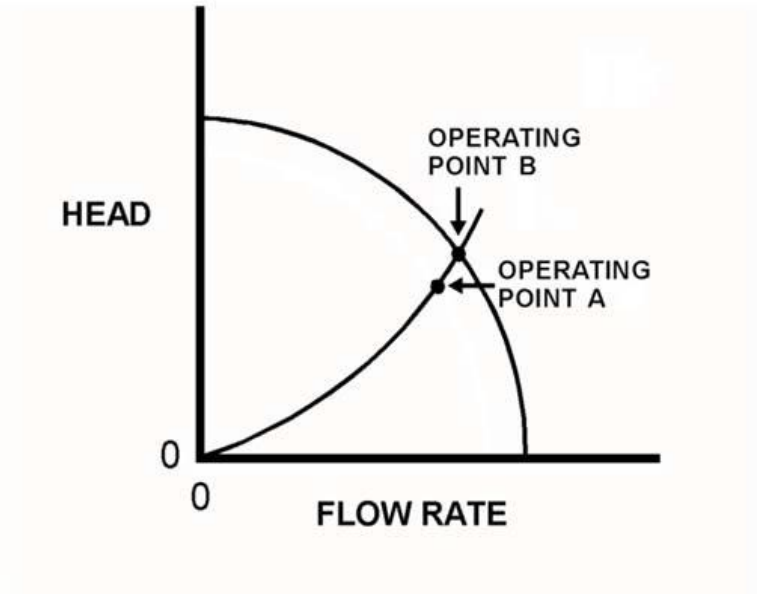

SERVICE
WATER
MAKEUP
SURGE
TANK
HEAT
EXCHANGER
HEAT
LOADS
PUMP

科目/題號：291004/7 (2016 新增)
知能類：K1.05 [2.8/2.9]
序號：B7604 (P7604)

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的離心泵特性曲線與系統曲線如下圖。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：291004/8 (2016 新增)
知能類：K1.05 [2.8/2.9]
序號：B7614 (P7614)

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.

使用一台離式泵補水進入一座高 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。該儲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

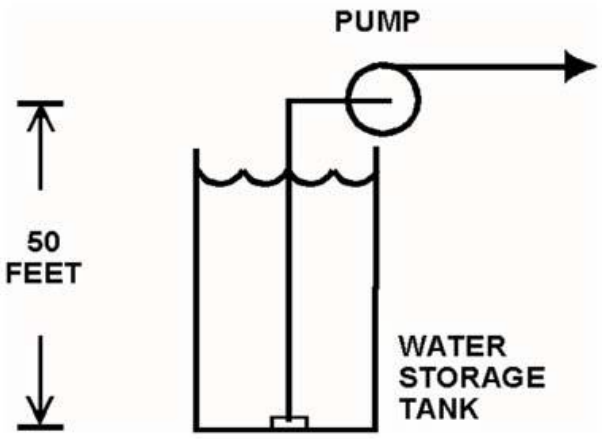
答案： C

科目/題號：291004/9 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B4113 (P4110)

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 feet of net positive suction head (NPSH). Assume that pump suction 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.

參考一台高架的離心泵從一座開放式儲水槽的底部取水，水溫 66°F(見下圖)。假設在一標準大氣壓下，泵所需淨正吸水頭(NPSH)為 4 feet，假設泵的吸水頭損失可忽略，如果水槽水位允許連續下降，請問水位大約多高的時候該水泵開始出現孔蝕現象？
A.34 feet
B.29 feet
C.21 feet
D.16 feet

答案： C

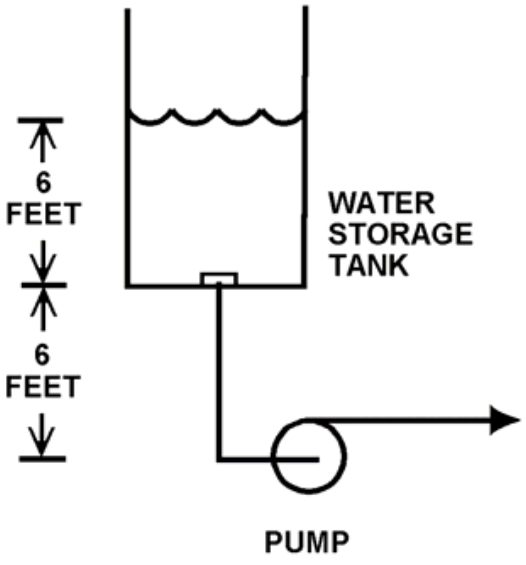


科目/題號：291004/10 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B4410 (P4410)

Refer to the drawing of a centrifugal pump taking suction from the bottom of an open storage tank containing water at 66°F (see figure below). 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. 6 feet
B. 12 feet
C. 39 feet
D. 45 feet
ANSWER: D.

