科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P104 (B231)

Refer to the drawing of an operating water cleanup system. All valves are identical and are initially 50% open (see figure below).

To lower the temperature at point 7, the operator should adjust valve _____ in the open direction.

A. A

B. B

C. C

D. D

ANSWER: D.

請參照下圖的運轉中水淨化系統。所有的閥都相同，並於一開始打開50%開度。

為了降低位置7的溫度，運轉員應將閥_____向開的方向調轉。

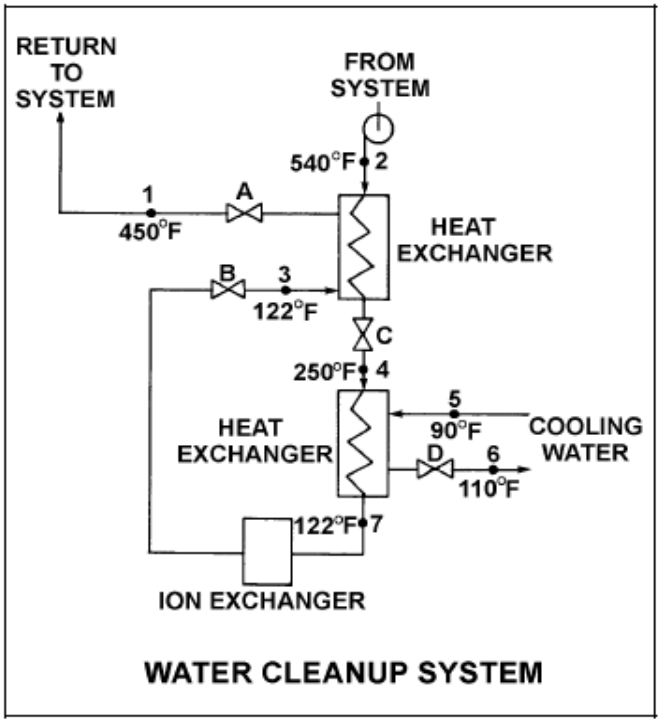
A. A

B. B

C. C

D. D

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P534 (B331)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Increasing the oil flow rate through the heat exchanger will cause the oil outlet temperature to _____ and the cooling water outlet temperature to _____. (Assume cooling water flow rate remains the same.)

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase

ANSWER: D.

請參照下圖的運轉中潤滑油熱交換器。

增加流過熱交換器潤滑油的流量，將導致油的出口溫度_____，冷卻水的出口溫度_____(假設冷卻水的流量維持不變)。

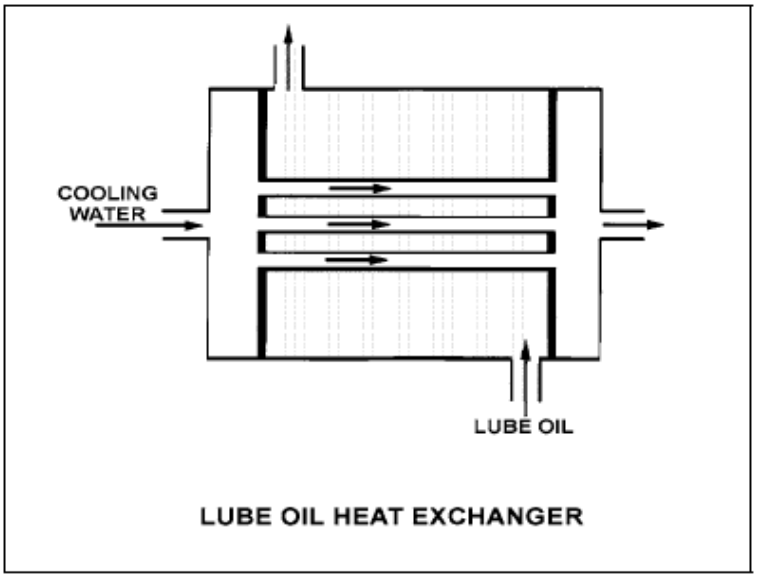
A. 降低；降低

B. 降低；升高

C. 升高；降低

D. 升高；升高

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P632 (B431)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Assume that the inlet lube oil and inlet cooling water temperatures are constant and cooling water flow rate remains the same. Decreasing the oil flow rate through the heat exchanger will cause the oil outlet temperature to _____ and the cooling water outlet temperature to _____.

A. increase, increase

B. increase, decrease

C. decrease, increase

D. decrease, decrease

ANSWER: D.

請參照下圖的運轉中潤滑油熱交換器。

假設潤滑油和冷卻水的進口溫度不變，冷卻水流量也不變。減低流過熱交換器潤滑油的流量，會導致潤滑油的出口溫度_____，冷卻水的出口溫度_____。

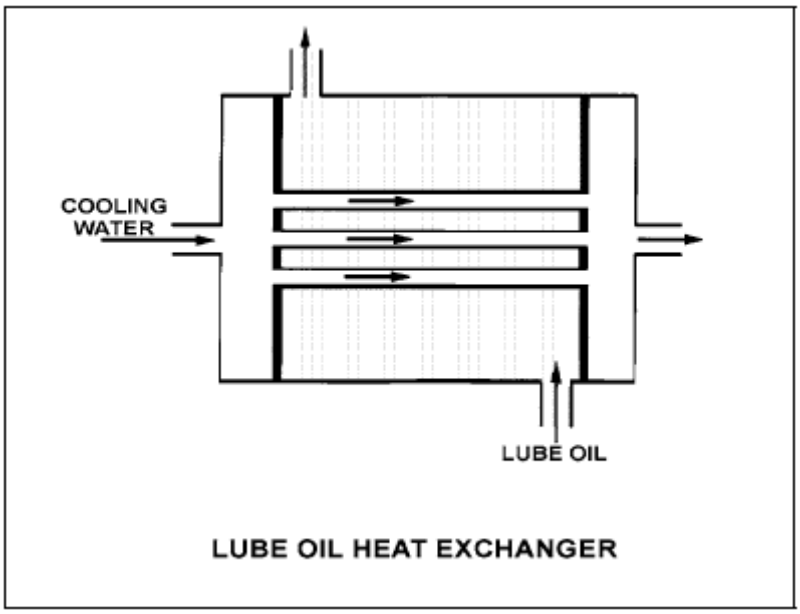
A. 升高；升高

B. 升高；降低

C. 降低；升高

D. 降低；降低

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P732 (B1834)

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

Valves A, B, and C are fully open. Valve D is 80% open. All temperatures are as shown. If valve D is then throttled to 50%, the temperature at point...

A. 3 will decrease.

B. 4 will increase.

C. 5 will increase.

D. 6 will decrease.

ANSWER: B.

請參照下圖的運轉中水淨化系統。

A、B與C閥都是完全打開，D閥打開80%開度，所有溫度如圖所示。如果將D閥關至50%開度，則……

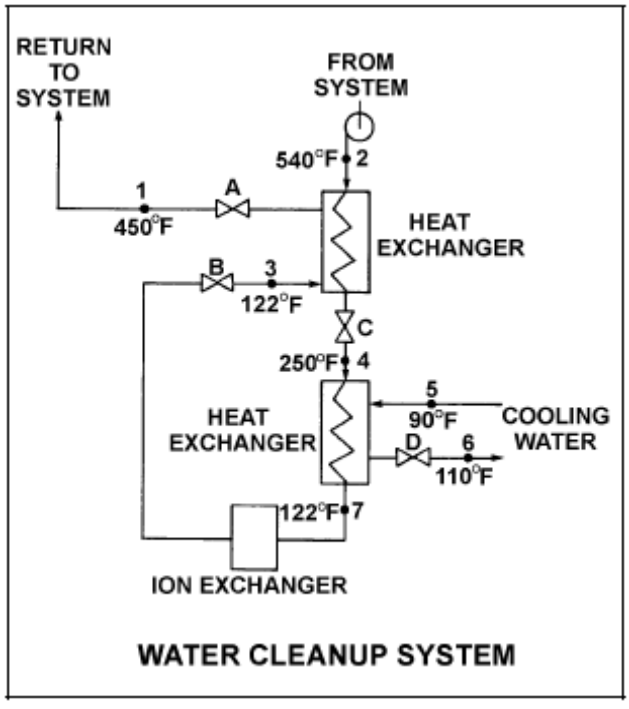
A. 位置3的溫度會降低。

B. 位置4的溫度會升高。

C. 位置5的溫度會升高。

D. 位置6的溫度會降低。

答案：B.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1032 (B1031)

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

Valves A, B, and C are fully open. Valve D is 20% open. All temperatures are as shown. Valve D is then quickly opened to 100%.

The temperature at point...

A. 3 will increase.

B. 4 will decrease.

C. 5 will decrease.

D. 7 will increase.

ANSWER: B.

請參照下圖的運轉中水淨化系統。

A、B與C閥都是完全打開，D閥打開20%開度，所有溫度均如圖所示。若將D閥快速開至100%開度，則……

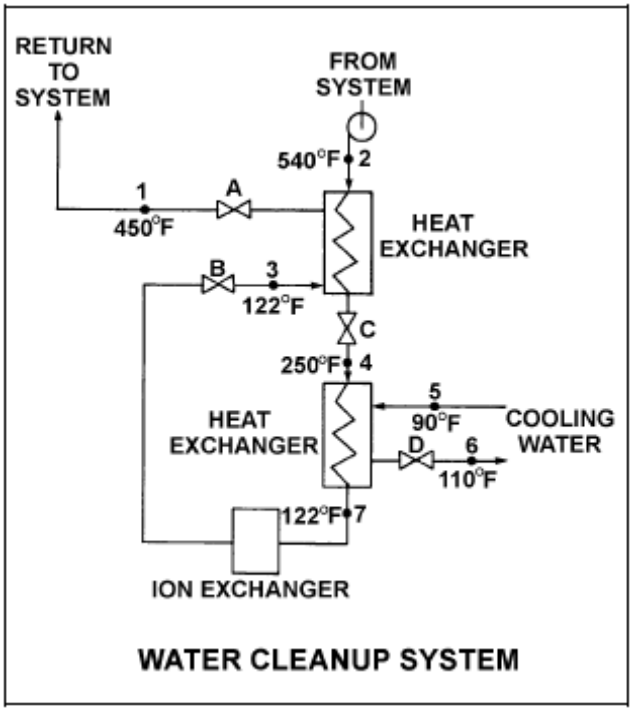
A. 位置3的溫度會升高。

B. 位置4的溫度會降低。

C. 位置5的溫度會降低。

D. 位置7的溫度會升高。

答案：B.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1231 (B1231)

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

All valves are identical and are initially 50% open. To lower the temperature at point 4, the operator can adjust valve _____ in the _____ direction.

A. D; shut

B. C; open

C. B; shut

D. A; open

ANSWER: C.

請參照下圖的運轉中水淨化系統。

所有的閥都相同，並於一開始打開50%開度。為了降低位置4的溫度，運轉員應將閥_____朝_____的方向調轉。

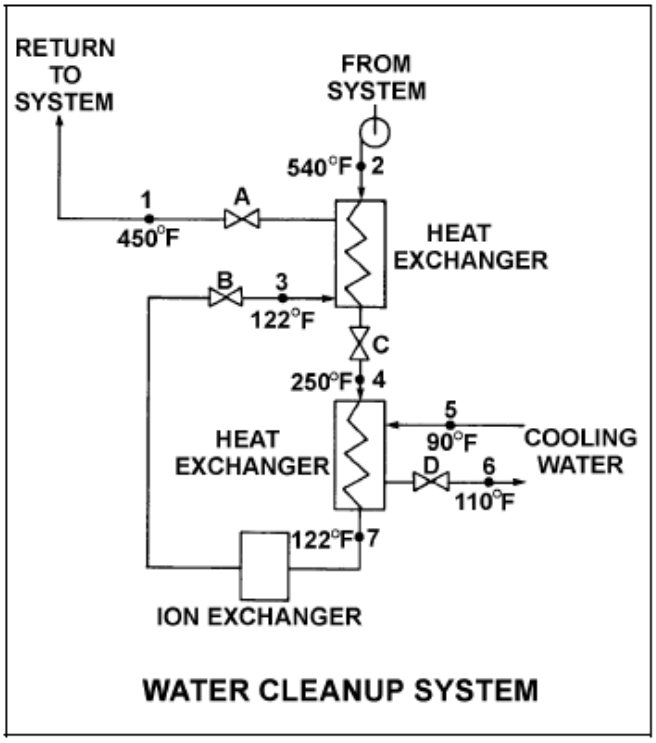
A. D；關

B. C；開

C. B；關

D. A；開

答案：C.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1432 (B1432)

The rate of heat transfer between two liquids in a heat exchanger will be increased if the: (Assume single-phase conditions and a constant specific heat.)

A. temperature of the hotter liquid is decreased by 20°F.

B. temperature of the colder liquid is increased by 20°F.

C. flow rates of both liquids are decreased by 10%.

D. flow rates of both liquids are increased by 10%.

ANSWER: D.

下列何者會提高熱交換器中兩種液體間的熱傳速率？(假設處於單相狀態，比熱固定)

A. 較熱液體的溫度降低20˚F。

B. 較冷液體的溫度升高20˚F。

C. 兩種液體的流量都降低10%。

D. 兩種液體的流量都增加10%。

答案：D.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1533 (B1531)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The heat exchanger is operating with the following parameters:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$\dot{m}_{oil}$ = 4.0 x 10^4 lbm/hr
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$\dot{m}_{water}$ = ?

What is the mass flow rate of the cooling water?

A. 8.8 x 10^4 lbm/hr

B. 7.3 x 10^4 lbm/hr

C. 2.2 x 10^4 lbm/hr

D. 1.8 x 10^4 lbm/hr

ANSWER: A.

請參照下圖的運轉中潤滑油熱交換器。

熱交換器按照下列參數運轉：

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$\dot{m}_{oil}$ = 4.0 x 10^4 lbm/hr
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$\dot{m}_{water}$ = ?

請問冷卻水的流量為多少？

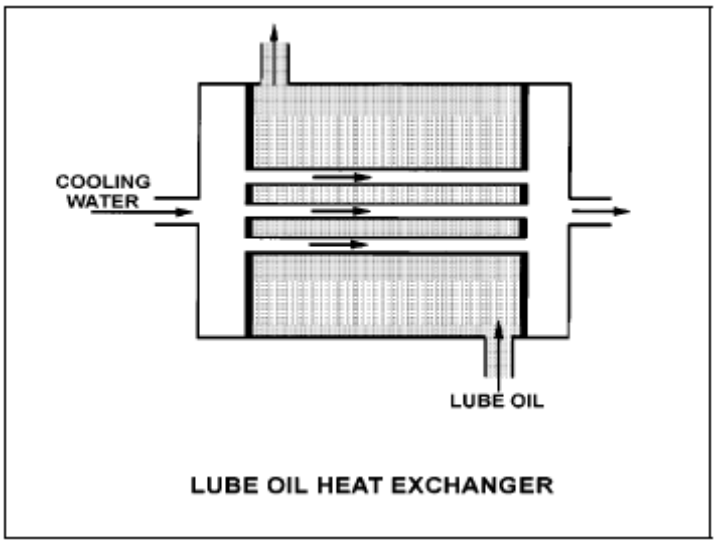
A. 8.8 x 10^4 lbm/hr

B. 7.3 x 10^4 lbm/hr

C. 2.2×10^4 lbm/hr

D. 1.8×10^4 lbm/hr

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1632 (B832)

A liquid-to-liquid counterflow heat exchanger is operating with single-phase conditions and a constant specific heat for each liquid. Which one of the following will decrease the heat transfer between the two liquids?

A. The temperature of both liquids is increased by 20°F.

B. The temperature of both liquids is decreased by 20°F.

C. The flow rate of the hotter liquid is increased by 10%.

D. The flow rate of the colder liquid is decreased by 10%.

ANSWER: D.

一部液體相互逆流的熱交換器於單相狀態運轉，每種液體的比熱維持不變。下列何者將降低熱交換器中兩種液體間的熱傳速率？

A. 兩種液體的溫度都升高20˚F。

B. 兩種液體的溫度都降低20˚F。

C. 較熱液體的流量增加10%。

D. 較冷液體的流量降低10%。

答案：D.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1634 (B1631)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following information, which one of the following is the temperature of the oil exiting
the heat exchanger ($T_{oil-out}$)?

$\dot{m}_{oil} = 2.0 \times 10^4$ lbm/hr
$\dot{m}_{water} = 3.0 \times 10^4$ lbm/hr
$C_{p-oil} = 1.1$ Btu/lbm-°F
$C_{p-water} = 1.0$ Btu/lbm-°F
$T_{cw-in} = 92$°F
$T_{cw-out} = 125$°F
$T_{oil-in} = 180$°F
$T_{oil-out} = ?$

A. 135°F

B. 140°F

C. 145°F

D. 150°F

ANSWER: A.

請參照下圖的運轉中潤滑油熱交換器。

已知下列資料時，下列何者為該熱交換器的潤滑油出口溫度($T_{oil-out}$)？

$\dot{m}_{oil} = 2.0 \times 10^4$ lbm/hr
$\dot{m}_{water} = 3.0 \times 10^4$ lbm/hr
$C_{p-oil} = 1.1$ Btu/lbm-˚F
$C_{p-water} = 1.0$ Btu/lbm-˚F
$T_{cw-in} = 92$˚F
$T_{cw-out} = 125$˚F
$T_{oil-in} = 180$˚F
$T_{oil-out} = ?$

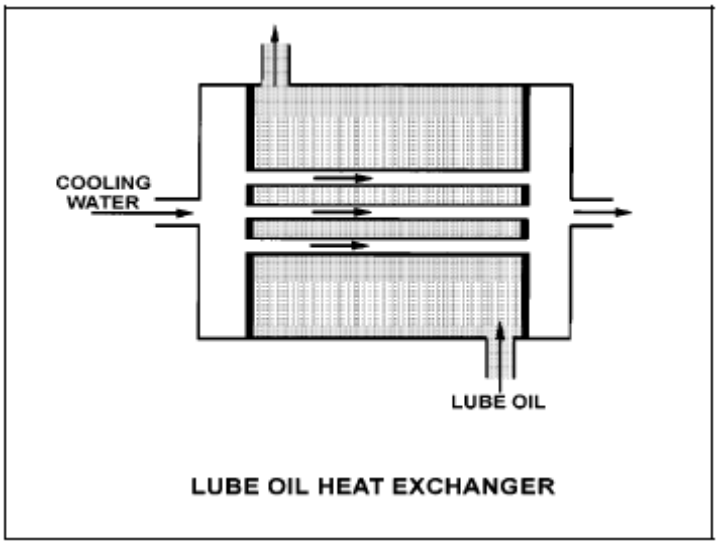
A. 135˚F

B. 140˚F

C. 145˚F

D. 150˚F

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1732 (B1732)

Which one of the following will reduce the rate of heat transfer between two liquids in a heat exchanger? (Assume single-phase conditions and a constant specific heat for both liquids.)

