科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B9

What happens to the pressure and velocity of water as it passes through a venturi?
A. Pressure remains constant, but the velocity increases as the diameter of the venturi decreases.
B. Pressure increases, but the velocity decreases as the diameter of the venturi decreases.
C. Pressure decreases, but the velocity remains constant as the diameter of the venturi increases.
D. Pressure increases, but the velocity decreases as the diameter of the venturi increases.
ANSWER: D.

當水穿過文氏管(Venturi)時，對於其壓力及速度會產生何種影響？
A. 壓力維持固定，但速度會隨文氏管直徑減小而增加
B. 壓力增加，但速度會隨文氏管直徑減小而減小
C. 壓力減小，但速度不會隨文氏管直徑增加而改變
D. 壓力增加，但速度會隨文氏管直徑增加而減小
答案： D.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B159

A venturi flow device...
A. develops an output signal by measuring the differential pressure of the fluid as it passes through the device.
B. can measure the rate of flow of incompressible fluids, but not of compressible fluids.
C. develops an output signal by measuring the velocity of the fluid as it passes through the device.
D. has head loss greater than the head losses produced by an orifice.
ANSWER: A.

一文氏管(Venturi)流量計
A. 會在流體流經該設備時，藉由量測差壓而輸出信號
B. 能夠量測不可壓縮流體的流量，但是無法量測可壓縮流體的流量
C. 會在流體流經該設備時，藉由量測其速度而輸出信號
D. 產生的水頭損失較孔口流量計(Orifice)產生之水頭損失為大
答案： A.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B305 (P305)

A cooling water system is operating at steady-state conditions indicating 900 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1800 gpm, differential pressure across the flow transmitter venturi will be approximately...
A. 85 psid.
B. 120 psid.
C. 175 psid.
D. 240 psid.
ANSWER: D.

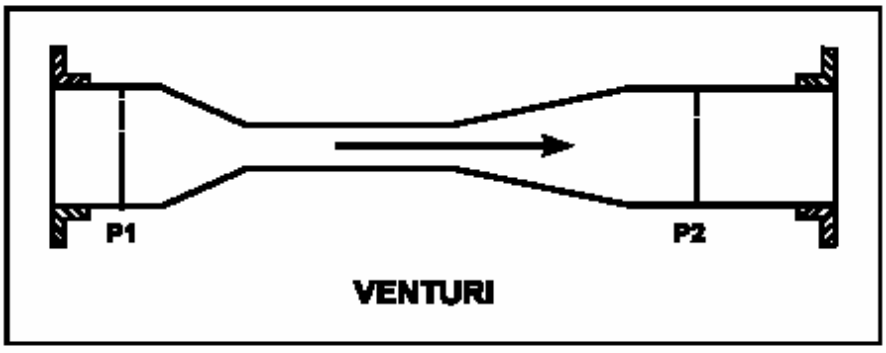
一冷卻水系統運轉於流量指示為900 gpm的穩態下，文氏管流量計的差壓為60 psid。如果冷卻水流量增加到1800 gpm, 則流量計的差壓大約是
A. 85 psid.
B. 120 psid.
C. 175 psid.
D. 240 psid.
答案： D.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B407 (P1606)

Refer to the drawing in which subcooled water is flowing through a convergent-divergent venturi (see figure below). The pipe diameters at P1 and P2 are equal.
Compared to the conditions at the inlet of the venturi (P1), the pressure at the outlet of the venturi (P2) has _____ and water velocity at the outlet of the venturi has _____. (Assume "real" conditions.)
A. remained the same; remained the same
B. remained the same; decreased slightly
C. decreased slightly; remained the same
D. decreased slightly; decreased slightly
ANSWER: C.