參考一台離心泵從一座開放式儲水槽的底部取水，水溫 66°F(見下圖)。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約為何？
A. 6 feet
B. 12 feet
C. 39 feet
D. 45 feet

答案： D



科目/題號：291004/11 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B4710 (P4712)

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：291004/12 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B5210 (P5211)

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.

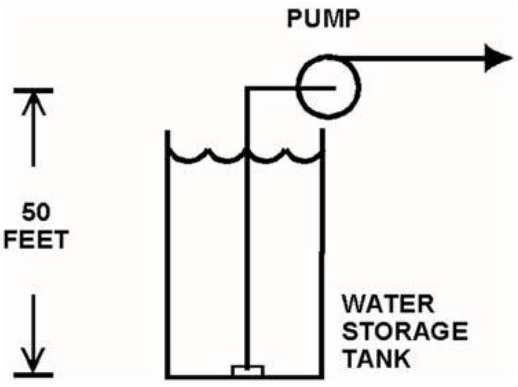
Which one of the following describes the effect on pump operation if tank water level is allowed to continuously decrease?
A. The pump will operate normally until tank water level decreases below approximately 20 feet, at which time the pump will cavitate.
B. The pump will operate normally until tank 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 50feet
- 該水泵所需最小淨正吸水頭為 4feet

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 20feet，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 16feet，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：291004/13 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B5510 (P5511)

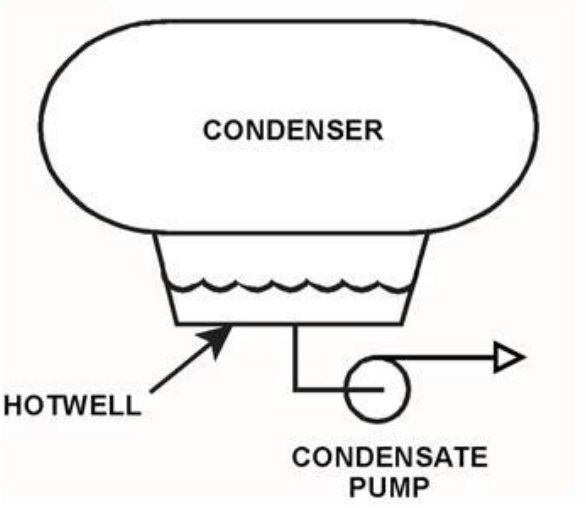
Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).Given the following:
- The eye of the pump impeller is located 6.0 feet below the bottom of the hotwell.
- The pump requires 10.0 feet of net positive suction head (NPSH).
- Condenser pressure is 1.2 psia.
- Hotwell 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：291004/14 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B5610 (P5611)

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

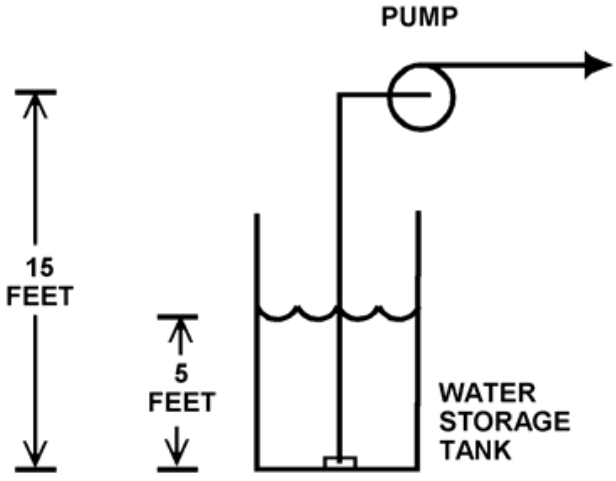
答案： D

科目/題號：291004/15 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B5810 (P5810)

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：291004/16 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B5911 (P5910)