A. The inlet temperatures of both liquids are decreased by 20°F.

B. The inlet temperatures of both liquids are increased by 20°F.

C. The inlet temperature of the hotter liquid is increased by 20°F.

D. The inlet temperature of the colder liquid is increased by 20°F.

ANSWER: D.

下列何者將降低熱交換器中兩種液體間的熱傳速率？(假設處於單相狀態，兩種液體比熱固定)

A. 兩種液體的進口溫度都降低20˚F。

B. 兩種液體的進口溫度都升高20˚F。

C. 較熱液體的進口溫度升高20˚F。

D. 較冷液體的進口溫度升高20˚F。

答案：D.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1832 (B631)

The rate of heat transfer between two liquids in a heat exchanger will be increased if the: (Assume single-phase conditions and a constant specific heat capacity.)

A. temperature of both liquids is decreased by 20°F.

B. temperature of both liquids is increased by 20°F.

C. flow rate of the colder liquid is decreased by 10%.

D. flow rate of the hotter liquid is increased by 10%.

ANSWER: D.

下列何者將增加熱交換器中兩種液體間的熱傳速率？(假設處於單相狀態，兩種液體的比熱固定)

A. 兩種液體的溫度都降低20˚F。

B. 兩種液體的溫度都升高20˚F。

C. 較冷液體的流量降低10%。

D. 較熱液體的流量增加10%。

答案：D.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P1934 (B1933)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following information, which one of the following is the temperature of the oil exiting the heat exchanger ($T_{oil-out}$)?

$\dot{m}_{oil}$ = 1.5 x 10^4 lbm/hr
$\dot{m}_{water}$ = 2.5 x 10^4 lbm/hr
C_{p-oil} = 1.1 Btu/lbm-°F
$C_{p-water}$ = 1.0 Btu/lbm-°F
T_{cw-in} = 92°F
T_{cw-out} = 125°F
T_{oil-in} = 160°F
$T_{oil-out}$ = ?

A. 110°F

B. 127°F

C. 135°F

D. 147°F

ANSWER: A.

請參照下圖的運轉中潤滑油熱交換器。

已知下列資料下，下列何者為該熱交換器的潤滑油出口溫度($T_{oil-out}$)？

$\dot{m}_{oil}$ = 1.5 x 10^4 lbm/hr
$\dot{m}_{water}$ = 2.5 x 10^4 lbm/hr
C_{p-oil} = 1.1 Btu/lbm-˚F
$C_{p-water}$ = 1.0 Btu/lbm-˚F
T_{cw-in} = 92˚F
T_{cw-out} = 125˚F
T_{oil-in} = 160˚F
$T_{oil-out}$ = ?

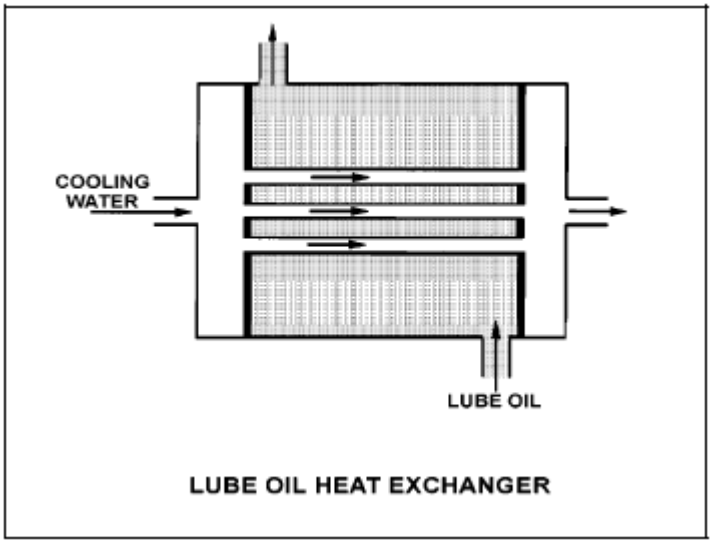
A. 110˚F

B. 127˚F

C. 135˚F

D. 147˚F

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2034 (B834)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following existing conditions:

$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$\dot{m}_{oil}$ = 1.2 x 10^4 lbm/hr
$\dot{m}_{water}$ = 1.61 x 10^4 lbm/hr
$T_{oil\ in}$ = 170°F
$T_{oil\ out}$ = 120°F
$T_{water\ out}$ = 110°F
$T_{water\ in}$ = ?

Which one of the following is the approximate cooling water inlet temperature ($T_{water\ in}$) in this heat exchanger?

A. 65°F

B. 69°F

C. 73°F

D. 77°F

ANSWER: B.

請參照下圖的運轉中潤滑油熱交換器。

已知現有狀態如下：

$C_{p\text{-}oil}$ = 1.1 Btu/lbm-˚F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-˚F
$\dot{m}_{oil}$ = 1.2 x 10^4 lbm/hr
$\dot{m}_{water}$ = 1.61 x 10^4 lbm/hr
$T_{oil\ in}$ = 170˚F
$T_{oil\ out}$ = 120˚F
$T_{water\ out}$ = 110˚F
$T_{water\ in}$ = ?

下列何者為熱交換器冷卻水進口的大約溫度($T_{water\ in}$)？

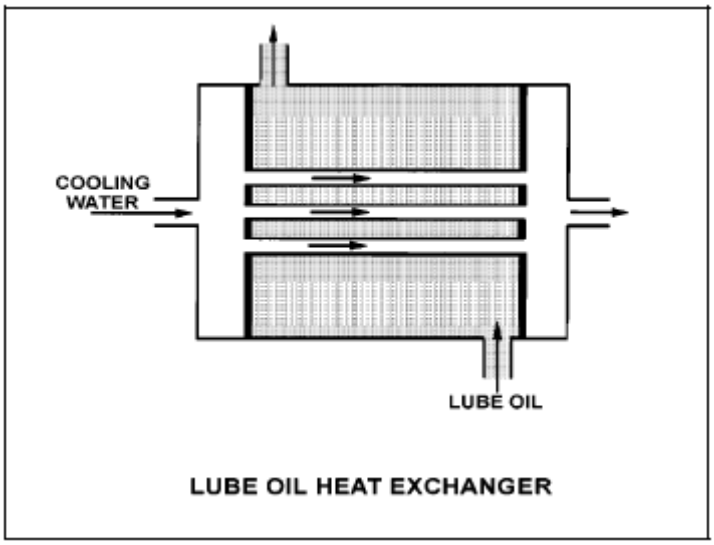
A. 65˚F

B. 69˚F

C. 73˚F

D. 77˚F

答案：B.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2133 (B2132)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 120°F
Cooling water inlet temperature: 60°F

Assuming cooling water flow rate is greater than lube oil flow rate, which one of the following pairs of heat exchanger outlet temperatures is possible? (Assume both fluids have the same c_p.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	100°F	100°F
B.	90°F	90°F
C.	80°F	80°F
D.	80°F	100°F

ANSWER: C.

請參照下圖的潤滑油熱交換器。

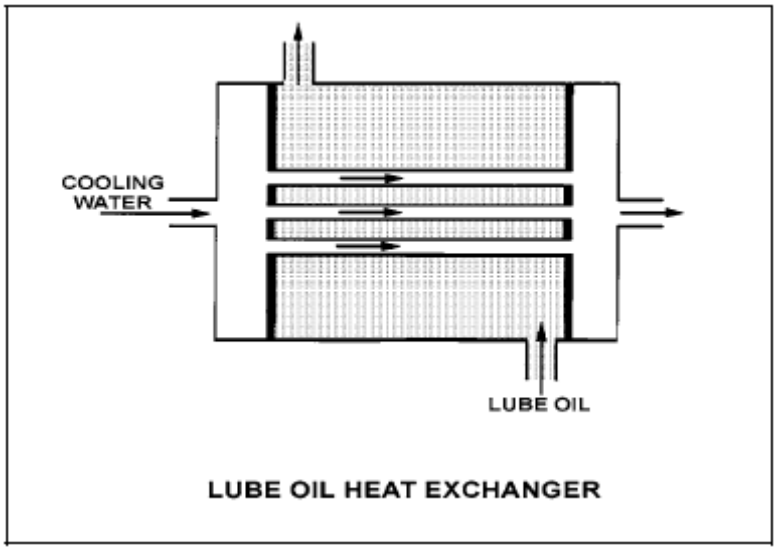
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度： 120˚F
冷卻水進口溫度： 60˚F

假設冷卻水流量大於潤滑油流量，下列何組為可能的熱交換器出口溫度？(假設兩種液體的c_p值相同)

	潤滑油出口溫度	冷卻水出口溫度
A.	100˚F	100˚F
B.	90˚F	90˚F
C.	80˚F	80˚F
D.	80˚F	100˚F

答案：C.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2232 (B1435)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following existing conditions:

$\dot{m}_{oil}$ = 1.8 x 10^4 lbm/hr
$\dot{m}_{water}$ = 3.3 x 10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$T_{cw\text{-}in}$ = 90°F
$T_{cw\text{-}out}$ = 120°F
$T_{oil\text{-}in}$ = 190°F
$T_{oil\text{-}out}$ = ?

Which one of the following is the temperature of the oil exiting the heat exchanger ($T_{oil\text{-}out}$)?

A. 110°F

B. 120°F

C. 130°F

D. 140°F

ANSWER: D.

請參照下圖的運轉中潤滑油熱交換器。

已知下列現有狀態：

$\dot{m}_{oil}$ = 1.8 x 10^4 lbm/hr
$\dot{m}_{water}$ = 3.3 x 10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-˚F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-˚F
$T_{cw\text{-}in}$ = 90˚F
$T_{cw\text{-}out}$ = 120˚F
$T_{oil\text{-}in}$ = 190˚F
$T_{oil\text{-}out}$ = ?

下列何者為熱交換器中潤滑油的出口溫度($T_{oil\text{-}out}$)？

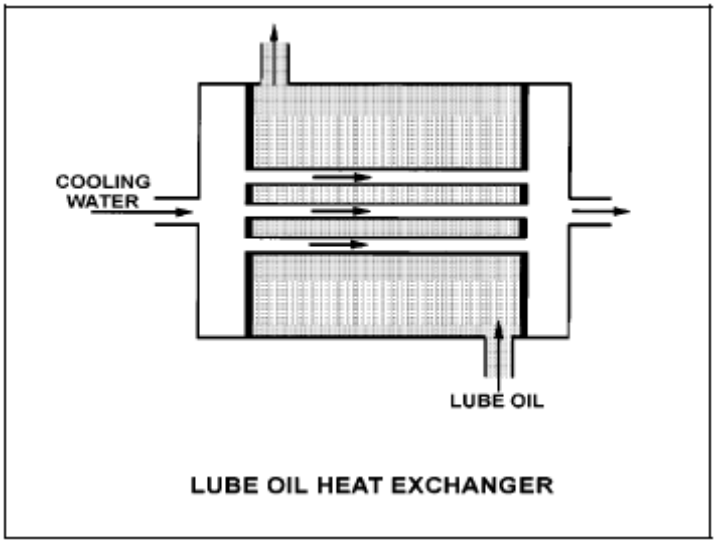
A. 110˚F

B. 120˚F

C. 130˚F

D. 140˚F

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2433 (B2431)

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

All valves are identical and are initially 50% open. To raise the temperature at point 1, the operator can adjust valve _____ in the _____ direction.

A. A; shut

B. B; open

C. C; shut

D. D; open

ANSWER: B.

請參照下圖的運轉中水淨化系統。

所有的閥都相同，並於一開始打開50%開度。欲將位置1的溫度提高，運轉員應將閥_____向_____的方向調轉。

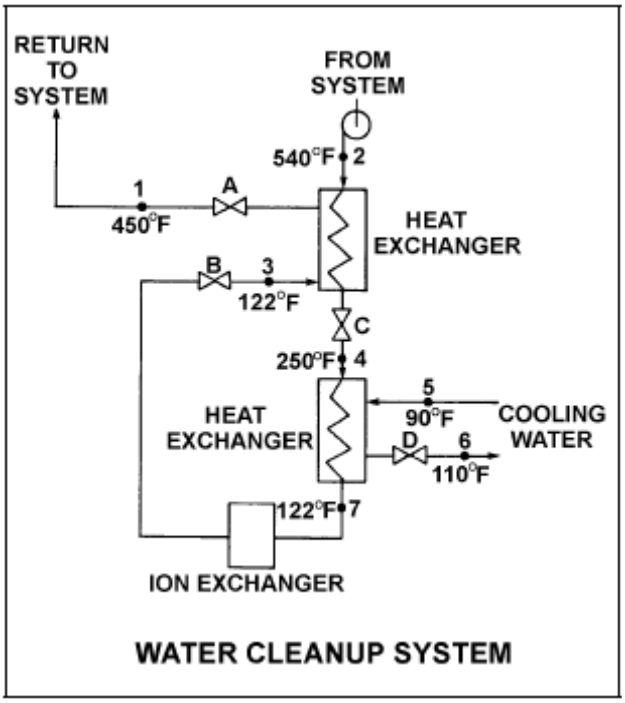
A. A；關

B. B；開

C. C；關

D. D；開

答案：B.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2434 (B2233)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 130°F
Cooling water inlet temperature: 70°F

Assuming cooling water flow rate is greater than lube oil flow rate, which one of the following pairs of heat exchanger outlet temperatures is possible? (Neglect any difference between fluid specific heat.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	90°F	100°F
B.	90°F	110°F
C.	100°F	100°F
D.	100°F	110°F

ANSWER: A.

請參照下圖的潤滑油熱交換器。

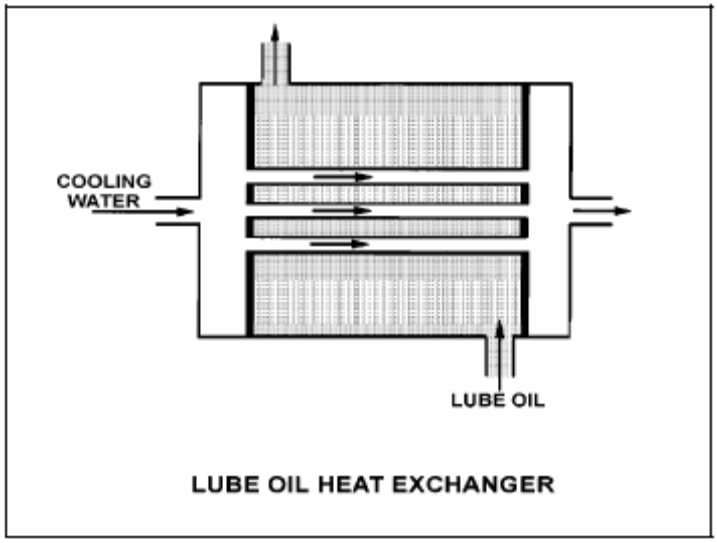
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度：130˚F
冷卻水進口溫度：70˚F

假設冷卻水流量大於潤滑油流量，下列何組為可能的熱交換器出口溫度？(忽略流體之間的比熱差異)

	潤滑油 出口溫度	冷卻水 出口溫度
A.	90˚F	100˚F
B.	90˚F	110˚F
C.	100˚F	100˚F
D.	100˚F	110˚F

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2532 (B2534)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following information, which one of the following is the temperature of the cooling water exiting the heat exchanger ($T_{cw\text{-}out}$)?

$\dot{m}_{oil}$ = 1.5 x 10^4 lbm/hr
$\dot{m}_{water}$ = 2.5 x 10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$T_{cw\text{-}in}$ = 92°F
$T_{cw\text{-}out}$ = ?
$T_{oil\text{-}in}$ = 160°F
$T_{oil\text{-}out}$ = 110°F

A. 110°F

B. 115°F

C. 120°F

D. 125°F

ANSWER: D.

請參照下圖的運轉中潤滑油熱交換器。

已知下列資料下，下列何者為該熱交換器的冷卻水出口溫度($T_{cw\text{-}out}$)？

$\dot{m}_{oil}$ = 1.5 x 10^4 lbm/hr
$\dot{m}_{water}$ = 2.5 x 10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-˚F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-˚F
$T_{cw\text{-}in}$ = 92˚F
$T_{cw\text{-}out}$ = ?
$T_{oil\text{-}in}$ = 160˚F
$T_{oil\text{-}out}$ = 110˚F

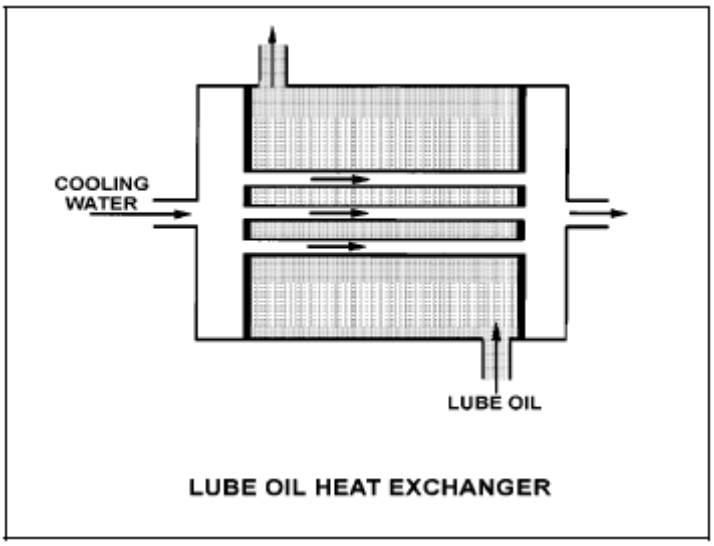
A. 110˚F

B. 115˚F

C. 120˚F

D. 125˚F

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2632 (B2531)

The rate of heat transfer between two liquids in a heat exchanger will be decreased if the: (Assume single-phase conditions and a constant specific heat for both liquids.)