附圖中次冷(Subcooled)水流經一漸縮—漸擴文氏管(Venturi)流量計（參閱下圖）。入口端(P1) 與出口端(P2)管徑相等。與流量計入口端(P1)相比，流量計出口端(P2)處壓力_____而流量計出口處的水流速_____

A. 維持相等；維持相等
B. 維持相等；稍微下降
C. 稍微下降；維持相等
D. 稍微下降；稍微下降
答案： C.



科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B508

As water flows through a venturi flow element, the _____ pressure and the _____ velocity of the fluid occurs at the throat of the venturi.
A. highest; highest
B. lowest; lowest
C. lowest; highest
D. highest; lowest
ANSWER: C.

當水流經過文氏管(Venturi)流量計時，在文氏管的喉部位置，流體的壓力_____，流體的速度_____。
A. 最高；最高
B. 最低；最低
C. 最低；最高
D. 最高；最低
答案： C.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B706 (P707)

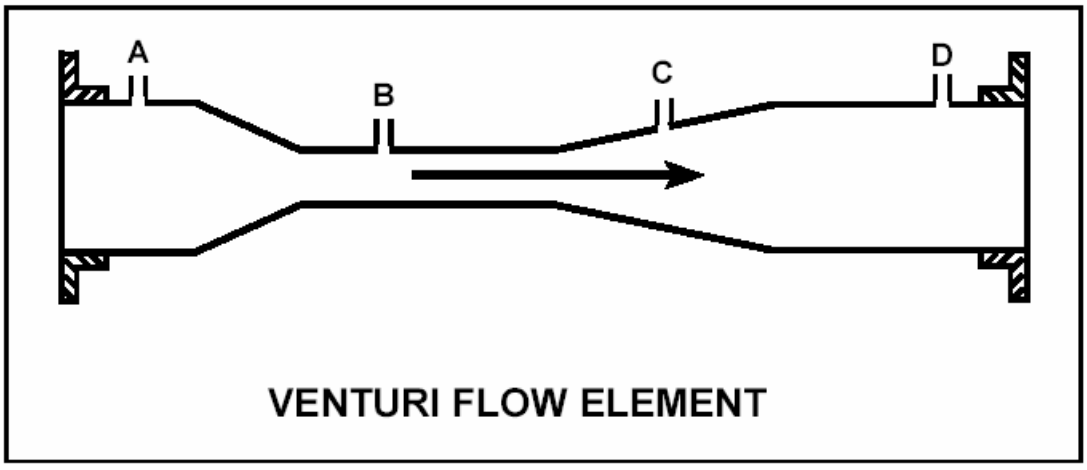
A cooling water system is operating at a steady-state flow rate of 700 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1000 gpm, differential pressure across the flow transmitter venturi will be...
A. 85.7 psid.
B. 122.4 psid.
C. 171.4 psid.
D. 244.8 psid.
ANSWER: B.

一冷卻水系統運轉於流量指示為700 gpm的穩態下，文氏管(Venturi)流量計的差壓為60 psid。如果冷卻水流量增加到1000 gpm, 則流量計的差壓將是
A. 85.7 psid.
B. 122.4 psid.
C. 171.4 psid.
D. 244.8 psid.
答案： B.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B807 (P807)

Refer to the drawing of a venturi flow element (see figure below) with direction of water flow indicated by the arrow.
Where should the high pressure tap of a differential pressure flow detector be connected?
A. Point A
B. Point B
C. Point C
D. Point D
ANSWER: A.