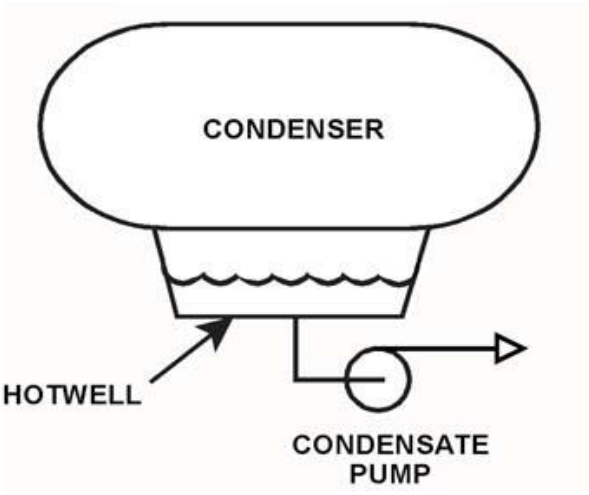
Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).
Given the following initial conditions:
- Condenser pressure is 1.2 psia.
- Condensate temperature is 96°F.
- Hotwell level is 10 feet above the condensate pump suction.

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-inch.
B. Hotwell level increases by 6 -inch.
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：291004/17 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B6211 (P6211)

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：291004/18 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B6410 (P6410)

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：291004/19 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B6510 (P6510)

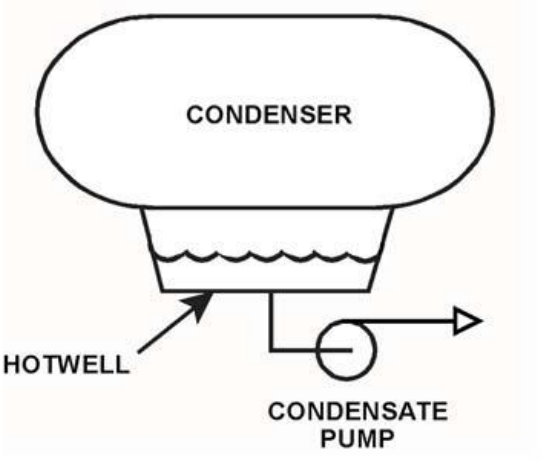
Refer to the drawing of a steam condenser, hotwell, and condensate pump (see figure below).
Given the following:
- The eye of the pump impeller is located 6.0 feet below the bottom of the hotwell.
- Hotwell water level is 6.0 feet.
- Hotwell water temperature is 90°F.
- Condenser pressure is 1.3 psia.
- 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：291004/20 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B6811 (P6810)

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：291004/21 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B6911 (P6911)

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，泵安裝在水槽底座。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
- 泵現正運轉中，其流量率為 50 gpm
- 該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

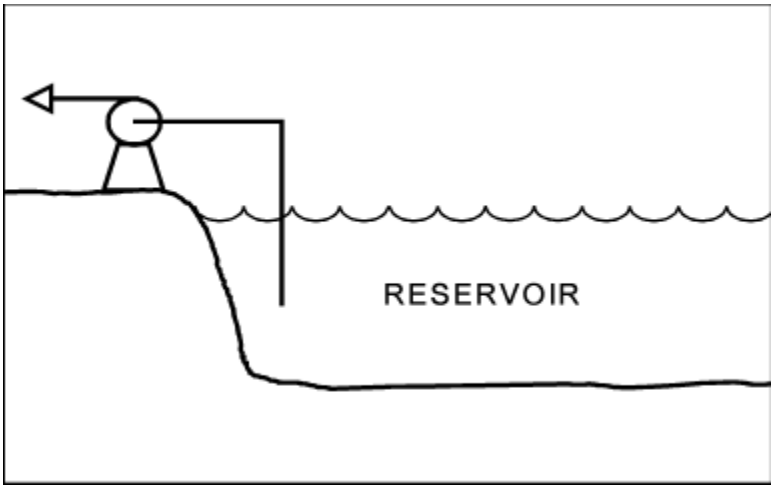
答案： D

科目/題號：291004/22 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B7112 (P7110)

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 shallower.
ANSWER: B.

下圖中一台離心泵從一個蓄水池取水。該泵安裝在水池岸邊，泵葉輪眼比池面高出 4 feet。
泵之取水管路取水點在池面下 4 feet。假設蓄水池水溫是均勻的，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.泵及取水管路均提高 2 feet
B.泵及取水管路均降低 2 feet
C.延長取水管路，使新取水點較目前深 2 feet
D.縮短取水管路，使新取水點較目前淺 2 feet