A. inlet temperature of the hotter liquid is increased by 20°F.

B. inlet temperature of the colder liquid is decreased by 20°F.

C. flow rates of both liquids are decreased by 10%.

D. flow rates of both liquids are increased by 10%.

ANSWER: C.

下列何者會降低熱交換器中兩種液體間的熱傳速率？(假設處於單相狀態，兩種液體比熱固定)

A. 較熱液體的進口溫度增加20˚F。

B. 較冷液體的進口溫度降低20˚F。

C. 兩種液體的流量都降低10%。

D. 兩種液體的流量都增加10%。

答案：C.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2633 (B2632)

Refer to the drawing of a lube oil heat exchanger (see figure below). The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 110°F
Cooling water inlet temperature: 75°F

Assuming cooling water flow rate is greater than lube oil flow rate, which one of the following pairs of heat exchanger outlet temperatures is possible? (Neglect any difference between fluid specific heats.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	100°F	100°F
B.	100°F	90°F
C.	90°F	100°F
D.	90°F	90°F

ANSWER: D.

請參照下圖的潤滑油熱交換器。

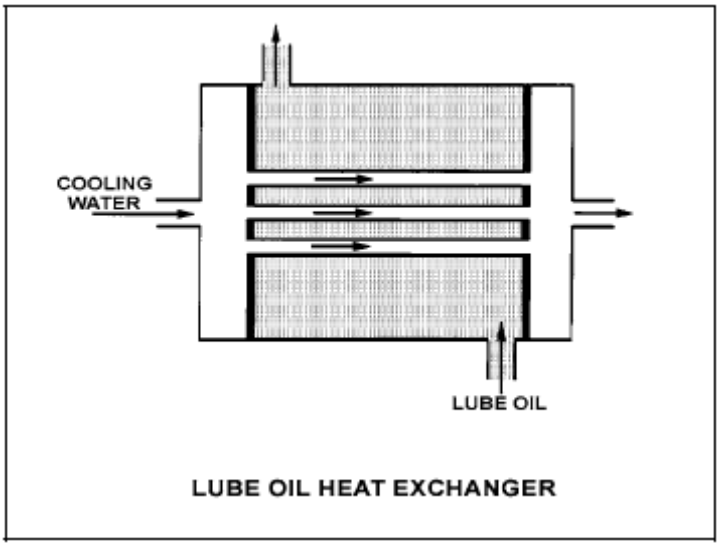
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度：110˚F
冷卻水進口溫度：75˚F

假設冷卻水流量大於潤滑油流量，下列何組為可能的熱交換器出口溫度？(忽略流體間的比熱差異)

	潤滑油出口溫度	冷卻水出口溫度
A.	100˚F	100˚F
B.	100˚F	90˚F
C.	90˚F	100˚F
D.	90˚F	90˚F

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2732 (B2732)

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

All valves are identical and are initially 50% open. To raise the temperature at point 4, the operator can adjust valve _____ in the _____ direction.

A. A; shut

B. B; shut

C. C; open

D. D; open

ANSWER: C.

請參照下圖的運轉中水淨化系統。

所有的閥均相同，並於一開始打開50%開度。為了提高位置4的溫度，運轉員應將閥_____向_____的方向調轉。

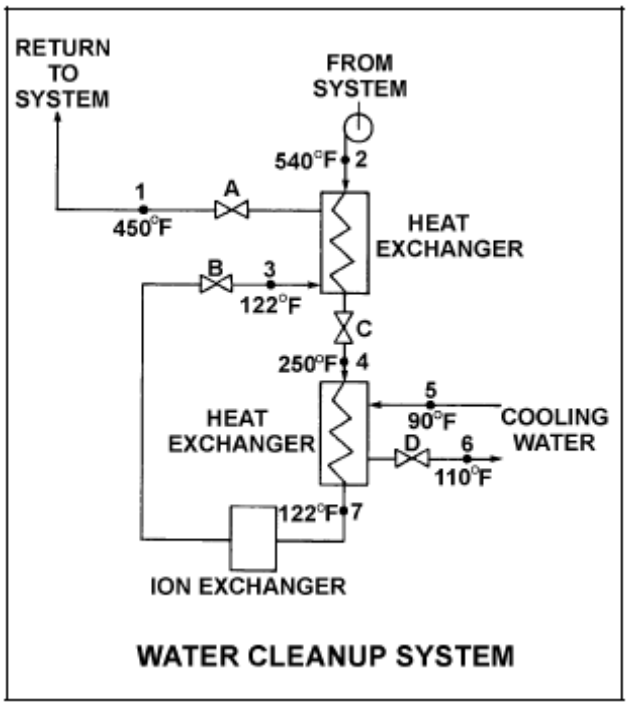
A. A；關

B. B；關

C. C；開

D. D；開

答案：C.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2733 (B2733)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 130°F
Cooling water inlet temperature: 70°F

Assuming cooling water flow rate is greater than lube oil flow rate, which one of the following pairs of heat exchanger outlet temperatures is not possible? (Assume both fluids have the same specific heat.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	90°F	86°F
B.	100°F	85°F
C.	110°F	84°F
D.	120°F	83°F

ANSWER: D.

請參照下圖的潤滑油熱交換器。

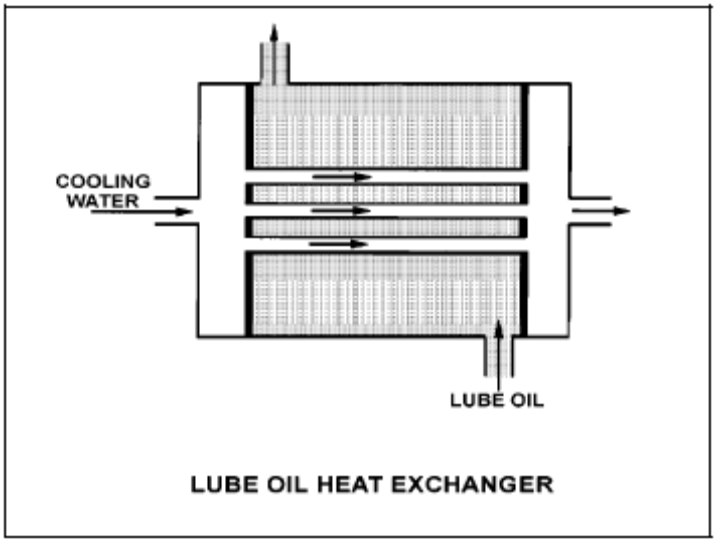
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度：130˚F
冷卻水進口溫度：70˚F

假設冷卻水流量大於潤滑油流量，下列何組不可能是該熱交換器的出口溫度？(假設兩種流體比熱相同)

	潤滑油 出口溫度	冷卻水 出口溫度
A.	90˚F	86˚F
B.	100˚F	85˚F
C.	110˚F	84˚F
D.	120˚F	83˚F

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P2934 (B2933)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 130°F
Cooling water inlet temperature: 70°F

Assuming that cooling water flow rate is significantly larger than lube oil flow rate, which one of the following pairs of heat exchanger outlet temperatures is possible? (Assume both fluids have the same specific heat.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	100°F	90°F
B.	100°F	100°F
C.	110°F	90°F
D.	110°F	100°F

ANSWER: A.

請參照下圖的潤滑油熱交換器。

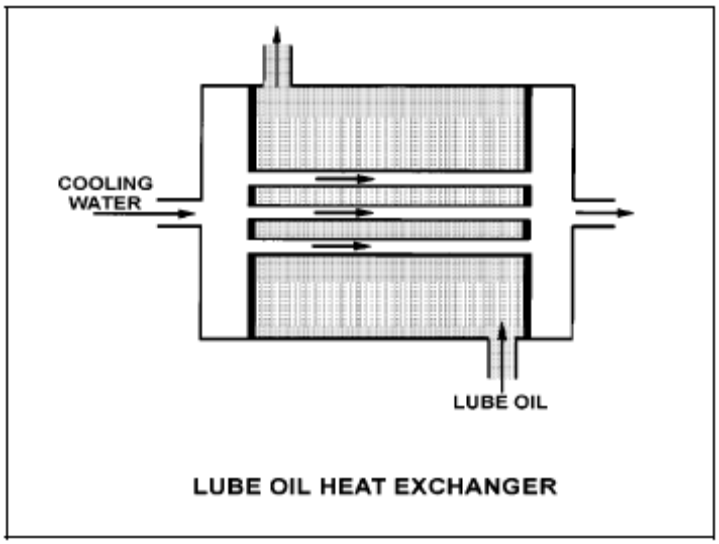
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度：130˚F
冷卻水進口溫度：70˚F

假設冷卻水流量遠大於潤滑油流量，下列何組可能是該熱交換器的出口溫度？(假設兩種流體比熱相同)

	潤滑油 出口溫度	冷卻水 出口溫度
A.	100˚F	90˚F
B.	100˚F	100˚F
C.	110˚F	90˚F
D.	110˚F	100˚F

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3034 (B3082)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following lube oil cooling system conditions:

The lube oil flow rate in the lube oil heat exchanger is 200 lbm/min.
The lube oil enters the heat exchanger at 140°F.
The lube oil leaves the heat exchanger at 100°F.
The specific heat of the lube oil is 0.8 Btu/lbm-°F.
The cooling water flow rate is 400 lbm/min.
The cooling water enters the lube oil heat exchanger at 60°F.
The specific heat of the cooling water is 1.0 Btu/lbm-°F.

What is the approximate temperature of the cooling water leaving the lube oil heat exchanger?

A. 76°F

B. 85°F

C. 92°F

D. 124°F

ANSWER: A.

請參照下圖的運轉中潤滑油熱交換器。

已知潤滑油冷卻系統的狀況如下：

潤滑油熱交換器的潤滑油流量為 200 lbm/min
熱交換器的潤滑油進口溫度為 140°F
熱交換器的潤滑油出口溫度為 100°F
潤滑油的比熱為 0.8 Btu/lbm-°F
冷卻水流量為 400 lbm/min
熱交換器的冷卻水進口溫度為 60°F
冷卻水的比熱為 1.0 Btu/lbm-°F

下列何者為潤滑油熱交換器冷卻水出口的大約溫度？

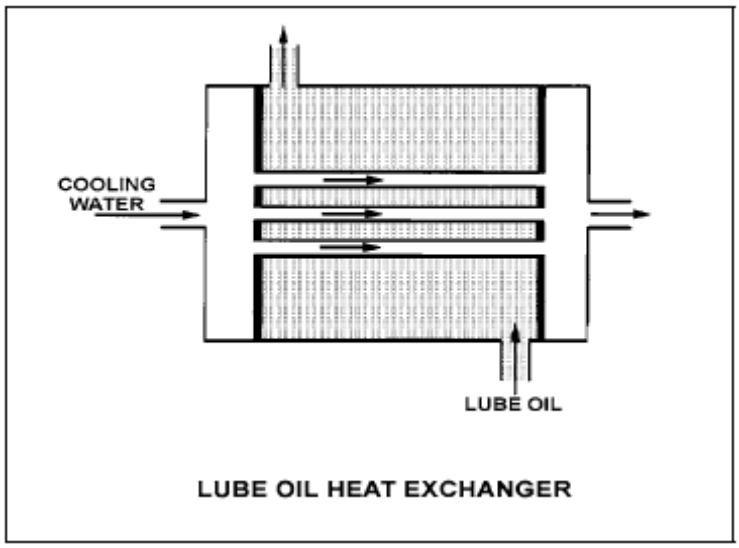
A. 76°F

B. 85°F

C. 92°F

D. 124°F

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3084 (B3084)

A nuclear power plant is operating at 100% rated power. Main turbine extraction steam is being supplied to a feedwater heater. Extraction steam parameters are as follows:

Steam pressure: 750 psia
Steam flow rate: 7.5×10^5 lbm/hr
Steam enthalpy: 1,150 Btu/lbm

Saturated liquid condensate at 448°F leaves the feedwater heater via a drain line.

What is the approximate heat transfer rate from the extraction steam to the feedwater in the feedwater heater?

A. 3.8×10^7 Btu/hr

B. 8.6×10^7 Btu/hr

C. 5.4×10^8 Btu/hr

D. 7.2×10^8 Btu/hr

ANSWER: C.

核能電廠於 100%額定功率運轉中。主汽機抽取的蒸汽提供給飼水加熱器使用。抽取蒸汽的參數如下：

蒸汽壓力： 750 psia
蒸汽流量： 7.5×10^5 lbm/hr
蒸汽熱焓： 1,150 Btu/lbm

448°F 的飽和凝結水從排水管離開飼水加熱器。

請問在飼水加熱器中，抽取蒸汽至飼水的熱傳速率約是多少？

A. 3.8×10^7 Btu/hr

B. 8.6×10^7 Btu/hr

C. 5.4×10^8 Btu/hr

D. 7.2×10^8 Btu/hr

答案：C.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3132 (B934)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The heat exchanger is operating with the following parameters:

$\dot{Q}_{oil}$ = 1.0 x 10^7 Btu/hr
$T_{oil\ in}$ = 170°F
$T_{oil\ out}$ = 134°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 112°F
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$\dot{m}_{water}$ = ?

Which one of the following is the mass flow rate of the cooling water?

A. 4.5 x 10^5 lbm/hr

B. 3.7 x 10^5 lbm/hr

C. 2.5 x 10^5 lbm/hr

D. 1.2 x 10^5 lbm/hr

ANSWER: B.

請參照下圖的潤滑油熱交換器。

該熱交換器以下列參數運轉：

$\dot{Q}_{oil}$ = 1.0 x 10^7 Btu/hr
$T_{oil\ in}$ = 170˚F
$T_{oil\ out}$ = 134˚F
$T_{water\ in}$ = 85˚F
$T_{water\ out}$ = 112˚F
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-˚F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-˚F
$\dot{m}_{water}$ = ?

下列何者為冷卻水的流量？

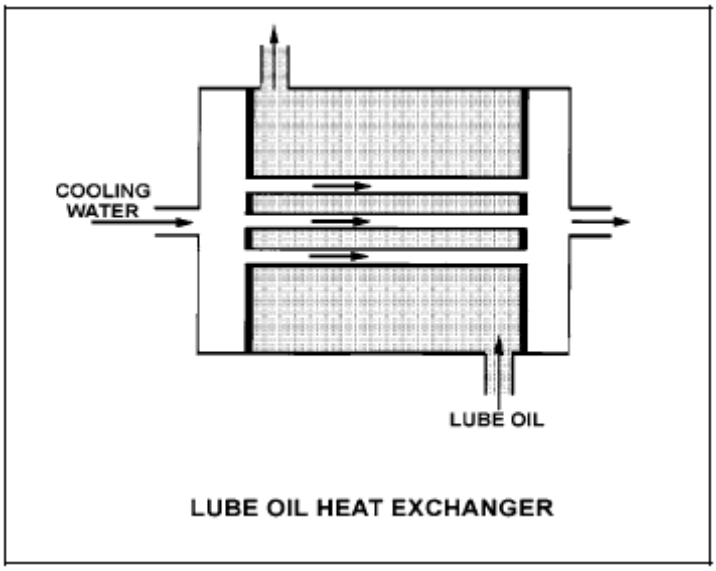
A. 4.5 x 10^5 lbm/hr

B. 3.7 x 10^5 lbm/hr

C. 2.5×10^5 lbm/hr

D. 1.2×10^5 lbm/hr

答案：B.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3232 (B632)

Refer to the drawing of an operating water cleanup system (see figure below). Valves A, B, and D are fully open and valve C is 50% open.

If valve C is opened to 100%, how will the temperatures at points 3 and 6 be affected?

	Point 3	Point 6
A.	Decrease	Decrease
B.	Decrease	Increase
C.	Increase	Decrease
D.	Increase	Increase

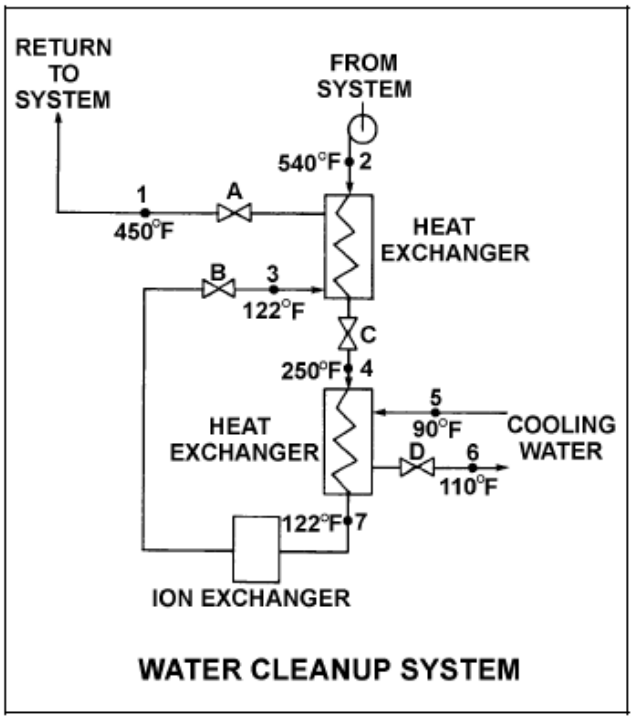
ANSWER: D.

請參照下圖的運轉中水淨化系統。A、B與D閥完全打開，C閥打開50%開度。

若將C閥打開到100%開度，位置3和位置6的溫度將受到什麼影響？

	位置3	位置6
A.	降低	降低
B.	降低	升高
C.	升高	降低
D.	升高	升高

答案：D.



WATER CLEANUP SYSTEM

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3332 (B1930)

Refer to the drawing of an operating water cleanup system (see figure below). All valves are identical and are initially 50% open.

To raise the temperature at point 7, the operator should adjust valve _____ in the close direction.

A. A

B. B

C. C

D. D

ANSWER: D.