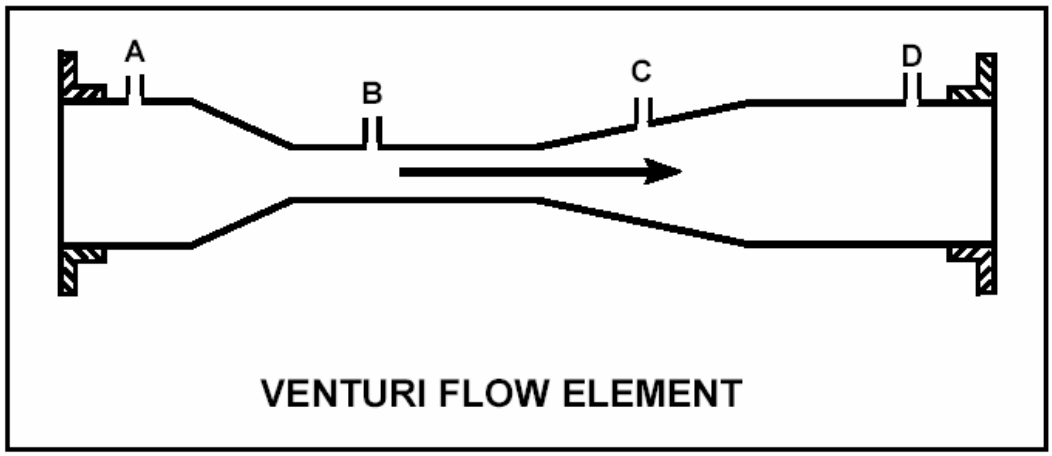
參閱文氏管(Venturi)流量計圖示（見下圖），箭號表示水流方向。
差壓流量計的高壓管接頭應該連接於何處？
A. 位置 A
B. 位置 B
C. 位置 C
D. 位置 D
答案： A.



科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B907 (P1308)

Refer to the drawing of a venturi flow element (see figure below) with direction of water flow indicated by the arrow.
A differential pressure detector measuring flow through the venturi will produce the highest flow indication if its high-pressure tap is connected at point _____ and its low-pressure tap is connected at point _____.
A. A; D
B. A; B
C. B; D
D. B; C
ANSWER: B.

參閱文氏管(Venturi)流量計圖示（見下圖），箭號表示水流方向。
一量測流經文氏管水流的差壓流量計，如果其高壓管接頭連接於_____點，而其低壓管接頭連接於_____點，將會產生最高的流量指示。
A. A; D
B. A; B
C. B; D
D. B; C
答案： B.



科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B2010 (P3306)

A cooling water system is operating at steady-state conditions. A calibrated system flow meter indicates 600 gpm with 50 psid across the flow transmitter venturi.
If cooling water flow rate is increased to 900 gpm, differential pressure across the flow transmitter venturi will be approximately...
A. 63 psid.
B. 75 psid.
C. 97 psid.
D. 112 psid.
ANSWER: D.

一冷卻水系統運轉在穩態的情況下。一經校正的系統流量計讀數600gpm，而文氏管流量計的差壓為50psid。如果冷卻水流量增加至900gpm，則流量計的差壓將會大約是
A. 63 psid.
B. 75 psid.
C. 97 psid.
D. 112 psid.
答案： D.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B2106 (P908)

Which one of the following flow devices produces the largest unrecoverable head loss when used in an operating fluid system?
A. Venturi
B. Flow nozzle
C. Pipe elbow
D. Orifice
ANSWER: D.

當使用在一運轉中的流體系統中時，下列何種流量計會產生最大不可回復的水頭損失？
A. 文氏管(Venturi)流量計
B. 噴嘴流量計
C. 流量計
D. 孔口流量計
答案： D.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B2206 (P2406)

A cooling water system is operating at a steady-state flow rate of 700 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 900 gpm, differential pressure across the flow transmitter venturi will be approximately...
A. 68 psid.
B. 77 psid.
C. 99 psid.
D. 127 psid.
ANSWER: C.

一冷卻水系統運轉在700 gpm的穩態下，文氏管(Venturi)流量計的差壓為60 psid。如果冷卻水流量增加到 900 gpm, 則流量計的差壓將大約是
A. 68 psid.
B. 77 psid.
C. 99 psid.
D. 127 psid
答案： C.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B2306 (P2306)

A venturi is being used to measure flow rate in a cooling water system. As the water flows from the throat to the discharge of the venturi, water pressure will _____ and volumetric flow rate will _____. (Assume water is incompressible.)
A. increase; remain the same
B. increase; increase
C. decrease; remain the same
D. decrease; decrease
ANSWER: A.