答案： B

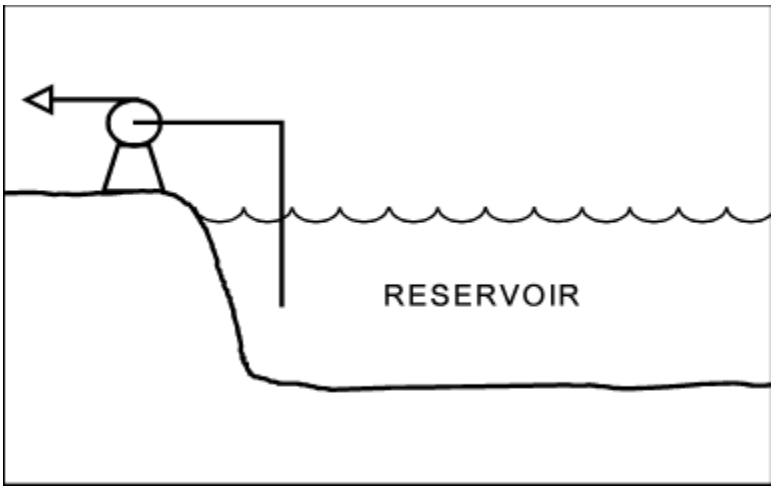


科目/題號：291004/23 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B7624 (P7624)

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.

下圖中一台離心泵從一個蓄水池抽水。該泵安裝在水池岸邊，泵葉輪眼比池面高出 4 feet。
泵之取水管路取水點在池面下 4 feet。假設蓄水池水溫是均勻的，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.泵及取水管路均提高 2 feet
B.泵及取水管路均降低 2 feet
C.延長取水管路，使新取水點較目前深 2 feet
D.縮短取水管路，使新取水點較目前淺 2 feet

答案： A

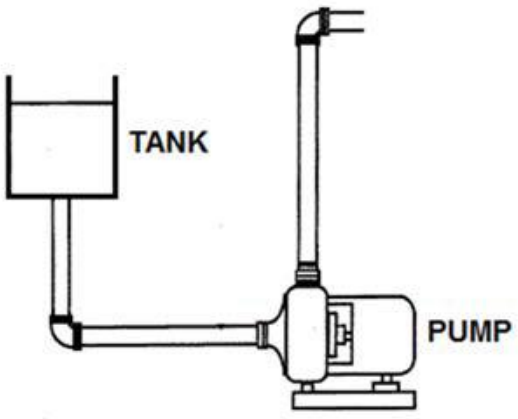


科目/題號：291004/24 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B7643 (P7643)

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(見下圖)，儲水槽水位 20 feet，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：291004/25 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B7664 (P7664)

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 storage tank is filled to a level of 26 feet with 60°F water.
- The pump requires 45 feet of net positive suction head.
- The pump is currently operating at 50 gpm.

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 the tank empties.
D. The pump is currently not cavitating; pump flow rate will gradually decrease with tank level, and then rapidly decrease when cavitation begins before the tank empties.

ANSWER: D.

一台離心泵從一座開放式儲水槽取水。泵安裝在水槽底座並從水槽的底部取水，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
- 該泵所需淨正吸水頭為 45 feet
- 泵現正運轉中，其流量率為 50 gpm

下列何者描述為該泵目前的狀態，以及儲水槽水位下降對泵流量率的影響？
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；在水槽水被抽乾前，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，但當水槽的水被抽乾時，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，但在水槽水被抽乾前，當泵開始出現孔蝕現象時，泵流量率將急劇降低

答案： D

科目/題號：291004/26 (2016 新增)
知能類：K1.06 [3.3/3.3]
序號：B7683 (P7683)

A centrifugal pump is operating normally in a closed cooling water system. If system pressure is increased by 10 psi, the available net positive suction head (NPSH) for the pump will _____; and the pump mass flow rate will _____. (Assume the water density does not change and the minimum required NPSH for the pump is maintained.)
A. increase; increase
B. increase; remain the same
C. decrease; decrease
D. decrease; remain the same
ANSWER: B.

一台離心泵在一個封閉式冷卻水系統中正常運轉。倘若冷卻水系統的壓力升高 10 psi，該泵之可用淨正吸水頭(NPSH)將_____；水泵質量流量率將_____(假設水密度不變，且維持該泵之最小所需 NPSH)。
A. 升高；升高
B. 升高；不變
C. 降低；降低
D. 降低；不變

答案： B

科目/題號：291004/27 (2016 新增)
知能類：K1.07 [2.8/2.8]
序號：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：291004/28 (2016 新增)
知能類：K1.07 [2.8/2.8]
序號：B1726 (P2827)

A cooling water pump is being driven by an AC induction motor. Which one of the following describes how and why pump motor current will change if the pump shaft shears?
A. Decreases, due to decreased pump work.
B. Decreases, due to decreased counter electromotive force.
C. Increases, due to increased pump work.
D. Increases, due to decreased counter electromotive force.
ANSWER: A.