請參照下圖的運轉中水淨化系統，所有的閥都相同，而且一開始打開50%開度。

欲將位置7的溫度升高，運轉員應將閥_____向關的方向調轉。

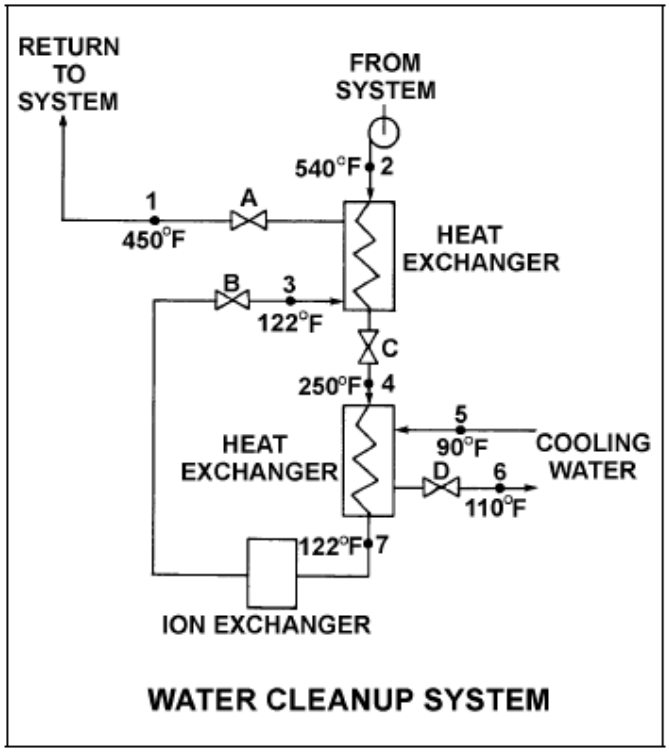
A. A

B. B

C. C

D. D

答案：D.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3432 (B1435)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following existing conditions:

$\dot{m}_{oil}$ = 1.8 x 10^4 lbm/hr
$\dot{m}_{water}$ = 3.3 x 10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-°F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-°F
$T_{cw\text{-}in}$ = 90°F
$T_{cw\text{-}out}$ = 120°F
$T_{oil\text{-}in}$ = 170°F
$T_{oil\text{-}out}$ = ?

What is the approximate temperature of the oil exiting the heat exchanger ($T_{oil\text{-}out}$)?

A. 110°F

B. 120°F

C. 130°F

D. 140°F

ANSWER: B.

請參照下圖的運轉中潤滑油熱交換器。

已知下列現有狀態：

$\dot{m}_{oil}$ = 1.8 x 10^4 lbm/hr
$\dot{m}_{water}$ = 3.3 x 10^4 lbm/hr
$C_{p\text{-}oil}$ = 1.1 Btu/lbm-˚F
$C_{p\text{-}water}$ = 1.0 Btu/lbm-˚F
$T_{cw\text{-}in}$ = 90˚F
$T_{cw\text{-}out}$ = 120˚F
$T_{oil\text{-}in}$ = 170˚F
$T_{oil\text{-}out}$ = ?

請問熱交換器的潤滑油出口溫度($T_{oil\text{-}out}$)約為多少？

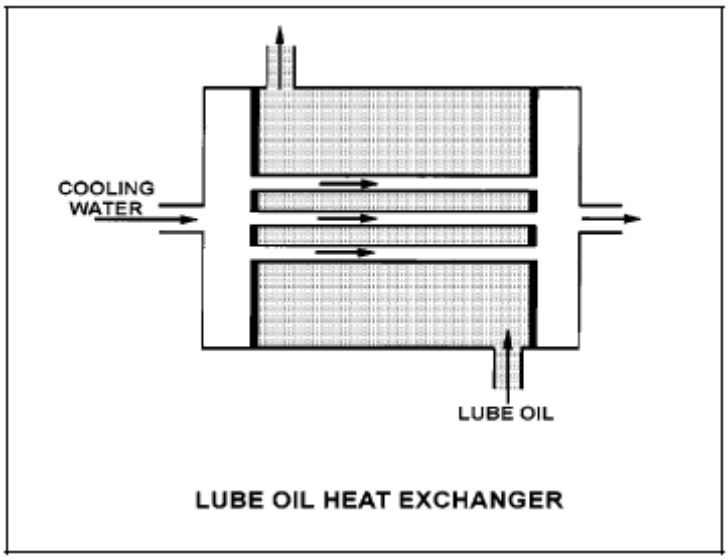
A. 110˚F

B. 120˚F

C. 130˚F

D. 140˚F

答案：B.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3632 (B3631)

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

If cooling water flow rate is 1.0 x 10^6 lbm/hr, what is the approximate water flow rate in the cleanup system?

A. 1.6 x 10^5 lbm/hr

B. 3.2 x 10^5 lbm/hr

C. 1.6 x 10^6 lbm/hr

D. 3.2 x 10^6 lbm/hr

ANSWER: A.

請參照下圖的運轉中水淨化系統。

如果冷卻水流量為1.0 x 10^6 lbm/hr，此淨化系統的水流量大約為多少？

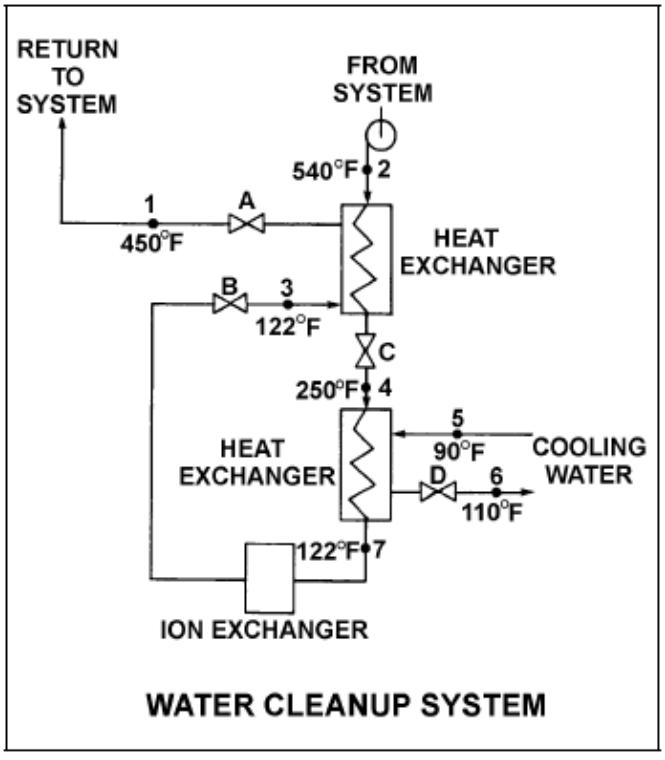
A. 1.6 x 10^5 lbm/hr

B. 3.2 x 10^5 lbm/hr

C. 1.6 x 10^6 lbm/hr

D. 3.2 x 10^6 lbm/hr

答案：A.



科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P3732 (B3732)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 130°F
Cooling water inlet temperature: 70°F

Assume that cooling water mass flow rate is less than lube oil mass flow rate, and that both fluids have the same specific heat. Which one of the following pairs of heat exchanger outlet temperatures is not possible?

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	100°F	105°F
B.	105°F	105°F
C.	110°F	90°F
D.	115°F	90°F

ANSWER: C.

請參照下圖的潤滑油熱交換器。

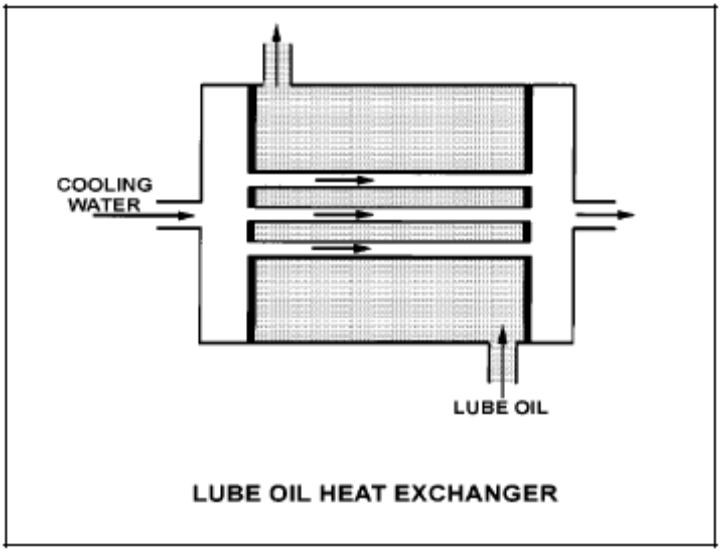
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度：130˚F
冷卻水進口溫度：70˚F

假設冷卻水流量小於潤滑油流量，兩種流體有相同比熱，下列何者不可能是該熱交換器的出口溫度？

	潤滑油出口溫度	冷卻水出口溫度
A.	100˚F	105˚F
B.	105˚F	105˚F
C.	110˚F	90˚F
D.	115˚F	90˚F

答案：C.



科目： 191006
知能類：K1.07 [2.5/2.7]
序號： P3833 (B3832)

A main turbine-generator was operating at 80% load with the following initial steady-state cooling water and lube oil temperatures for the main turbine lube oil heat exchanger:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

Six months later, the following current steady-state heat exchanger temperatures are observed:

$T_{oil\ in}$ = 177°F
$T_{oil\ out}$ = 111°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

Assume that the total heat exchanger heat transfer coefficient and the cooling water flow rate do not change, and that the specific heat values for the cooling water and lube oil do not change. Also, assume that the lube oil system is a closed system.

Which one of the following could be responsible for the differences between the initial and current steady-state heat exchanger temperatures?

A. The current main turbine-generator load is lower than the initial load.

B. The current main turbine-generator load is higher than the initial load.

C. The current main turbine lube oil flow rate is less than the initial flow rate.

D. The current main turbine lube oil flow rate is greater than the initial flow rate.

ANSWER: C.

一部主汽輪發電機以80%負載運轉，其潤滑油熱交換器冷卻水和潤滑油的初始穩態溫度如下：

$T_{oil\ in}$ = 174˚F
$T_{oil\ out}$ = 114˚F
$T_{water\ in}$ = 85˚F
$T_{water\ out}$ = 115˚F

六個月後，觀察到熱交換器的目前穩態溫度如下：
$T_{oil\ in}$ = 177˚F
$T_{oil\ out}$ = 111˚F
$T_{water\ in}$ = 85˚F

$T_{water\ out} = 115^{\circ}F$

假設熱交換器總熱傳係數和冷卻水流量都沒有改變，冷卻水和潤滑油的比熱也沒有改變。再假設潤滑油系統為封閉系統。

下列何者可能為導致熱交換器初始和目前穩態溫度不同的原因？

A. 主汽輪發電機目前的負載比初始負載低。

B. 主汽輪發電機目前的負載比初始負載高。

C. 主汽機目前的潤滑油流量比初始流量小。

D. 主汽機目前的潤滑油流量比初始流量大。

答案：C.

科目： 191006
知能類：K1.07 [2.4/2.6]
序號： P4416 (B4416)

Refer to the drawing of a lube oil heat exchanger (see figure below).

The lube oil heat exchanger is in service with the following inlet temperatures:

Lube oil inlet temperature: 120°F
Cooling water inlet temperature: 60°F

Assuming cooling water flow rate is greater than lube oil flow rate, which one of the following sets of heat exchanger outlet temperatures is possible? (Neglect any difference between fluid specific heats.)

	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	90°F	100°F
B.	90°F	85°F
C.	95°F	100°F
D.	95°F	85°F

ANSWER: B.

請參照下圖的潤滑油熱交換器。

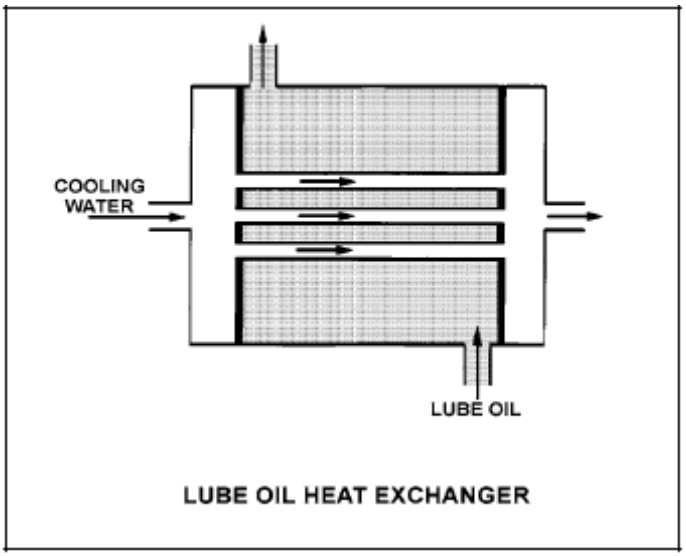
該潤滑油熱交換器以下列進口溫度運轉：

潤滑油進口溫度：120˚F
冷卻水進口溫度：60˚F

假設冷卻水流量大於潤滑油流量，下列何組可能是熱交換器的出口溫度？(忽略流體比熱差異。)

	潤滑油 出口溫度	冷卻水 出口溫度
A.	90˚F	100˚F
B.	90˚F	85˚F
C.	95˚F	100˚F
D.	95˚F	85˚F

答案：B.



科目： 191006
知能類：K1.09 [2.8/2.8]
序號： P31

Severe stress in a mechanical component, induced by a sudden, unequally distributed temperature reduction is a description of...

A. fracture stress.

B. brittle fracture.

C. thermal shock.

D. pressurized thermal shock.

ANSWER: C.

下列何者意指分佈不均的溫度驟降情形，造成機械零件承受到嚴重應力？

A. 斷裂應力(fracture stress)。

B. 脆性破壞(brittle fracture)。

C. 熱震。

D. 受壓熱震。

答案：C.

科目： 191006
知能類：K1.09 [2.8/2.8]
序號： P233

The major thermodynamic concern resulting from rapidly cooling a reactor vessel is...

A. thermal shock.

B. stress corrosion.

C. loss of shutdown margin.

D. loss of subcooling margin.

ANSWER: A.

反應爐迅速冷卻而引發的主要熱力問題為……

A. 熱震。

B. 應力腐蝕(stress corrosion)。

C. 停機餘裕損失(shutdown margin loss)。

D. 次冷餘裕損失(subcooling margin loss)。

答案：A.

科目： 191006
知能類：K1.09 [2.8/2.8]
序號： P2832 (B633)

Steam has been admitted to a main condenser for 25 minutes with no cooling water. Initiating full cooling water flow rate at this time will...

A. reduce the stress on the condenser shell by rapidly cooling the shell.

B. reduce the stress on the condenser tubes by rapidly cooling the tubes.

C. induce large thermal stresses on the condenser shell.

D. induce large thermal stresses on the junctions between the condenser tubes and the tubesheet.

ANSWER: D.

於無冷卻水的情況下，蒸氣已進入冷凝器達25分鐘，此時以全流量加入冷卻水，將會……

A. 因快速冷卻冷凝器殼而降低殼的應力。

B. 因快速冷卻冷凝器管子而降低管子的應力。

C. 在冷凝器殼造成大量的熱應力。

D. 在冷凝器管和管板間的接頭上，造成大量的熱應力。

答案：D.

科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P32 (B1234)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

If scaling occurs inside the cooling water tubes, cooling water outlet temperature will _____ and lube oil outlet temperature will _____. (Assume oil and cooling water flow rates remain the same.)

A. decrease; decrease

B. decrease; increase

C. increase; decrease

D. increase; increase

ANSWER: B.

請參照下圖的運轉中潤滑油熱交換器。

如果冷卻水管內產生水垢，冷卻水的出口溫度將_____，潤滑油的出口溫度將_____。(假設潤滑油和冷卻水流量維持不變。)

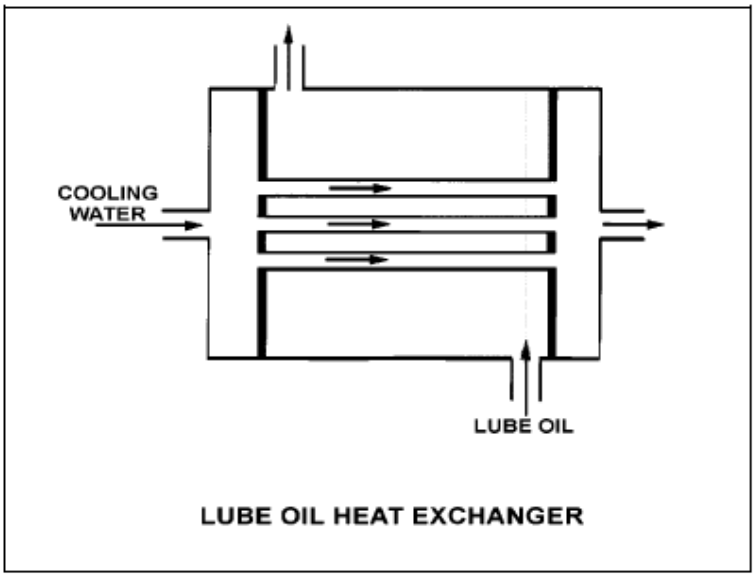
A. 降低；降低

B. 降低；升高

C. 升高；降低

D. 升高；升高

答案：B.



科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P105

Which one of the following will occur to reduce the heat transfer rate in a parallel-flow heat exchanger as scaling increases on the exterior surface of the tubes? (Assume no operator actions.)

A. Flow through the heat exchanger tubes will decrease.

B. Surface area of the tubes will decrease.

C. Thermal conductivity of the tubes will decrease.

D. Delta-T across the tubes will decrease.

ANSWER: C.

一平行流熱交換器管外表面的水垢增加時，下列何種情況會降低該熱交換器的熱傳速率？ (假設運轉員不採取行動)

A. 熱交換器管內流量減少。

B. 管子的表面積減少。

C. 管子的熱傳速度降低。

D. 管子兩端的 ΔT 值減少。

答案：C.

科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P331 (B332)

During normal steady-state nuclear power plant operation with a constant generator load, plugging of 1% of the tubes in the main condenser will cause absolute pressure in the condenser to _____ and hotwell temperature to _____.