一文氏管(Venturi)用來量測一冷卻水系統之流量。當水從文氏管的喉部流至出口時，水壓將會_____而體積流量將會_____（假設水是不可壓縮）
A. 增加；維持不變
B. 增加；增加
C. 減小；維持不變
D. 減小；減小
答案： A.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B2606 (P2506)

A venturi is used to measure flow rate in a cooling water system. As the water flows from the inlet to the throat of the venturi, water pressure will _____ and volumetric flow rate will _____. (Assume water is incompressible.)
A. increase; remain the same
B. increase; increase
C. decrease; remain the same
D. decrease; increase
ANSWER: C.

一文氏管(Venturi)用來量測一冷卻水系統之流量。當水從文氏管的入口流至喉部，水壓將會_____而體積流量將會_____（假設水是不可壓縮）
A. 增加；維持不變
B. 增加；增加
C. 減小；維持不變
D. 減小；增加
答案： C.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B2806 (P2808)

A differential pressure detector is being used with an orifice plate to measure water flow rate through a pipe. When the flow detector was last calibrated, the following parameters were observed:

Upstream Pressure: 135 psig
Downstream Pressure: 120 psig
Actual Flow Rate: 100 gpm
Indicated Flow Rate: 100 gpm

Significant erosion of the orifice hole has occurred since the last calibration such that actual flow rate through the orifice has increased to 120 gpm while the upstream and downstream pressures have changed to 124 psig and 109 psig respectively.
What is the approximate currently indicated flow rate?
A. 44 gpm
B. 67 gpm
C. 100 gpm
D. 120 gpm
ANSWER: C.

一差壓計與孔口板(orifice plate)配合使用以量測流經管路的水流量。當流量計在前次校正時，觀察到以下參數：

上游壓力：135psig
下游壓力：120psig
實際流量：100gpm
流量指示：100gpm

於前次校正之後孔口產生嚴重沖蝕，以至於實際流經孔口的流量增加到120gpm，而上游與下游壓力分別變為 124 psig 與109psig。
則目前所指示的流量約為下列何者？
A. 44 gpm
B. 67 gpm
C. 100 gpm
D. 120 gpm
答案： C.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B3206 (P3207)

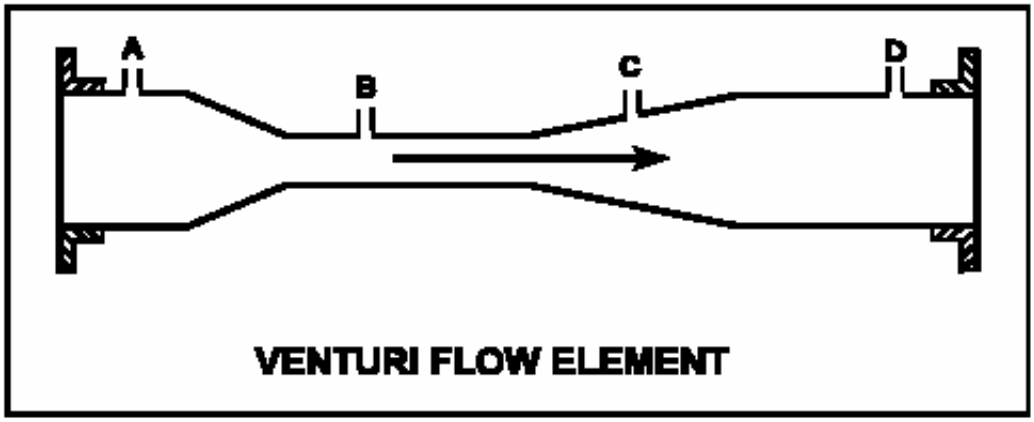
A cooling water system uses a horizontal venturi with a differential pressure flow detector to provide cooling water flow rate indication. Water enters and leaves the venturi at 70°F, 120 psig and 20 ft/sec. Water velocity at the throat of the venturi is 45 ft/sec. Assume water is incompressible and the venturi experiences no unrecoverable head loss.
What is the approximate pressure of the water at the throat of the venturi?
A. 109 psig
B. 98 psig
C. 86 psig
D. 71 psig
ANSWER: A.