一台冷卻水泵由一只交流感應馬達所驅動。下列何者描述如果泵軸斷裂，馬達的運轉電流會有什麼變化以及為什麼會產生變化？
A.馬達運轉電流會降低，因為水泵作功減少
B.馬達運轉電流會降低，因為逆電動勢變小
C.馬達運轉電流會上升，因為泵作功增加
D.馬達運轉電流會上升，因為逆電動勢變小

答案： A

科目/題號：291004/29 (2016 新增)
知能類：K1.07 [2.8/2.8]
序號：B3820 (P3822)

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：291004/30 (2016 新增)
知能類：K1.07 [2.8/2.8]
序號：B4811 (P4811)

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：

泵馬達電流 = 100 amps
泵流量率 = 400 gpm
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：291004/31 (2016 新增)
知能類：K1.07 [2.8/2.8]
序號：B6311 (P6310)

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

4 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：291004/32 (2016 新增)
知能類：K1.12 [2./2.8]
序號：B5111 (P5111)

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.

安裝在離心泵出口端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：291004/33 (2016 新增)
知能類：K1.13 [2.6/2.7]
序號：B5812 (P5813)

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：291004/34 (2016 新增)
知能類：K1.13 [2.6/2.7]
序號：B6012

A single-stage (single impeller) centrifugal pump and a two-stage (two impellers) centrifugal pump have identical head-capacity curves. The pumps are connected to identical suction and discharge piping in a water system.
Compared to the single-stage pump, the two-stage pump produces the same flow rate at about _____ pump discharge head; and for the same flow rate, the two-stage pump requires _____ net positive suction head.
A. twice the; less
B. twice the; more
C. the same; less
D. the same; more
ANSWER: C.

一台單級(單葉輪)離心泵與一台雙級(雙葉輪)離心泵有相同的水頭-容量曲線。這兩台泵的進口連接至水系統中同一條進水管路，其出口也連接至該水系統中同一條出口管路。在相同流量率的情況下，雙級泵的出口水頭約為單級泵的_____；雙級泵的所需淨正吸水頭比單級泵_____。
A.兩倍；低
B.兩倍；高
C.相同值；低
D.相同值；高

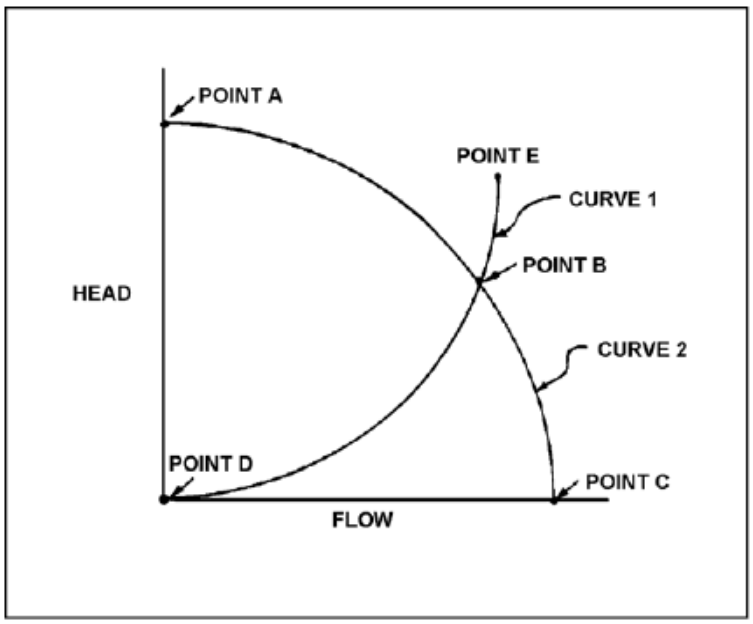
答案： C

科目/題號：291004/35 (2016 新增)
知能類： K1.13 [2.6/2.7]
序號：B6712 (P6711)

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 30feet 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

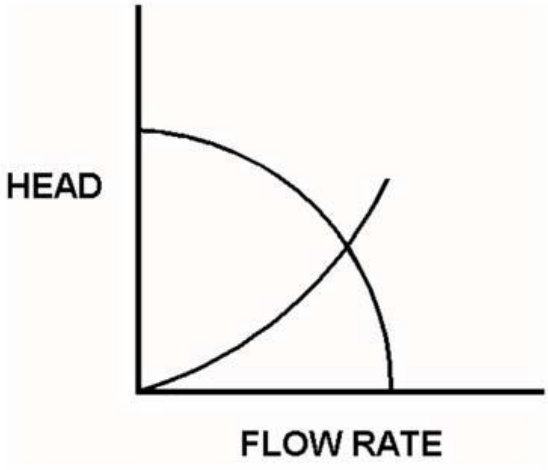


科目/題號：291004/36 (2016 新增)
知能類：K1.13 [2.6/2.7]
序號：B7312 (P7310)

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.