A. increase; increase

B. decrease; increase

C. increase; decrease

D. decrease; decrease

ANSWER: A.

核能電廠以固定的發電機負載正常穩態運轉，若主冷凝器中，1%的管子塞管，將使冷凝器的絕對壓力_____，熱井的溫度_____。

A. 升高；升高

B. 降低；升高

C. 升高；降低

D. 降低；降低

答案：A.

科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P2233 (B1833)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

If deposits accumulate on the outside of the cooling water tubes, cooling water outlet temperature will _____ and oil outlet temperature will _____. (Assume oil and cooling water inlet temperatures and flow rates remain the same.)

A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase

ANSWER: D.

請參照下圖的運轉中潤滑油熱交換器。

如果沈澱物累積於冷卻水管外，冷卻水的出口溫度將會_____，潤滑油的出口溫度將會_____(假設潤滑油和冷卻水的進口溫度和流量維持不變)。

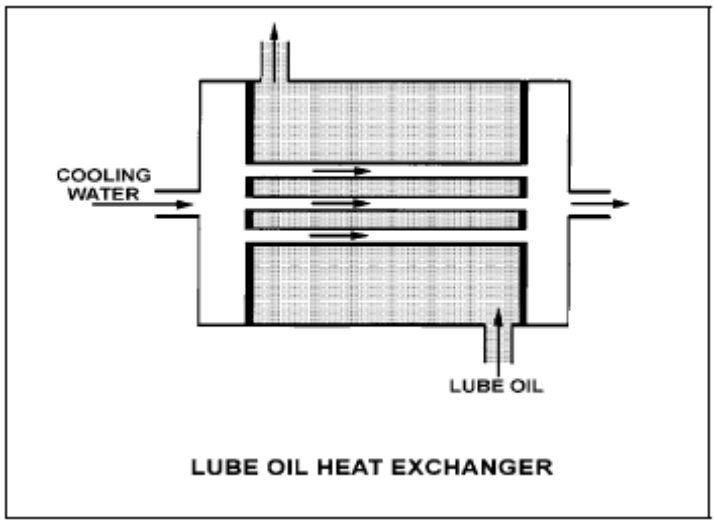
A. 升高；降低

B. 升高；升高

C. 降低；降低

D. 降低；升高

答案：D.



科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P3633 (B3635)

A main turbine-generator is operating at 80% load with the following initial steady-state temperatures for the main turbine lube oil heat exchanger:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

After six months of main turbine operation, the following final steady-state lube oil heat exchanger temperatures are observed:

$T_{oil\ in}$ = 179°F
$T_{oil\ out}$ = 119°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

Assume that the final cooling water and lube oil flow rates are the same as the initial flow rates, and that the specific heat values for the cooling water and lube oil do not change.

Which one of the following could be responsible for the differences between the initial and final heat exchanger steady-state temperatures?

A. The heat exchanger tubes have become fouled with scale.

B. The temperature of the cooling water source has increased.

C. The final main turbine-generator load is higher than the initial load.

D. The final main turbine-generator load is lower than the initial load.

ANSWER: A.

主汽輪發電機以80%負載運轉，主汽機的潤滑油熱交換器初始穩態溫度為：

$T_{oil\ in}$ = 174˚F
$T_{oil\ out}$ = 114˚F
$T_{water\ in}$ = 85˚F
$T_{water\ out}$ = 115˚F

主汽輪發電機運轉六個月後，該潤滑油熱交換器的最終穩態溫度為：

$T_{oil\ in}$ = 179˚F
$T_{oil\ out}$ = 119˚F
$T_{water\ in}$ = 85˚F
$T_{water\ out}$ = 115˚F

假設冷卻水和潤滑油的最終流量和初始流量相同，冷卻水和潤滑油的比熱也沒有改變。

下列何者是造成熱交換器初始和最終穩態溫度差異的原因？

A. 熱交換器管因水垢而阻塞。

B. 冷卻水源的溫度升高。

C. 主汽輪發電機的最終負載高於初始負載。

D. 主汽輪發電機的最終負載低於初始負載。

答案：A.

科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P4016 (B4018)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following initial parameters:

Cooling water inlet temperature ($T_{cw\text{-}in}$) = 75°F
Cooling water outlet temperature ($T_{cw\text{-}out}$) = 95°F
Oil inlet temperature ($T_{oil\text{-}in}$) = 150°F
Oil outlet temperature ($T_{oil\text{-}out}$) = 120°F

Air introduction to the heat exchanger results in some of the heat exchanger tubes becoming uncovered. As a result, $T_{cw\text{-}out}$ decreases to 91°F. Assume the inlet temperatures, mass flow rates, and specific heats of both fluids remain the same.

Which one of the following will be the new approximate temperature of the oil exiting the heat exchanger ($T_{oil\text{-}out}$)?

A. 126°F

B. 130°F

C. 134°F

D. 138°F

ANSWER: A.

請參照下圖的運轉中潤滑油熱交換器。

已知下列初始參數：

冷卻水進口溫度 ($T_{cw\text{-}in}$) = 75˚F
冷卻水出口溫度 ($T_{cw\text{-}out}$) = 95˚F
潤滑油進口溫度 ($T_{oil\text{-}in}$) = 150˚F
潤滑油出口溫度 ($T_{oil\text{-}out}$) = 120˚F

空氣進入熱交換器，導致有些熱交換管未被水覆蓋。結果$T_{cw\text{-}out}$降低到91˚F。假設進口溫度、流量及兩種流體的比熱維持不變。

下列何者為潤滑油流出熱交換器時的大約溫度($T_{oil\text{-}out}$)？

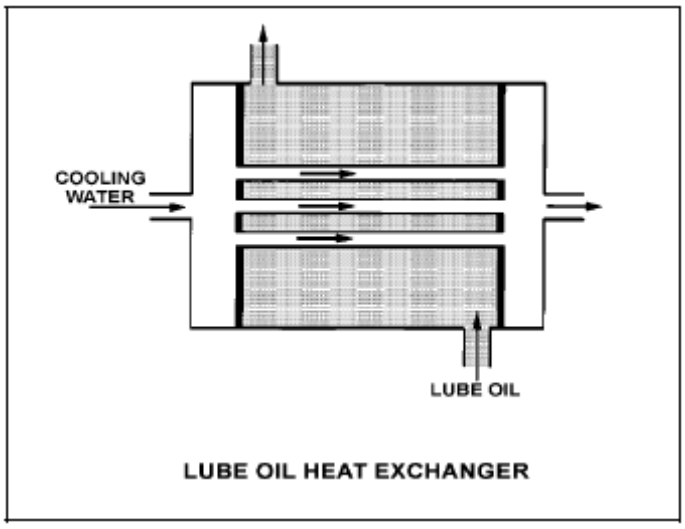
A. 126˚F

B. 130˚F

C. 134˚F

D. 138˚F

答案：A.



科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P4517 (B2832)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).

Given the following initial parameters:

Cooling water inlet temperature ($T_{cw\text{-}in}$) = 75°F
Cooling water outlet temperature ($T_{cw\text{-}out}$) = 105°F
Oil inlet temperature ($T_{oil\text{-}in}$) = 140°F
Oil outlet temperature ($T_{oil\text{-}out}$) = 100°F

Air introduction to the heat exchanger results in some of the heat exchanger tubes becoming uncovered. As a result, $T_{cw\text{-}out}$ decreases to 99°F. Assume that the mass flow rate and specific heat of both fluids remain the same, and that Toil-in does not change. Which one of the following will be the approximate temperature of the oil exiting the heat exchanger ($T_{oil\text{-}out}$)?

A. 99°F

B. 108°F

C. 116°F

D. 122°F

ANSWER: B.

請參照下圖的運轉中潤滑油熱交換器。

已知下列初始參數：

冷卻水進口溫度($T_{cw\text{-}in}$) = 75˚F
冷卻水出口溫度($T_{cw\text{-}out}$) = 105˚F
潤滑油進口溫度($T_{oil\text{-}in}$) = 140˚F
潤滑油出口溫度($T_{oil\text{-}out}$) = 100˚F

由於空氣進入該熱交換器，以致於有些熱交換器水管未被水覆蓋，因此讓$T_{cw\text{-}out}$降低到99˚F。假設兩種流體的流量及比熱維持相同，$T_{oil\text{-}in}$沒有改變，下列何者為該熱交換器潤滑油的大約出口溫度($T_{oil\text{-}out}$)？

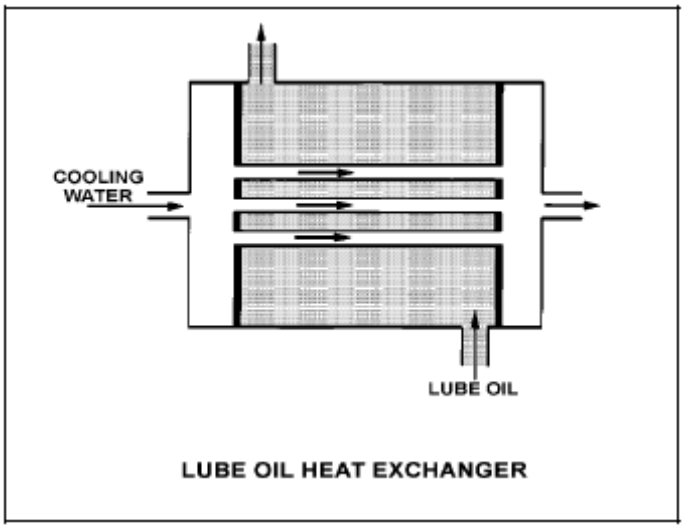
A. 99˚F

B. 108˚F

C. 116˚F

D. 122˚F

答案：B.



科目： 191006
知能類：K1.12 [2.5/2.7]
序號： P4617 (B4616)

Refer to the drawing of two system curves for a typical main condenser cooling water system (see figure below).

Which one of the following will result in the system curve shifting from the solid curve toward the dashed curve?

A The main condenser tubes are cleaned.

B. The main condenser tubes become increasingly fouled.

C. Cooling water flow rate is increased by 25% by starting an additional cooling water pump.

D. Cooling water flow rate is decreased by 25% by stopping one of the operating cooling water pumps.

ANSWER: A.

請參照下圖中，典型主冷凝器冷卻水系統的兩條系統曲線。

下列何者將導致系統曲線從實線移至虛線處？

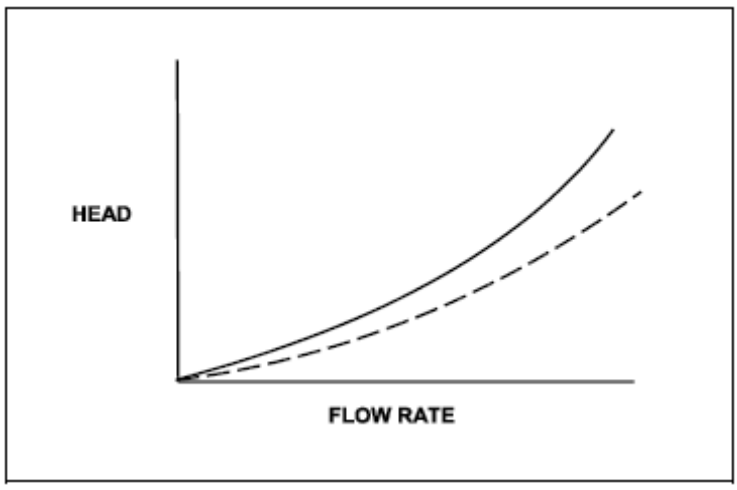
A. 清理主冷凝器管。

B. 主冷凝器管的水垢增加。

C. 啟動另一部冷卻水泵，讓冷卻水流增加 25%。

D. 停止一部運轉中的冷卻水泵，讓冷卻水流減少 25%。

答案：A.



科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P333 (B333)

A nuclear power plant is operating normally at 50% of rated power. Which one of the following will result from a cooling water tube rupture in the main condenser?

A. Increased condenser vacuum

B. Increased conductivity of the condensate

C. Decreased condensate pump net positive suction head

D. Decreased condensate pump flow rate

ANSWER: B.

核能發電廠以50%額定功率運轉。如果一條主冷凝器冷卻水管破裂，將導致下列何種現象？

A. 冷凝器的真空度提高。

B. 凝結水的導電度增加。

C. 凝結水泵的淨正吸水頭降低。

D. 凝結水泵的流量降低。

答案：B.

科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P33

Borated water is flowing through the tubes of a heat exchanger being cooled by fresh water. The shell side pressure is less than tube side pressure. What will occur as a result of a tube failure?

A. Shell side pressure will increase and the borated water system will be diluted.

B. Shell side pressure will decrease and the borated water inventory will be depleted.

C. Shell side pressure will increase and the borated water inventory will be depleted.

D. Shell side pressure will decrease and the borated water system will be diluted.

ANSWER: C.

以清水冷卻的熱交換器管內正流著硼酸水。如果殼側壓力低於管側壓力，管子破漏將導致下列何種情況？

A. 殼側壓力將增加，硼酸水系統將稀釋。

B. 殼側壓力將降低，硼酸水存量將耗盡。

C. 殼側壓力將增加，硼酸水存量將耗盡。

D. 殼側壓力將降低，硼酸水系統將稀釋。

答案：C.

科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P234 (B3535)

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

Which one of the following effects would occur as a result of the failed tube in the heat exchanger?

A. Level in the surge tank increases.

B. Flow in the low pressure system reverses.

C. Pressure in the low pressure system decreases.

D. Low pressure fluid heat exchanger outlet temperature decreases.

ANSWER: D.

請參照下圖的運轉中冷卻水系統。

下列何者為熱交換器管子破漏所產生的影響？

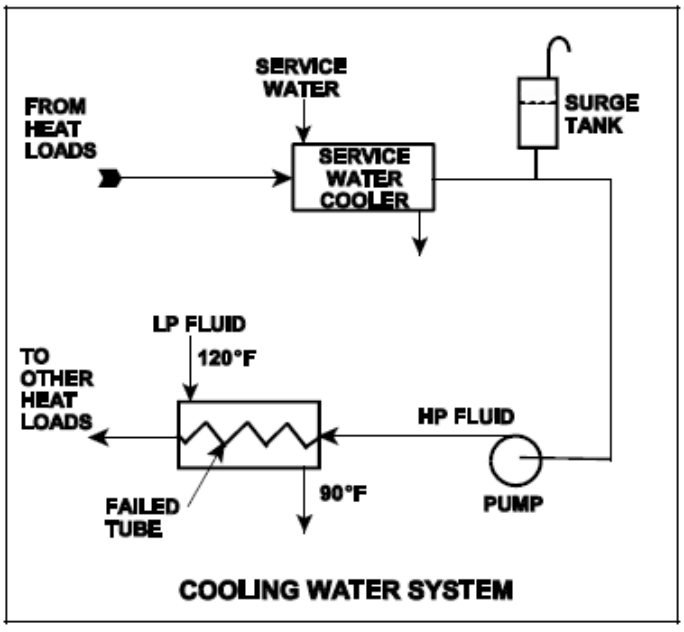
A. 調節槽(surge tank)的水位升高。

B. 低壓系統的水流倒轉。

C. 低壓系統的壓力降低。

D. 低壓液體熱交換器的出口溫度降低。

答案：D.



科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P333 (B333)

A nuclear power plant is operating normally at 50% power. Which one of the following will result from a cooling water tube rupture in the main condenser?

A. Increased condenser vacuum

B. Increased conductivity of the condensate

C. Decreased condensate pump net positive suction head

D. Decreased condensate pump flow rate

ANSWER: B.

核能發電廠以50%功率運轉中。如果一條主冷凝器冷卻水管破裂，將導致下列何種現象？

A. 冷凝器的真空度提高。

B. 凝結水的導電度增加。

C. 凝結水泵的淨正吸水頭降低。

D. 凝結水泵的流量降低。

答案：B.

科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P1134 (B1931)

Which one of the following effects will occur as a result of multiple tube failures (leaks) in the main condenser of a nuclear power plant at 50% power?

A. Condensate depression will decrease.

B. Condensate conductivity will increase.

C. Condensate oxygen concentration will decrease.

D. Condenser inlet cooling water flow rate will decrease.

ANSWER: B.

以50%功率運轉的電廠中，多條主冷凝器管子破裂(漏)，會產生下列何種影響？

A. 凝結水壓降減少。

B. 凝結水導電度提高。

C. 凝結水氧濃度降低。

D. 冷凝器進口冷卻水流量降低。

答案：B.

科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P1234 (B1535)

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

Which one of the following will occur as a result of the indicated tube failure in the heat exchanger?

A. High pressure (HP) fluid inventory increases.

B. Pressure in the low pressure (LP) system decreases.

C. Temperature in the low pressure (LP) system increases.

D. Level in the surge tank decreases.

ANSWER: D.

請參照下圖的冷卻水系統。

若箭頭所指的熱交換器管子破漏時，會發生下列何種現象？

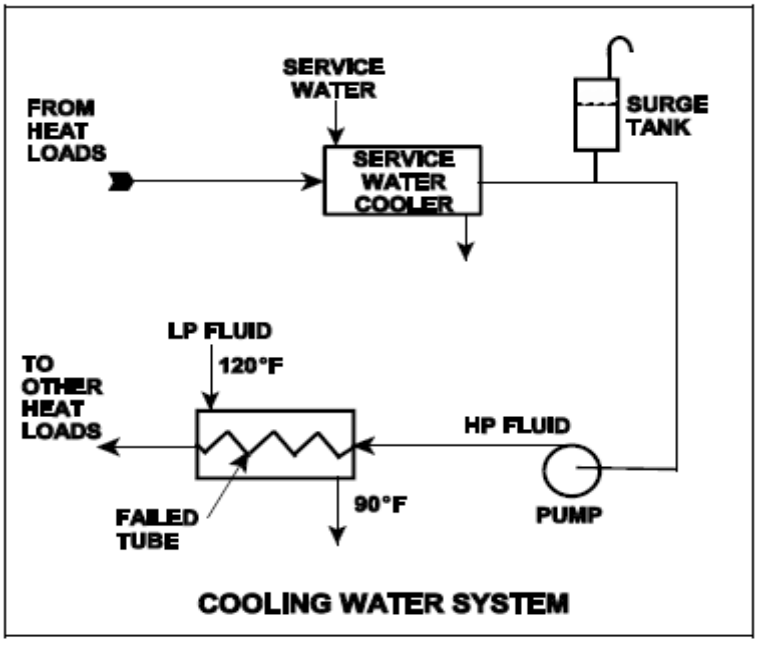
A. 高壓(HP)流體存量增加。

B. 低壓(LP)系統壓力降低。

C. 低壓(LP)系統溫度升高。

D. 調節槽(surge tank)的水位降低。

答案：D.