一冷卻水系統使用一具有差壓的流量量測器的水平文氏管(Venturi)以提供水流的流量指示。水以70 °F, 120 psig 及20 ft/sec 進入與離開流量計。文氏管喉部的流速為45 ft/sec。假設水為不可壓縮，而流量計無不可回復之水頭損失。
水在流量計喉部的大約壓力為何？
A. 109 psig
B. 98 psig
C. 86 psig
D. 71 psig
答案： A.

科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B3306 (P1106)

Refer to the drawing of a venturi flow element in an operating cooling water system (see figure below).
At what point does the lowest pressure exist?
A. Point A
B. Point B
C. Point C
D. Point D
ANSWER: B.

參閱一運轉中的冷卻水系統中之文氏管(Venturi)流量計圖示（見下圖）
在何點的壓力最低？
A. 位置 A
B. 位置 B
C. 位置 C
D. 位置 D
答案： B.



科目： 291002
知能類： K1.01 [2.4/2.5]
序號： B3706 (P3706)

The following is the current calibration data for an orifice plate that is being used for water flow rate measurement:

Upstream Pressure: 135 psig
Downstream Pressure: 120 psig
Flow Rate: 100 gpm

During a surveillance the following pressures are observed across the orifice plate:

Upstream Pressure: 124 psig
Downstream Pressure: 117 psig

What is the approximate water flow rate through the orifice plate?

A. 47 gpm
B. 57 gpm
C. 68 gpm
D. 78 gpm

ANSWER: C.

用於測量水流量之孔口板(orifice plate)，目前的校正數據如下：

上游壓力：135psig
下游壓力：120psig
流量：100gpm

於監測時觀察到下列流經孔口板的壓力如下:

上游壓力：124psig
下游壓力：117psig

則流經孔口板的水流量約為？

A. 47 gpm
B. 57 gpm
C. 68 gpm
D. 78 gpm

答案： C.

科目： 291002
知能類： K1.02 [2.4/2.5]
序號： B10

The change in pressure across a main steam line flow element is...
A. directly proportional to the volumetric flow rate.
B. inversely proportional to the volumentric flow rate.
C. directly proportional to the mass flow rate.
D. inversely proportional to the mass flow rate.
ANSWER: A.

跨接主蒸汽管流量計兩端的壓力改變是
A. 正比於體積流量。
B. 反比於體積流量。
C. 正比於質量流量。
D. 反比於質量流量。
答案： A.

科目： 291002
知能類： K1.02 [2.4/2.5]
序號： B906

If the density input to a density-compensated steam flow instrument rapidly fails high, the indicated flow will...
A. increase and stabilize at a new higher value.
B. increase temporarily, then return to its initial value.
C. decrease and stabilize at a new lower value.
D. decrease temporarily, then return to its initial value.
ANSWER: A.

如果密度補償之蒸汽流量計的密度輸入值迅速指示為高值失效(fail high)(fail high)，則流量指示值將會
A. 增加並在一新的較高值達到穩定
B. 暫時增加，然後回到其初值
C. 減小並在一新的較低值達到穩定
D. 暫時減小，然後回到其初值
答案： A.

科目： 291002
知能類： K1.02 [2.4/2.5]
序號： B1606 (P406)

The compensating input for a steam flow instrument is proportional to density. This compensating input converts volumetric flow rate to...
A. velocity flow rate.
B. specific work.
C. mass flow rate.
D. differential pressure.
ANSWER: C.

蒸汽流量計的補償輸入正比於其密度。此補償輸入會將體積流量轉換成
A. 速度流量
B. 比功(Specific Work)
C. 質量流量
D. 差壓
答案： C.