參考圖中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：291004/37 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B4312 (P4313)

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 eye of the pump impeller 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 eye of the pump impeller will the fire hose spray nozzle first be unable to provide flow? (Disregard all sources of head loss.)
A. 106 feet
B. 121 feet
C. 136 feet
D. 151 feet
ANSWER: D.

一台離心式消防水泵從一座設有排氣裝置的儲水槽抽水，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槽水面 30 feet
- 泵之關斷水頭設計值為 120 feet
- 泵所需之淨正吸水頭(NPSH)為 15 feet
- 水槽水溫為 60°F

若不考慮其他水頭損失，當消防水帶噴嘴高於泵葉輪眼多少高度時，該噴嘴開始噴不出水來？
A. 106 feet
B. 121 feet
C. 136 feet
D. 151feet

答案： D

科目/題號：291004/38 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B4513 (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.

當一台離心泵運轉在關斷水頭的狀況時，下列何者之數值比正常值還高？
A.泵馬達電流
B.泵之體積流量率
C.可用淨正吸水頭
D.所需淨正吸水頭

答案： C

科目/題號：291004/39 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B4911 (P4912)

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管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：291004/40 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B5412 (P5412)

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：291004/41 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B5712 (P5712)

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.)

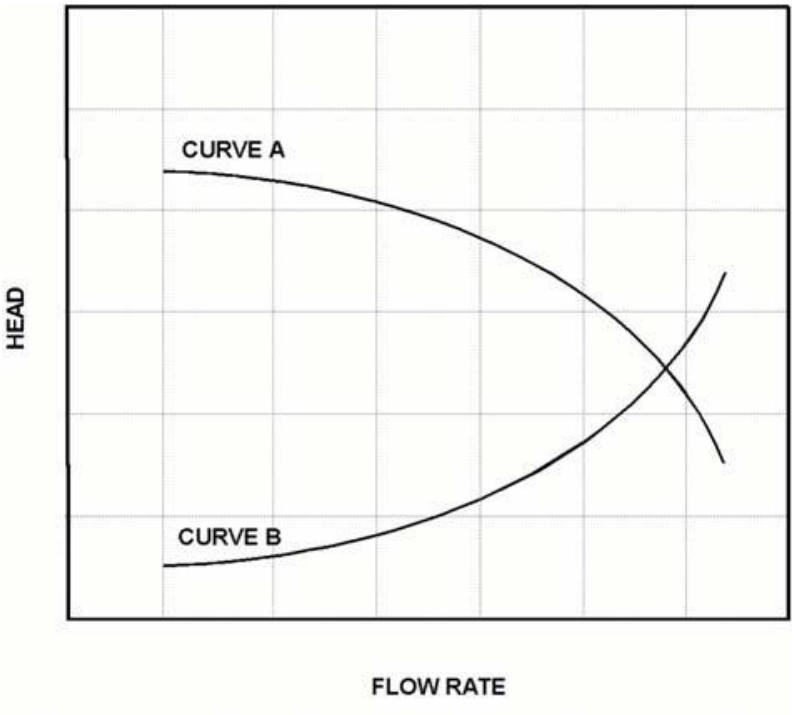
	Curve A	Curve B
A.	Pump Head	Available NPSH
B.	Available NPSH	Required NPSH
C.	Required NPSH	System Head Loss
D.	System Head Loss	Pump Head

ANSWER: B.

下圖顯示一台單一轉速之離心泵的水頭-容量特性。
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：291004/42 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B6511 (P6512)

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.