科目： 191006
知能類：K1.13 [2.8/2.9]
序號： P2984 (B2084)

The following 100% rated power conditions existed before a nuclear power plant outage:

Main condenser pressure: 1.20 psia
Cooling water inlet temperature: 60°F
Cooling water outlet temperature: 92°F

During the outage, 6% of the main condenser tubes were plugged. After the outage, the following 100% rated power conditions exist:

Main condenser pressure: 1.31 psia
Cooling water inlet temperature: 60°F
Cooling water outlet temperature: ?

Which one of the following is the approximate cooling water outlet temperature after the outage?

A. 92°F

B. 94°F

C. 96°F

D. 98°F

ANSWER: B.

核能電廠於進行大修前，以 100%額定功率運轉，此時的狀況如下：

主冷凝器壓力： 1.20 psia
冷卻水進口溫度：60°F
冷卻水出口溫度：92°F

電廠大修期間，主冷凝器的管子有 6%進行塞管。大修後，運轉於 100%額定功率，此時的狀況如下：

主冷凝器壓力：1.31 psia
冷卻水進口溫度：60°F
冷卻水出口溫度：？

下列何者為大修後冷卻水出口的大約溫度？

A. 92°F

B. 94°F

C. 96°F

D. 98°F

答案：B.

科目： 191006
知能類：K1.14 [2.4/2.6]
序號： P1834 (B111)

During normal nuclear power plant operation, a main condenser develops an air leak which decreases vacuum at a rate of 1 inch Hg/min. Which one of the following will increase because of this condition?

A. Extraction steam flow rate

B. Condenser hotwell temperature

C. Low pressure turbine exhaust steam moisture content

D. Steam cycle efficiency

ANSWER: B.

核能電廠正常運轉時，一主冷凝器發生漏氣現象，導致真空度以每分鐘1吋汞柱的速度降低。下列何者會因此狀況而增加(或提高)？

A. 抽汽流量。

B. 冷凝器熱井溫度。

C. 低壓汽機排汽的含水率。

D. 蒸汽循環效率。

答案：B.

科目： 191006
知能類：K1.14 [2.4/2.6]
序號： P1912 (B936)

During normal nuclear power plant operation, why does air entry into the main condenser reduce the thermodynamic efficiency of the steam cycle?

A. The rate of steam flow through the main turbine increases.

B. The condensate subcooling in the main condenser increases.

C. The enthalpy of the low pressure turbine exhaust increases.

D. The air mixes with the steam and enters the condensate.

ANSWER: C.

核能電廠正常運轉時，若讓空氣進入主冷凝器，為何會降低蒸汽循環的熱效率？

A. 通過主汽機的蒸汽流量增加。

B. 主冷凝器的凝結水次冷度提高。

C. 低壓汽機排汽的熱焓增加。

D. 空氣會和蒸汽混合，進入凝結水中。

答案：C.

科目： 191006
知能類：K1.14 [2.4/2.6]
序號： P2634 (B2633)

A nuclear power plant is operating at steady-state 100% power. Assuming that condenser cooling water inlet temperature and flow rate do not change, if condenser vacuum decreases, condensate temperature will...

A. increase because condensate subcooling has decreased.

B. increase because condenser saturation pressure has increased.

C. decrease because condensate subcooling has increased.

D. decrease because condenser saturation pressure has decreased.

ANSWER: B.

核能電廠以100%功率穩態運轉，假設冷凝器冷卻水的進口溫度和流量都不變，如果冷凝器的真空度降低，凝結水的溫度將……

A. 升高，因為凝結水的次冷度降低。

B. 升高，因為冷凝器的飽和壓力增加。

C. 降低，因為凝結水的次冷度提高。

D. 降低，因為冷凝器的飽和壓力降低。

答案：B.

科目： 191006
知能類：K1.14 [2.4/2.6]
序號： P2834 (B2235)

A nuclear power plant is operating at 100% power when air inleakage results in the buildup of noncondensible gases in the main condenser. Which one of the following will decrease as a result of this air inleakage?

A. Condensate temperature

B. Pressure in the main condenser

C. Suction pressure at the condensate pumps

D. Condenser cooling water outlet temperature

ANSWER: D.

當空氣滲入導致主冷凝器中的不凝結氣體增加時，核能電廠正以100%功率運轉。下列何者將因空氣漏入而降低？

A. 凝結水溫度。

B. 主冷凝器中的壓力。

C. 凝結水泵的進口壓力。

D. 冷凝器冷卻水的出口溫度。

答案：D.

科目： 191006
知能類：K1.14 [2.4/2.6]
序號： P3534 (B2736)

A nuclear power plant is operating at steady-state 100% power when air inleakage causes main condenser vacuum to decrease from 28 inches Hg to 27 inches Hg. Assume the steam inlet quality and mass flow rate of steam through the main turbine remain unchanged, and that condenser cooling water inlet temperature and flow rate do not change.

When the plant stabilizes, turbine exhaust quality will be_____ and turbine exhaust temperature will be _____.

A. higher; higher

B. higher; lower

C. lower; higher

D. lower; lower

ANSWER: A.

核能電廠以100%功率穩態運轉，此時發生空氣漏入現象，使得主冷凝器的真空度，由28吋汞柱降到27吋汞柱。假設主汽機進口的蒸汽乾度和流量都保持不變，而且冷凝器的冷卻水進口溫度和流量也沒有改變。

當電廠穩定下來時，汽機的排汽乾度將會_____，汽機的排汽溫度將會_____。

A. 升高，升高

B. 升高，降低

C. 降低，升高

D. 降低，降低

答案：A.

科目： 191006
知能類：K1.14 [2.4/2.6]
序號： P3734 (B3777)

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

Main steam pressure: 900 psia
Main steam quality: 100%, saturated vapor
Main condenser pressure: 1.0 psia

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

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

A. 5.0%

B. 6.3%

C. 7.5%

D. 8.8%

ANSWER: C.

核能電廠正以接近額定功率運轉，其初始條件如下：

主蒸汽壓力：900 psia
主蒸汽乾度：100%，飽和蒸汽
主冷凝器壓力：1.0 psia

此時，空氣滲漏至主冷凝器而導致其升壓，並穩定於2.0 psia。假設所有主蒸汽參數(即壓力、乾度和流量)維持相同，主汽機效率維持在100%。

如果主冷凝器的壓力增加，將導致主發電機的發電量，大約減少多少百分比？

A. 5.0%

B. 6.3%

C. 7.5%

D. 8.8%

答案：C.

科目/題號：191006/1 (2016新增)
知能類：K1.04 [2.5/2.7]
序號：P6716

A reactor is shut down with core decay heat being removed by the residual heat removal (RHR) system. Assume that only the RHR heat exchangers are removing heat from the reactor coolant system (RCS) and that the RHR system provides complete thermal mixing of the RCS.
Given the following information:

Reactor core rated thermal power = 2,950 MW
Core decay heat rate = 0.5% rated thermal power
RHR system heat removal rate = 5.3×10^7 Btu/hr
RHR and reactor coolant c_p = 1.05 Btu/lbm-°F
Combined RCS and RHR inventory = 425,000 lbm

Which one of the following actions will establish a reactor cooldown rate between 20°F /hour and 30°F/hour?
A. Increase RHR heat exchanger flow rate to increase the cooldown rate by 10°F/hour.
B. Increase RHR heat exchanger flow rate to increase the cooldown rate by 20°F/hour.
C. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 10°F/hour.
D. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 20°F/hour.
ANSWER: B.

某反應器處於停機狀態，其爐心衰變熱正由餘熱移除系統(RHR)移除。假設只有 RHR 熱交換器用來移除反應爐冷卻水系統(RCS)的餘熱，且 RCS 系統的熱混合完全由 RHR 系統來完成。
已知下列資訊：

反應器爐心額定熱功率 = 2,950 MW
爐心熱衰變率 = 0.5% 額定熱功率
RHR 系統熱移除速率 = 5.3×10^7 Btu/hr
RHR 與反應爐冷卻水比熱(Cp) = 1.05 Btu/lbm-°F
RCS 與 RHR 加總冷卻水存量 = 425,000 lbm

下列何作法，將使反應爐的降溫率維持在 20°F/hr 與 30°F/hr 之間？
A.增加 RHR 熱交換器的流量率以增加 10°F/hr 之冷卻率
B.增加 RHR 熱交換器的流量率以增加 20°F/hr 之冷卻率
C.減少 RHR 熱交換器的流量率以減少 10°F/hr 之冷卻率
D.減少 RHR 熱交換器的流量率以減少 20°F/hr 之冷卻率

答案： B

科目/題號：191006/2 (2016新增)
知能類：K1.04 [2.5/2.7]
序號：P7116

A reactor is shut down with core decay heat being removed by the residual heat removal (RHR) system. Assume that only the RHR heat exchangers are removing heat from the reactor coolant system (RCS) and that the RHR system provides complete thermal mixing of the RCS.
Given the following information:

Reactor core rated thermal power = 2,950 MW
Core decay heat rate = 0.5% rated thermal power
RHR system heat removal rate = 5.7×10^7 Btu/hr
RHR and reactor coolant cp = 1.05 Btu/lbm-°F
Combined RCS and RHR inventory = 450,000 lbm

Which one of the following actions will establish a reactor cooldown rate between 20°F/hour and 30°F/hour?

A. Increase RHR heat exchanger flow rate to increase the cooldown rate by 10°F/hour.
B. Increase RHR heat exchanger flow rate to increase the cooldown rate by 20°F/hour.
C. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 10°F/hour.
D. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 20°F/hour.

ANSWER: A.

某反應器處於停機狀態，其爐心衰變熱正由餘熱移除系統(RHR)移除。假設只有 RHR 熱交換器用來移除反應爐冷卻水系統(RCS)的餘熱，且 RCS 系統的熱混合完全由 RHR 系統來完成。已知下列資訊：

反應器爐心額定熱功率 = 2,950 MW
爐心熱衰變率 = 0.5% 額定熱功率
RHR 系統熱移除速率 = 5.7×10^7 Btu/hr
RHR 與反應爐冷卻水之比熱(Cp) = 1.05 Btu/lbm-°F
RCS 與 RHR 系統加總存水量 = 450,000 lbm

下列何作法，將使反應器冷卻率維持在 20°F/hr 與 30°F/hr 之間？
A.增加 RHR 熱交換器的流量率以增加 10°F/hr 之冷卻率.
B.增加 RHR 熱交換器的流量率以增加 20°F/hr 之冷卻率.
C.減少 RHR 熱交換器的流量率以減少 10°F/hr 之冷卻率
D.減少 RHR 熱交換器的流量率以減少 20°F/hr 之冷卻率.

答案： A

科目/題號：191006/3 (2016新增)
知能類：K1.04 [2.5/2.7]
序號：P7616

A nuclear power plant is shut down with core decay heat being removed by the residual heat removal (RHR) system. Assume that only the RHR heat exchangers are removing heat from the reactor coolant system (RCS) and that the RHR system provides complete thermal mixing of the RCS.
Given the following information:

Reactor core rated thermal power = 2,950 MW
Core decay heat rate = 0.6 percent rated thermal power
RHR system heat removal rate = 8.1×10^7 Btu/hr
RCS c_p = 1.05 Btu/lbm-°F
Combined RCS and RHR inventory = 450,000 lbm

Which one of the following actions will establish an RCS cooldown rate between 20°F/hour and 30°F/hour?

A. Increase RHR heat exchanger flow rate to increase the cooldown rate by 10°F/hour.
B. Increase RHR heat exchanger flow rate to increase the cooldown rate by 20°F/hour.
C. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 10°F/hour.
D. Reduce RHR heat exchanger flow rate to decrease the cooldown rate by 20°F/hour.

ANSWER: D.

某反應器處於停機狀態，其爐心衰變熱正由餘熱移除系統(RHR)移除。假設只有 RHR 熱交換器用來移除反應爐冷卻水系統(RCS)的餘熱，且 RCS 系統的熱混合完全由 RHR 系統來完成。已知下列資訊：

反應器爐心額定熱功率 = 2,950 MW
爐心熱衰變率 = 0.6% 額定熱功率
RHR 系統熱移除率 = 8.1×10^7 Btu/hr
RCS 之冷卻水比熱(Cp) = 1.05 Btu/lbm-°F
RCS 與 RHR 系統加總存水量 = 450,000 lbm

下列何作法，將使反應器的冷卻率維持在 20°F/hr 與 30°F/hr 之間？
A.增加 RHR 熱交換器的流量率以增加 10°F/hr 之冷卻率
B.增加 RHR 熱交換器的流量率以增加 20°F/hr 之冷卻率
C.減少 RHR 熱交換器的流量率以減少 10°F/hr 之冷卻率
D.減少 RHR 熱交換器的流量率以減少 20°F/hr 之冷卻率

答案： D

科目/題號：191006/4 (2016新增)
知能類：K1.07 [2.5/2.7]
序號：P5316 (B5317)

A main turbine-generator was operating at 80 percent load with the following initial steady-state lube oil and cooling water temperatures for the main turbine lube oil heat exchanger:

Toil in = 174°F
Toil out = 114°F
Twater in = 85°F
Twater out = 115°F

Six months later, the current steady-state heat exchanger temperatures are:

Toil in = 174°F
Toil out = 120°F
Twater in = 85°F
Twater out = 120°F

Assume that the lube oil mass flow rate does not change, and that the specific heat values for the cooling water and lube oil do not change. Also assume that the main turbine lube oil system is a closed system.
The differences between the initial and current steady-state heat exchanger temperatures could be caused by the current main turbine-generator load being _____ with the current heat exchanger cooling water mass flow rate being _____.
A. higher; lower
B. higher; higher
C. lower; lower
D. lower; higher
ANSER: C.

一主汽機發電機在80%負載下運轉，其主汽機潤滑油熱交換器潤滑油及冷卻水之最初穩定溫度狀態如下：

潤滑油進口溫度 = 174°F
潤滑油出口溫度 = 114°F
冷卻水進口溫度 = 85°F
冷卻水出口溫度 = 115°F

經過六個月後，現在的熱交換器穩定溫度為：

潤滑油進口溫度 = 174°F
潤滑油出口溫度 = 120°F
冷卻水進口溫度 = 85°F
冷卻水出口溫度 = 120°F

假設潤滑油質量流量率不變，且冷卻水及潤滑油之比熱值不變。再假設主汽機潤滑油系統為一封閉的系統。熱交換器最初與現在的穩定溫度的差異，可能是因為主汽機發電機的負載_____，以及現在熱交換器的冷卻水質量流量率_____所引起。
A.升高；降低
B.升高；升高
C.降低；降低
D.降低；升高
答案： C

科目/題號：191006/5 (2016 新增)
知能類：K1.07 [2.4/2.6]
序號：P5516 (B5517)

Refer to the drawing of a lube oil heat exchanger (see figure below).
The lube oil heat exchanger is in service with the following inlet temperatures:
Lube oil inlet temperature = 130°F
Cooling water inlet temperature = 70°F
Given that cooling water mass flow rate is greater than lube oil mass flow rate, which one of the following pairs of heat exchanger outlet temperatures is not possible? (Assume both fluids have the same specific heat.)

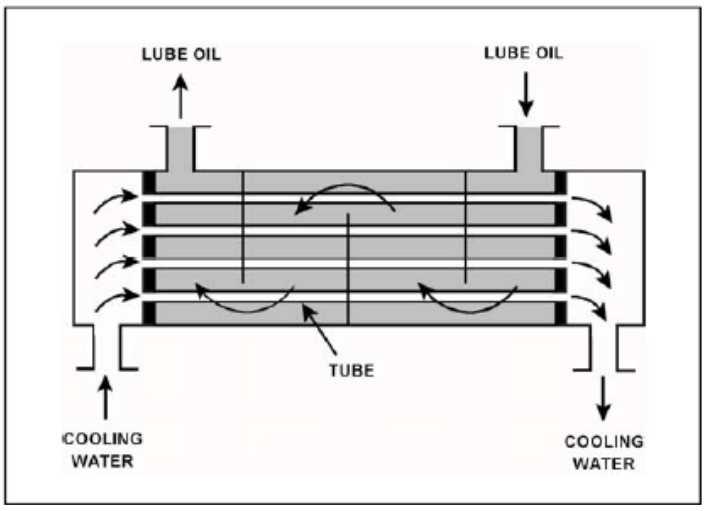
	Lube Oil Outlet Temp	Cooling Water Outlet Temp
A.	90°F	105°F
B.	90°F	100°F
C.	110°F	95°F
D.	110°F	85°F

ANSWER: C.