科目： 291002
知能類： K1.02 [2.4/2.5]
序號： B1806 (P6)

Density input is normally used in steam flow instruments to convert _____ into _____.
A. mass flow rate; volumetric flow rate
B. volumetric flow rate; mass flow rate
C. mass flow rate; differential pressure
D. differential pressure; volumetric flow rate
ANSWER: B.

一般用在蒸汽流量計中的密度輸入值會將_____轉換成_____
A. 質量流量；體積流量
B. 體積流量；質量流量
C. 質量流量；差壓
D. 差壓；體積流量
答案： B.

科目： 291002
知能類： K1.02 [2.4/2.5]
序號： B2506 (P2506)

A main steam flow rate measuring instrument uses a steam pressure input to produce main steam flow rate indication in lbm/hr. Assuming volumetric steam flow rate does not change, a steam pressure decrease will cause indicated steam flow rate to...

A. decrease because the density of the main steam has decreased.
B. increase because the specific volume of the main steam has increased.
C. remain the same because steam pressure does not affect the mass flow rate of main steam.
D. remain the same because the differential pressure across the flow rate measuring instrument has not changed.

ANSWER: A.

主蒸汽流量計使用蒸汽壓力輸入，以產生以lbm/hr為單位之主蒸汽流量指示。假設體積蒸汽流量沒有改變，則蒸汽壓力減小將會導致蒸汽流量

A. 減小，因為主蒸汽的密度減小
B. 增加，因為主蒸汽的比容(Specific Volume)增加
C. 維持不變，因為蒸汽壓力不影響主蒸汽的質量流量
D. 維持不變，因為流量計的差壓沒有改變

答案： A.

科目： 291002
知能類： K1.02 [2.4/2.6]
序號： B2906 (P305)

If the steam pressure input to a density-compensated steam flow instrument fails high, the indicated flow rate will...
A. decrease, because the density input has decreased.
B. increase, because the density input has decreased.
C. decrease, because the density input has increased.
D. increase, because the density input has increased.
ANSWER: D.

如果對於一密度補償蒸汽流量計之蒸汽壓力輸入高值失效(fail high),則流量指示將會
A. 減小，因為其密度輸入減小
B. 增加，因為其密度輸入減小
C. 減小，因為其密度輸入增加
D. 增加，因為其密度輸入增加
答案： D.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B8

A leak develops in the high-pressure side of a flow detector. What effect does the leak have on the affected flow indication?
A. The measured ΔP will decrease, causing indicated flow to decrease.
B. The measured ΔP will decrease, causing indicated flow to increase.
C. The measured ΔP will increase, causing indicated flow to decrease.
D. The measured ΔP will increase, causing indicated flow to increase.
ANSWER: A.

一流量計的高壓側發生洩漏。則此洩漏對於流量指示有何影響？
A. 量測之差壓(ΔP)會減小，導致流量指示減小
B. 量測之差壓(ΔP)會減小，導致流量指示增加
C. 量測之差壓(ΔP)會增加，導致流量指示減小
D. 量測之差壓(ΔP)會增加，導致流量指示增加
答案： A.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B211 (P207)

A differential pressure (D/P) cell is being used to measure flow rate in a cooling water system.
Flow rate is indicating 75% of scale. If the D/P cell diaphragm ruptures, indicated flow rate will go to...
A. 0% because low D/P is sensed.
B. 0% because high D/P is sensed.
C. 100% (full-scale) because low D/P is sensed.
D. 100% (full-scale) because high D/P is sensed.
ANSWER: A.