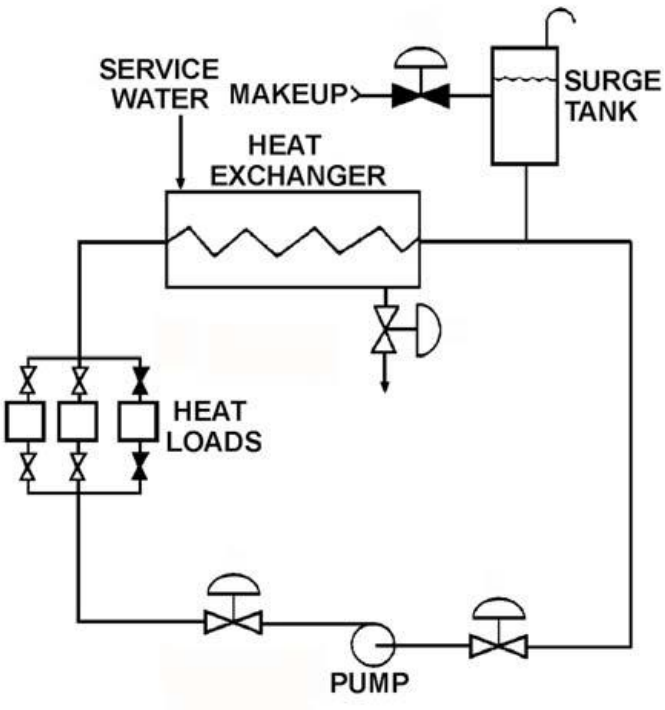
答案： C

科目/題號：291004/43 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B7012 (P7012)

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

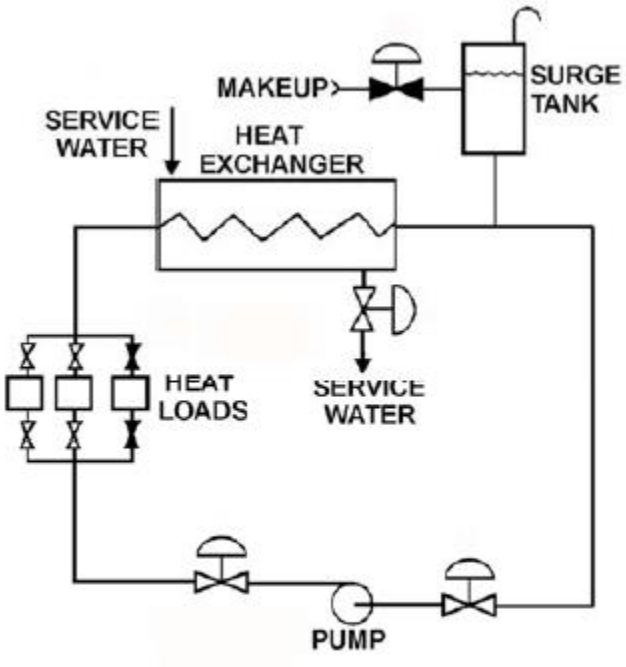


科目/題號：291004/44 (2016 新增)
知能類： K1.14 [2.5/2.5]
序號：B7634 (P7634)

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



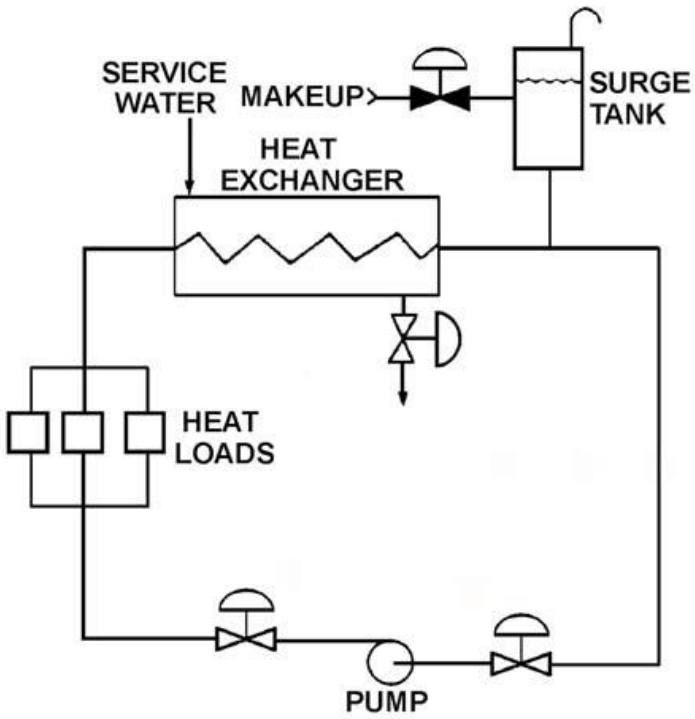
COOLING WATER SYSTEM

科目/題號：291004/45 (2016 新增)
知能類：K1.14 [2.5/2.5]
序號：B7674 (P7674)

Refer to the drawing of an operating cooling water system (see figure below).
How will the centrifugal pump flow rate be affected if the surge tank level decreases from 8 feet to 4 feet? (Assume the pump maintains adequate net positive suction head.)
A. Pump flow rate will increase.
B. Pump flow rate will decrease.
C. Pump flow rate will remain the same.
D. Cannot be determined without additional information.
ANSWER: C.