參考潤滑油熱交換器圖(見下圖)。
該潤滑油熱交換器在下列進口溫度下運轉：
潤滑油進口溫度 = 130°F
冷卻水進口溫度 = 70°F
已知冷卻水質量流量率大於潤滑油質量流量率，下列組合中何者不可能是熱交換器的出口溫度？(假設兩種流體均具有相同的比熱)

	潤滑油出口溫度	冷卻水出口溫度
A.	90°F	105°F
B.	90°F	100°F
C.	110°F	95°F
D.	110°F	85°F

答案： C

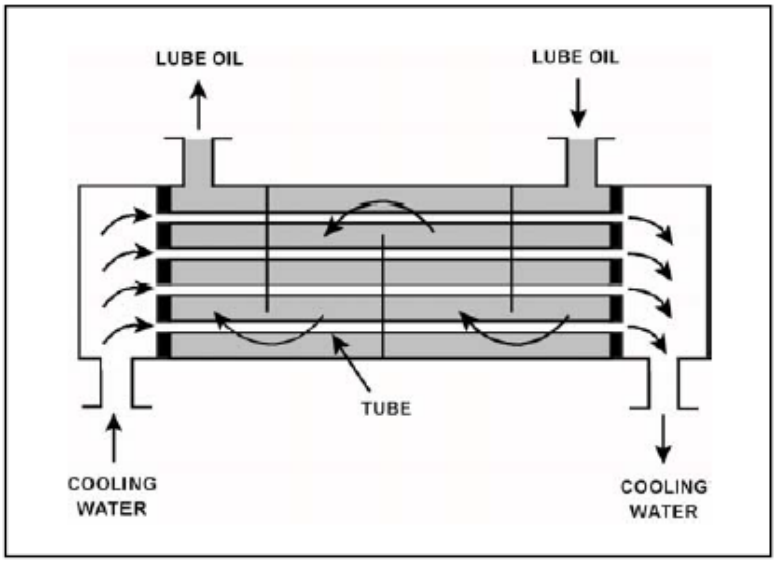


科目/題號：191006/6 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P5616 (B5617)

Refer to the drawing of an operating lube oil heat exchanger (see figure below). Assume that the inlet lube oil and inlet cooling water temperatures are constant and the lube oil flow rate remains the same. If the cooling water flow rate increases, the lube oil outlet temperature will _____; and the cooling water outlet temperature will _____.
A. increase; increase
B. increase; decrease
C. decrease; increase
D. decrease; decrease
ANSWER: D.

參考一運轉中潤滑油熱交換器圖(見下圖)。
假設潤滑油的進口溫度及冷卻水的進口溫度都是固定的，且潤滑油的流量率維持不變。如果冷卻水的流量率增加，潤滑油出口溫度將_____；又冷卻水的出口溫度將_____。
A.增加；增加
B.增加；減少
C.減少；增加
D.減少；減少

答案： D

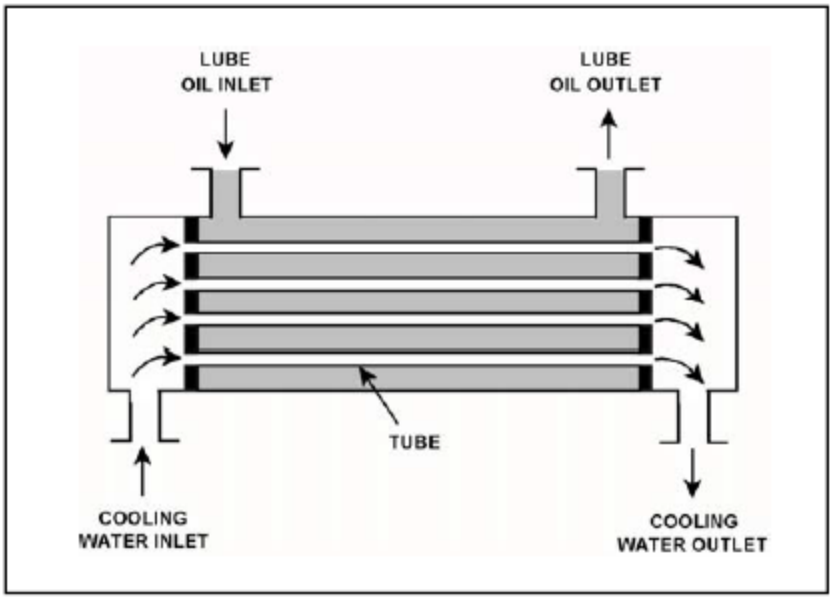


科目/題號：191006/7 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P5716 (B5716)

Refer to the drawing of an operating parallel-flow lube oil heat exchanger (see figure below). Assume that lube oil (LO) inlet temperature is greater than cooling water (CW) inlet temperature.
Unlike a counter-flow heat exchanger, in a parallel-flow heat exchanger the _____ temperature can never be greater than the _____ temperature.
A. LO outlet; CW inlet
B. LO outlet; CW outlet
C. CW outlet; LO inlet
D. CW outlet; LO outlet
ANSWER: D.

參考運轉中並流式潤滑油熱交換器圖(見下圖)。假設潤滑油進口溫度高於冷卻水進口溫度。
跟逆流式熱交換器不一樣，在並流式潤滑油熱交換器其_____溫度不可能高於_____溫度。
A.潤滑油出口；冷卻水進口
B.潤滑油出口；冷卻水出口
C.冷卻水出口；潤滑油進口
D.冷卻水出口；潤滑油出口

答案： D

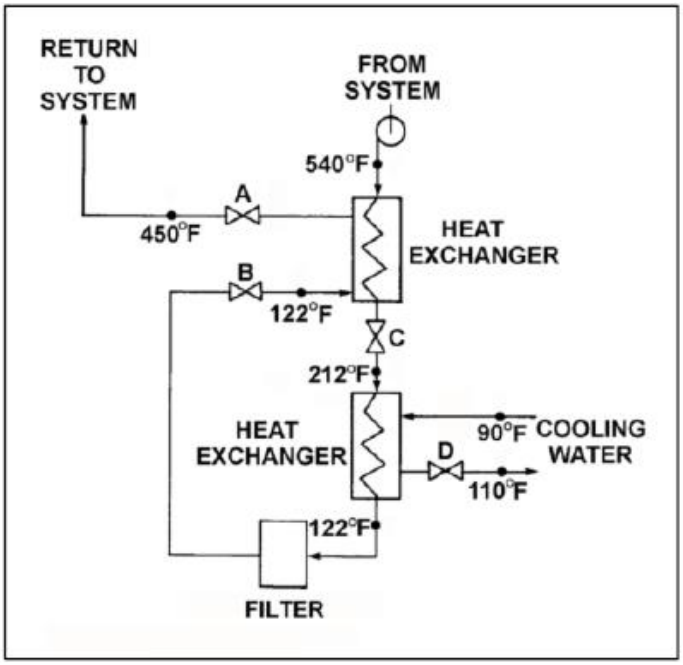


科目/題號：191006/8 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P5916 (B5917)

Refer to the drawing of an operating process water cleanup system (see figure below). Assume there is no heat loss from the process water cleanup system to the surroundings and the process water flow rate does not change. If valve D closes fully, what will be the final steady-state temperature of the process water flowing through the filter?
A. 212°F
B. 302°F
C. 450°F
D. 540°F
ANSWER: D.

參考運轉中流程用水淨化系統圖(見下圖)。假設流程用水沒有熱流失到周遭環境，且流程用水流量率不變。如果閥門D完全關閉，流程用水流經過濾器的最終穩定溫度是多少？
A. 212°F
B. 302°F
C. 450°F
D. 540°F

答案： D



科目/題號：191006/9 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P6116 (B6143)

A counter-flow heat exchanger is being used to cool the lube oil for a main turbine and generator.The main turbine and generator was initially operating at 100 percent load with the following stable heat exchanger conditions:

$T_{oil\ in}$ = 174°F
$T_{oil\ out}$ = 114°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = 115°F

Main turbine and generator load was reduced, and the heat exchanger cooling water mass flow rate was decreased to one-half of its initial value, resulting in the following stable current conditions:

$T_{oil\ in}$ = 178°F
$T_{oil\ out}$ = 138°F
$T_{water\ in}$ = 85°F
$T_{water\ out}$ = ?

Assume that the lube oil mass flow rate and the specific heats of both fluids did not change.Which one of the following is the current cooling water outlet temperature?
A. 115°F
B. 125°F
C. 135°F
D. 145°F
ANSWER: B.

主汽機發電機的潤滑油冷卻使用逆流式熱交換器。主汽機發電機最初運轉在100%負載，且熱交換器穩定在下列條件：

潤滑油進口溫度 = 174°F
潤滑油出口溫度 = 114°F
冷卻水進口溫度 = 85°F
冷卻水出口溫度 = 115°F

在主汽機發電機負載已下降，且熱交換器冷卻水質量流量率已降為原始值的一半，導致目前穩定條件如下：

潤滑油進口溫度 = 178°F
潤滑油出口溫度 = 138°F
冷卻水進口溫度 = 85°F
冷卻水出口溫度 = ?

假設潤滑油質量流量率和兩種流體比熱均未改變。下列何者是目前冷卻水出口溫度？
A. 115°F
B. 125°F
C. 135°F
D. 145°F

答案： B

科目/題號：191006/10 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P6516 (B6516)

Refer to the drawing of a heat exchanger (see figure below).
The heat exchanger is in service with the following inlet temperatures:
Service water inlet temperature = 130°F
Cooling water inlet temperature = 70°F
Assume that both fluids have the same specific heat, and that service water mass flow rate is greater than cooling water mass flow rate. Which one of the following pairs of heat exchanger outlet temperatures is possible?

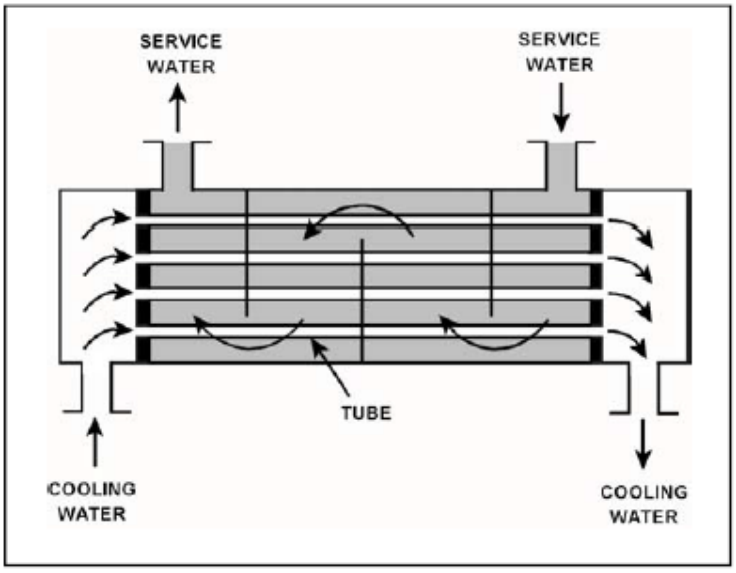
	Service Water Outlet Temp.	Cooling Water Outlet Temp.
A.	120°F	82°F
B.	110°F	90°F
C.	100°F	98°F
D.	90°F	106°F

ANSWER: A.

參考熱交換器圖(見下圖)。該熱交換器以下列進口溫度運轉：
廠用水進口溫度 = 130°F
冷卻水進口溫度= 70°F
假設兩種流體均有相同的比熱，而廠用水質量流量率大於冷卻水質量流量率。下列何者是熱交換器出口溫度的可能組合？

	廠用水 出口溫度	冷卻水 出口溫度
A.	120°F	82°F
B.	110°F	90°F
C.	100°F	98°F
D.	90°F	106°F

答案： A



科目/題號：191006/11 (2016 新增)
知能類：K1.07 [2.4/2.6]
序號：P7016 (B7017)

Given the following parameter values for a feedwater heater:
Feedwater inlet temperature = 320°F
Feedwater inlet pressure = 1,000 psia
Feedwater mass flow rate = 1.0×10^6 lbm/hr
Extraction steam pressure = 500 psia
Assume that the extraction steam enters the heater as a dry saturated vapor and leaves the heater as a saturated liquid at 500 psia.
Which one of the following is the approximate mass flow rate of extraction steam required to increase feedwater temperature to 380°F?
A. 5.2×10^4 lbm/hr
B. 7.9×10^4 lbm/hr
C. 8.4×10^4 lbm/hr
D. 8.9×10^4 lbm/hr
ANSWER: C.

已知下列飼水加熱器參數值：
飼水進口溫度 = 320°F
飼水進口壓力 = 1,000 psia
飼水質量流量率 = 1.0×10^6 lbm/hr
抽汽壓力 = 500 psia
假設抽汽以乾燥飽和蒸汽進入加熱器，再以500 psia飽和液體離開加熱器。
下列何者是提高飼水溫度到380°F所需的大約抽汽質量流量率？
A. 5.2×10^4lbm/hr
B. 7.9×10^4 lbm/hr
C. 8.4×10^4 lbm/hr
D. 8.9×10^4 lbm/hr

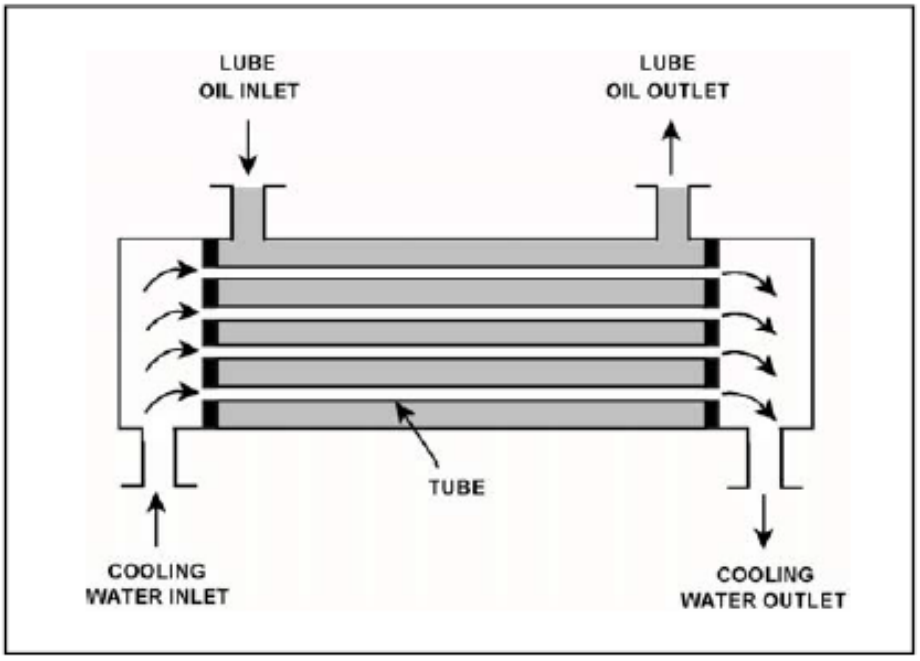
答案： C

科目/題號：191006/12 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P7316 (B7316)

Refer to the drawing of an operating parallel-flow lube oil heat exchanger (see figure below).
Unlike a counter-flow heat exchanger, in the parallel-flow heat exchanger the _____ temperature will always be greater than the _____ temperature.
A. CW outlet; LO inlet
B. CW outlet; LO outlet
C. LO outlet; CW inlet
D. LO outlet; CW outlet
ANSWER: D.

參考運轉中並流式潤滑油熱交換器圖(見下圖)。
跟逆流式熱交換器不一樣，在並流式潤滑油熱交換器其_____溫度總是高於_____溫度。
A.冷卻水出口；潤滑油進口
B.冷卻水出口；潤滑油出口
C.潤滑油出口；冷卻水進口
D.潤滑油出口；冷卻水出口

答案： D



科目/題號：191006/13 (2016新增)
知能類：K1.07 [2.4/2.6]
序號：P7516 (B7517)

Refer to the drawing of a heat exchanger (see figure below).
The heat exchanger is in service with the following inlet temperatures:
Cooling water inlet temperature = 70°F
Service water inlet temperature = 130°F
Assume that both fluids have the same specific heat, and that cooling water mass flow rate is greater than service water mass flow rate. Which one of the following pairs of heat exchanger outlet temperatures is not possible?

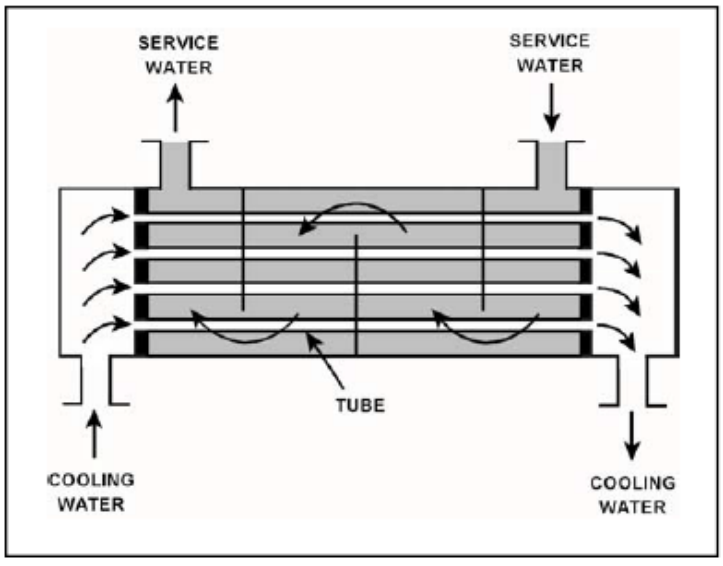
	Cooling Water Outlet Temp.	Service Water Outlet Temp.
A.	78°F	120°F
B.	90°F	110°F
C.	98°F	100°F
D.	100°F	90°F

ANSWER: B.

參考熱交換器圖(見下圖)。該熱交換器以下列進口溫度運轉：
冷卻水進口溫度 = 70°F
廠用水進口溫度= 130°F
假設兩種流體均有相同的比熱，而冷卻水質量流量率大於廠用水質量流量率。下列何者不可能是熱交換器出口溫度的組合？

	冷卻水出口溫度	廠用水出口溫度
A.	78°F	120°F
B.	90°F	110°F
C.	98°F	100°F
D.	100°F	90°F

答案： B



科目/題號：191006/14 (2016新增)
知能類：K1.12 [2.5/2.7]
序號：P1285

A nuclear power plant was initially operating at steady-state 100 percent power with the following reactor coolant system (RCS) and steam generator (SG) parameters:

RCS average coolant temperature = 575°F
RCS hot leg temperatures = 600°F
RCS cold leg temperatures = 550°F
SG pressures = 885 psig

The reactor was shut down for a maintenance outage, during which 7 percent of the tubes in each SG were plugged. The reactor was restarted and power was ramped to 100 percent. To establish the same SG pressure at 100 percent power, RCS average coolant temperature will have to be increased to...

A. 578°F.
B. 580°F.
C. 582°F.
D. 584°F.
ANSWER: A.

某核電廠在 100%功率運轉，其反應爐冷卻水系統(RCS)與蒸汽產生器(SG)的運轉參數如下：

RCS 冷卻水平均溫度 = 575°F
RCS 熱端管路水溫度 = 600°F
RCS 冷端管路水溫度 = 550°F
SG 壓力 = 885 psig

該反應爐後來停機維修。維修期間，各蒸汽反應器內有 7%的 U 型管被栓塞。之後反應爐重新啟動，功率提升至 100%。此時若想要建立相同的 SG 壓力，則 RCS 冷卻水平均溫度需提升至_____。

A. 578°F
B. 580°F
C. 582°F
D. 584°F

答案： A

科目/題號：191006/15 (2016新增)
知能類：K1.12 [2.5/2.7]
序號：P1685

A nuclear power plant with two steam generators (SGs) was initially operating at steady-state 90 percent power with the following SG and reactor coolant system (RCS) parameters:

RCS average coolant temperature = 575°F
RCS hot leg temperatures = 600°F
RCS cold leg temperatures = 550°F
SG pressures = 885 psig

The reactor was shut down for a maintenance outage, during which multiple tubes were plugged in each SG. The reactor was restarted with 98 percent of the RCS flow that existed prior to the outage.
If RCS hot leg temperatures are maintained at 600°F with the reactor at 90 percent power, the RCS cold leg temperatures will be...
A. 546°F.
B. 547°F.
C. 548°F.
D. 549°F.
ANSWER: D.

某配有二個蒸汽產生器的反應爐在 90%功率運轉，其蒸汽產生器(SG)與反應爐冷卻水系統(RCS)的運轉參數如下：

RCS 冷卻水平均溫度 = 575°F
RCS熱端管路水溫度= 600°F
RCS 冷端管路水溫度 = 550°F
SG 壓力 = 885 psig

該反應爐後來停機維修。維修期間，各蒸汽產生器內有多根管被栓塞。之後反應爐重新啟動，RCS 流量為停機維修前的 98%。當反應爐功率提升到 90%，RCS 熱端管路水溫維持在 600°F 時，則 RCS 冷端管路水溫為_____。
A. 546°F
B. 547°F
C. 548°F
D. 549°F

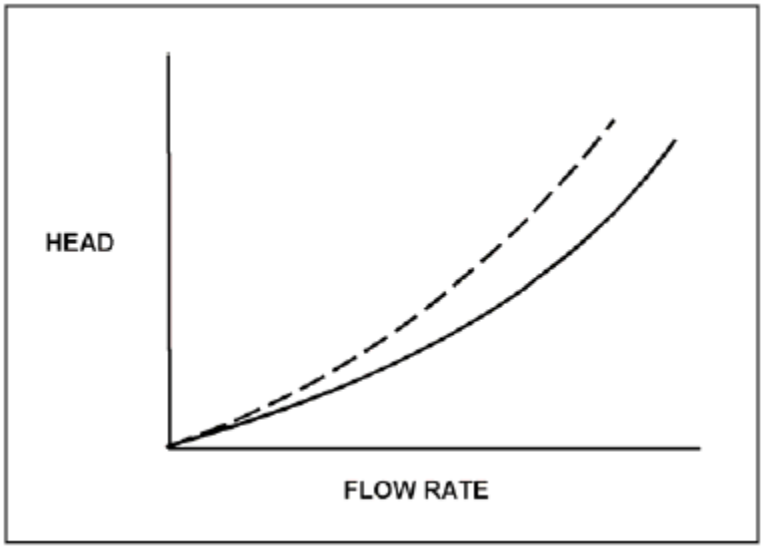
答案： D

科目/題號：191006/16 (2016新增)
知能類：K1.12 [2.5/2.7]
序號：P5116 (B5117)

Refer to the drawing of two system curves for a typical main condenser cooling water system (see figure below).
Which one of the following will cause the system curve to shift from the solid curve toward the dashed curve?
A. The main condenser tubes are cleaned.
B. The main condenser tubes become increasingly fouled.
C. Cooling water system flow rate is increased by 25 percent by starting an additional cooling water pump.
D. Cooling water system flow rate is decreased by 25 percent by stopping one of the operating cooling water pumps.
ANSWER: B.

參考一典型主冷凝器冷卻水系統的兩個系統曲線圖(見下圖)。
下列何者可使系統曲線從實線向虛線偏移？
A.主冷凝器管被清洗過
B.主冷凝器管越來越阻塞
C.再起動一台冷卻水泵使冷卻水流量增加25%
D.停止運轉中的一台冷卻水泵使冷卻水流量減少25%

答案： B

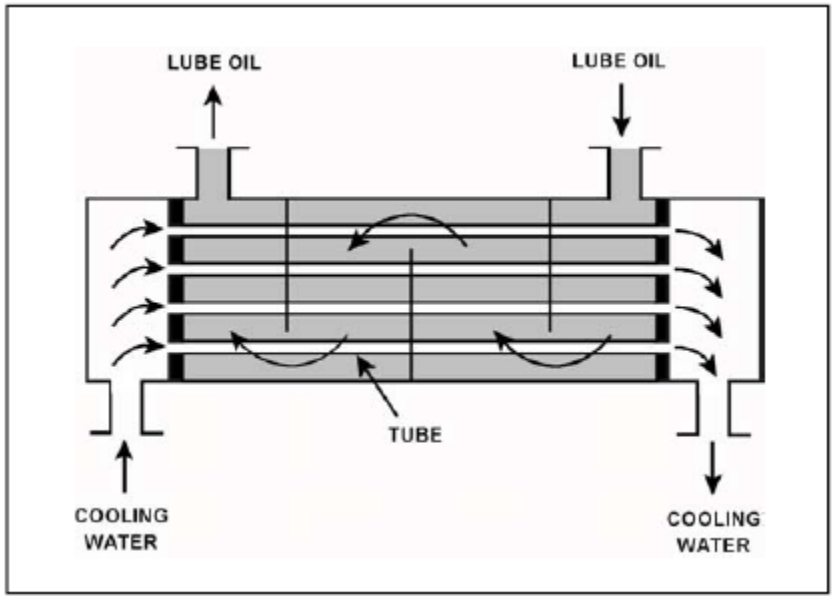


科目/題號：191006/17 (2016新增)
知能類：K1.12 [2.5/2.7]
序號：P6616 (B6617)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).
If mineral deposits accumulate on the inside of the cooling water tubes, cooling water outlet temperature will _____; and lube oil outlet temperature will _____.
(Assume the lube oil and cooling water inlet temperatures and flow rates do not change.)
A. increase; decrease
B. increase; increase
C. decrease; decrease
D. decrease; increase
ANSWER: D.

參考一運轉中潤滑油熱交換器圖(見下圖)。如果礦物質沉澱物在冷卻水管內累積。冷卻水出口溫度將_____；而潤滑油出口溫度將_____。
(假設潤滑油及冷卻水的進口溫度以及流量率都不變)
A.增加；減少
B.增加；增加
C.減少；減少
D.減少；增加

答案： D



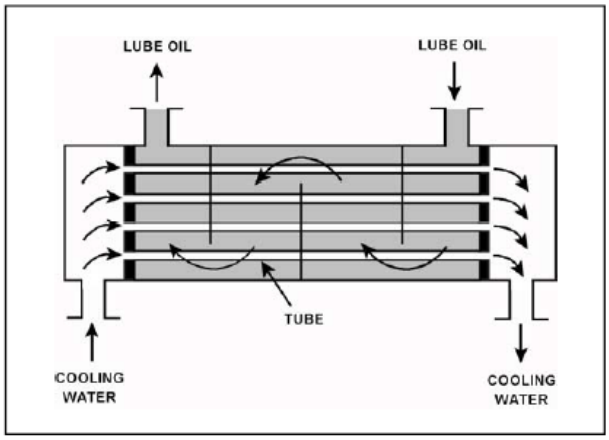
科目/題號：191006/18 (2016新增)
知能類：K1.12 [2.5/2.7]
序號：P7625 (B7625)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).
The heat exchanger was initially placed in continuous service 6 months ago. During the 6-month period of operation, mineral deposits have accumulated inside the heat exchanger tubes.
The following parameters are currently stable at their initial values:
- Lube oil mass flow rate
- Lube oil inlet temperature
- Lube oil outlet temperature
- Cooling water inlet temperature

Compared to their initial values, the current cooling water outlet temperature is _____; and the current cooling water mass flow rate is _____.
A. lower; smaller
B. lower; greater
C. higher; greater
D. higher; smaller
ANSWER: B.

參考一運轉中潤滑油熱交換器圖(見下圖)。該熱交換器於六個月前開始連續運轉。在這六個月運轉期間，礦物質沉澱物在熱交換器管內累積。
下列參數值目前仍穩定在其初始值：
- 潤滑油質量流量率
- 潤滑油進口溫度
- 潤滑油出口溫度
- 冷卻水進口溫度

與他們的初始值相比較，目前冷卻水出口溫度_____；而目前冷卻水質量流量率_____。
A.比較低；比較小
B.比較低；比較大
C.比較高；比較大
D.比較高；比較小
答案： B


LUBE OIL
LUBE OIL
TUBE
COOLING WATER
COOLING WATER

科目/題號：191006/19 (2016新增)
知能類：K1.14 [2.4/2.6]
序號：P4016 (B4018)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).
The heat exchanger is operating with the following initial parameters:

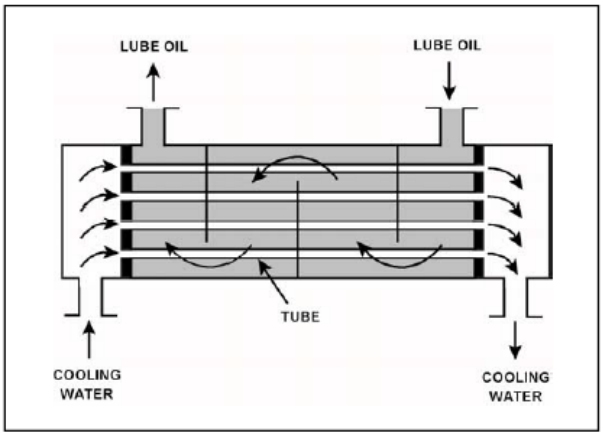
Cooling water inlet temperature (Tcw-in) = 75°F
Cooling water outlet temperature (Tcw-out) = 95°F
Oil inlet temperature (Toil-in) = 150°F
Oil outlet temperature (Toil-out) = 120°F

Air introduction to the heat exchanger results in some of the heat exchanger tubes becoming uncovered. As a result, Tcw-out decreases to 91°F. Assume the inlet temperatures, mass flow rates, and specific heats of both fluids do not change.
Which one of the following will be the resulting temperature of the lube oil exiting the heat exchanger
(Toil-out)?
A. 126°F
B. 130°F
C. 134°F
D. 138°F
ANSWER: A.

參考潤滑油熱交換器圖(見下圖)。該熱交換器初始運轉參數如下：

冷卻水進口溫度(Tcw-in) = 75°F
冷卻水出口溫度(Tcw-out) = 95°F
潤滑油進口溫度(Toil-in) = 150°F
潤滑油出口溫度(Toil-out) = 120°F

由於空氣進入熱交換器，以致於有些熱交換器水管未被冷卻水覆蓋，因此讓冷卻水出口溫度降到91°F。假設兩種流體的進口溫度、質量流量率及比熱均不變。
下列何者為熱交換器的潤滑油出口溫度？
A. 126°F
B. 130°F
C. 134°F
D. 138°F
答案： A


LUBE OIL
LUBE OIL
TUBE
COOLING WATER
COOLING WATER

科目/題號：191006/20 (2016新增)
知能類：K1.14 [2.4/2.6]
序號：P4517 (B2832)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).
Given the following initial parameters:

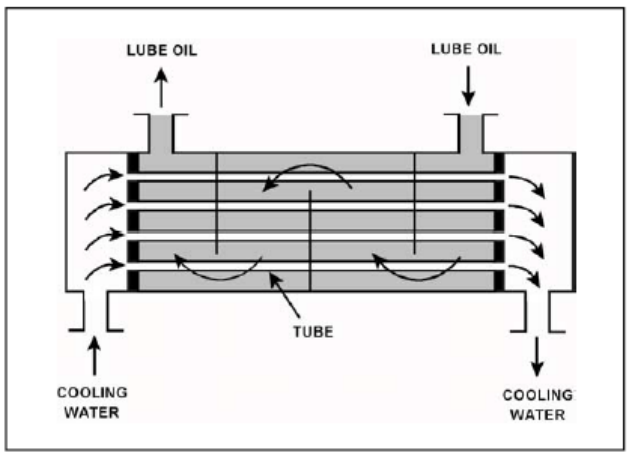
Cooling water inlet temperature (T_{cw-in}) = 75°F
Cooling water outlet temperature (T_{cw-out}) = 105°F
Oil inlet temperature (T_{oil-in}) = 140°F
Oil outlet temperature ($T_{oil-out}$) = 100°F

Air introduction to the heat exchanger results in some of the heat exchanger tubes becoming uncovered. As a result, T_{cw-out} decreases to 99F. Assume that the mass flow rate and specific heat of both fluids remain the same, and that Toil-in does not change. Which one of the following will be the approximate temperature of the lube oil exiting the heat exchanger ($T_{oil-out}$)?
A. 99°F
B. 108°F
C. 116°F
D. 122°F
ANSWER: B.

運轉中的潤滑油熱交換器圖（見下圖）。已知下列初始參數：

冷卻水進口溫度(T_{cw-in}) = 75˚F
冷卻水出口溫度(T_{cw-out}) = 105˚F
潤滑油進口溫度(T_{oil-in}) = 140˚F
潤滑油出口溫度($T_{oil-out}$) = 100˚F

由於空氣進入該熱交換器，以致於有一些熱交換器水管未被冷卻水覆蓋，也因此讓冷卻水出口溫度降低到99˚F。假設兩種流體的質量流量率以及比熱都沒有改變，下列何者為該熱交換器潤滑油的大約出口溫度($T_{oil-out}$)？
A. 99°F
B. 108°F
C. 116°F
D. 122°F
答案： B



科目/題號：191006/21 (2016新增)
知能類：K1.14 [2.4/2.6]
序號：P4816 (B4817)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).
The heat exchanger is operating with the following initial parameters:

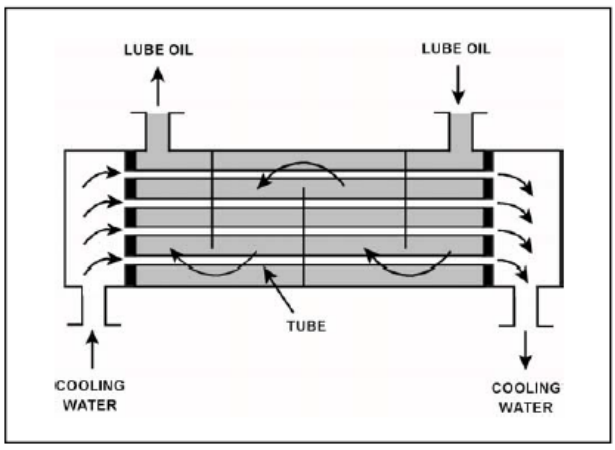
Cooling water inlet temperature ($T_{cw\text{-}in}$) = 75°F
Cooling water outlet temperature ($T_{cw\text{-}out}$) = 95°F
Oil inlet temperature ($T_{oil\text{-}in}$) = 150°F
Oil outlet temperature ($T_{oil\text{-}out}$) = 110°F

Air leakage into the heat exchanger causes some of the heat exchanger tubes to become uncovered. As a result, $T_{cw\text{-}out}$ decreases to 89°F. Assume the inlet temperatures, mass flow rates, and specific heats of both fluids do not change.
Which one of the following will be the resulting temperature of the lube oil exiting the heat exchanger ($T_{oil\text{-}out}$)?
A. 116°F
B. 122°F
C. 130°F
D. 138°F
ANSWER: B.

參考潤滑油熱交換器圖(見下圖)。該熱交換器初始運轉參數如下：

冷卻水進口溫度(Tcw-in) = 75°F
冷卻水出口溫度(Tcw-out) = 95°F
潤滑油進口溫度(Toil-in) = 150°F
潤滑油出口溫度(Toil-out) = 120°F

由於空氣進入熱交換器，以致於有些熱交換器水管未被冷卻水覆蓋，因此讓冷卻水出口溫度降到89°F。假設兩種流體的進口溫度、質量流量率及比熱均不變。
下列何者為熱交換器的潤滑油出口溫度？
A. 116°F
B. 122°F
C. 130°F
D. 138°F
答案： B



科目/題號：191006/22 (2016新增)
知能類：K1.14 [2.4/2.6]
序號：P5417 (B5418)

Refer to the drawing of an operating lube oil heat exchanger (see figure below).
The heat exchanger was operating with the following initial parameters:
Cooling water inlet temperature (Tcw-in) = 71°F
Cooling water outlet temperature (Tcw-out) = 91°F
Oil inlet temperature (Toil-in) = 175°F
Oil outlet temperature (Toil-out) = 125°F
The heat exchanger was vented, resulting in the following current parameters:
Cooling water inlet temperature (Tcw-in) = 71°F
Cooling water outlet temperature (Tcw-out) = 95°F
Oil inlet temperature (Toil-in) = 175°F
Oil outlet temperature (Toil-out) = ?
Assume that the mass flow rates and specific heats of both fluids were unchanged.
Which one of the following is the current lube oil outlet temperature (Toil-out)?
A. 115°F
B. 120°F
C. 130°F
D. 135°F
ANSWER: A.

參考潤滑油熱交換器圖(見下圖)。該熱交換器初始運轉參數如下：
冷卻水進口溫度(Tcw-in) = 71°F
冷卻水出口溫度(Tcw-out) = 91°F
潤滑油進口溫度(Toil-in) = 175°F
潤滑油出口溫度(Toil-out) = 125°F
熱交換器逸氣後，目前參數如下：
冷卻水進口溫度(Tcw-in) = 71°F
冷卻水出口溫度(Tcw-out) = 95°F
潤滑油進口溫度(Toil-in) = 175°F
潤滑油出口溫度(Toil-out) = ?
假設兩種流體的質量流量率及比熱均不變。下列何者為目前的潤滑油出口溫度？
A. 115°F
B. 120°F
C. 130°F
D. 135°F
答案：A