參考一運轉中的冷卻水系統圖(見下圖)。假設泵能夠維持足夠的淨正吸水頭，若調節槽的水位從 8 feet 降至 4 feet，水泵之流量率會受到甚麼影響？
A.泵流量率會增加
B.泵流量率會減少
C.泵流量率不變
D.資料不足，無法判斷其影響

答案： C

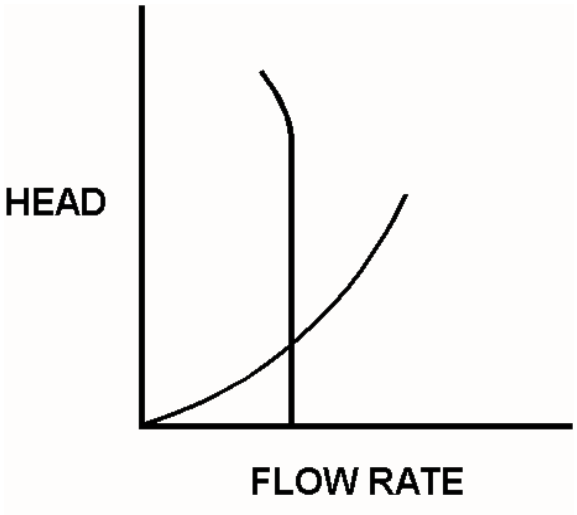


科目/題號：291004/46 (2016 新增)
知能類：K1.16 [2.5/2.7]
序號：B7675 (P7675)

Refer to the drawing of an operating curve for a positive displacement pump in a closed water system (see figure below).
Which one of the following describes the value of the 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 as the water circulates through the system.
ANSWER: D.

參考運轉在某密閉式水系統中的一只正排量泵之運轉曲線圖(見下圖)。
下列何者描述為圖中兩條曲線交叉點的水頭值？
A.是該泵所能提供之最大水頭值
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

答案： D



科目/題號：291004/47 (2016 新增)
知能類：K1.17 [2.5/2.6]
序號：B6113 (P6139)

Water enters a positive displacement pump at 50 psig and 90°F. What is the available net positive suction head for the pump?
A. 80 feet
B. 114 feet
C. 133 feet
D. 148 feet
ANSWER: D.

進入一只正排量泵的流體，其壓力為50 psig，溫度為90°F。
下列何者為該泵之可用淨正吸水頭？
A. 80 feet
B. 114 feet
C. 133 feet
D. 148 feet

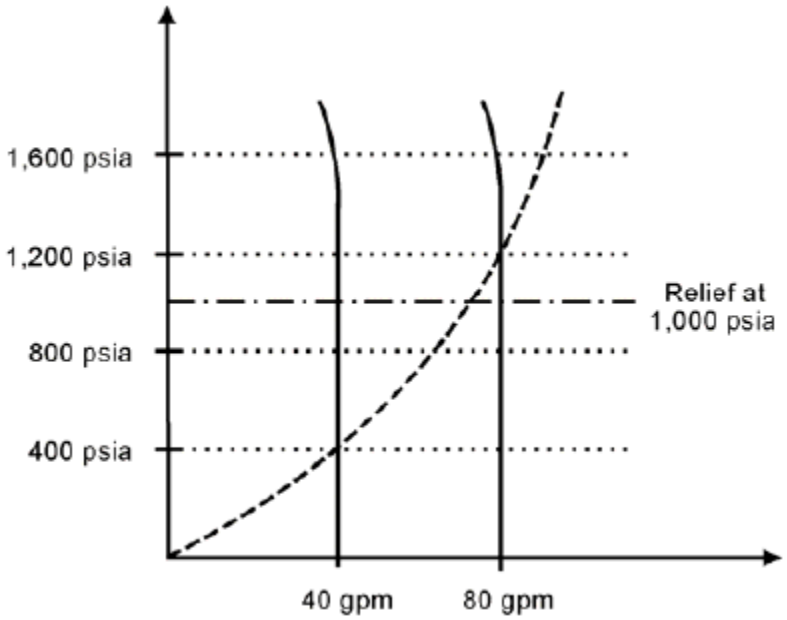
答案： D

科目/題號：291004/48 (2016 新增)
知能類：K1.19 [2.6/2.6}
序號：B5013 (P5012)

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：291004/49 (2016 新增)
知能類：K1.19 [2.6/2.6}
序號：B5313 (P5313)

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