在冷卻水系統中，一差壓(D/P)室(cell)用以量測流量。流量指示為75%。如果差壓室隔膜破裂，則流量指示將為
A. 0%因為感測到低差壓
B. 0%因為感測到高差壓
C. 100%（全刻度）因為測到低差壓
D. 100%（全刻度）因為測到高差壓
答案： A.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B307 (P307)

Which one of the following will cause indicated volumetric flow rate to be lower than actual volumetric flow rate using a differential pressure flow detector and a calibrated orifice?
A. System pressure decreases.
B. The orifice erodes over time.
C. Debris becomes lodged in the orifice.
D. A leak develops in the low pressure sensing line.
ANSWER: B.

使用一差壓流量計以及一經校正之孔口，下列何者將會導致指示體積流量小於實際之體積流量？
A. 系統壓力降低
B. 孔口因長時間沖蝕
C. 碎片堆積於孔口
D. 低壓感測管發生洩漏
答案： B.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B707 (P706)

Flow rate is being measured using a differential pressure flow detector and a calibrated orifice. If actual flow rate remains constant, which one of the following will cause indicated flow rate to be higher than actual flow rate?
A. The flow detector equalizing valve is inadvertently opened.
B. A leak develops in the high pressure sensing line.
C. Debris becomes lodged in the orifice.
D. The orifice erodes over time.
ANSWER: C.

利用一差壓流量計與一經校正孔口量測流量。如果實際流量維持不變，下列何者將會使流量指示較實際流量為高？
A. 流量計平衡閥不小心開啟
B. 高壓感測管發生洩漏
C. 碎片堆積於孔口
D. 孔口因長時間沖蝕
答案： C.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B1006

Which one of the following will cause indicated liquid flow rate to be higher than actual flow rate using a differential pressure (D/P) flow detector with a calibrated orifice?
A. System pressure decreases.
B. The detector diaphragm ruptures.
C. Debris becomes lodged in the orifice.
D. The pressure surrounding the D/P detector housing decreases.
ANSWER: C.

在使用具有經校正孔口的差壓流量計時，下列何者將會使流量指示較實際流量為大？
A. 系統壓力下降
B. 流量計隔膜破裂
C. 碎片堆積於孔口
D. 差壓感測器外殼周圍壓力下降
答案： C.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B1506 (P1205)

If the orifice in a differential pressure (D/P) flow sensor erodes such that the orifice opening becomes larger, indicated flow rate will _____ due to a _____ D/P across the orifice. (Assume actual flow rate remains the same.)
A. increase; larger
B. increase; smaller
C. decrease; larger
D. decrease; smaller
ANSWER: D.

如果一差壓流量感測器的孔口沖蝕，以致於孔口開口變大，則流量指示將會_____，因為孔口的差壓_____（假設實際流量維持不變）。
A. 增加；較大
B. 增加；較小
C. 減小；較大
D. 減小；較小
答案： D.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B1607

A flow instrument for an operating cooling water system was calibrated with the differential pressure flow detector equalizing valve slightly open. If the valve is subsequently closed, flow indication will...
A. decrease and stabilize above 0 gpm.
B. decrease and stabilize at 0 gpm.
C. increase and stabilize at the actual flow rate.
D. increase and stabilize above the actual flow rate.
ANSWER: D.

對一運轉中的冷卻水系統中之流量計，可利用差壓流量計之平衡閥微開的情況下以校正。如果此閥後來關閉，則流量指示將會
A. 減小，並在0 gpm以上達到穩定
B. 減小，並在0 gpm達到穩定
C. 增加，並在實際流量達到穩定
D. 增加，並在實際流量以上達到穩定
答案： D.

科目： 291002
知能類： K1.04 [2.9/3.1]
序號： B2310 (P2305)

An orifice is being used in an operating cooling water system to measure flow rate. Which one of the following will cause the differential pressure sensed across the orifice to decrease?
A. System pressure decreases.
B. System flow rate decreases.
C. Debris becomes lodged in the orifice.
D. A leak develops in the low pressure sensing line.
ANSWER: B.

在運轉中的冷卻水系統中，使用一孔口量測流量。下列何者將會導致孔口處感測的差壓下降？
A. 系統壓力減小
B. 系統流量減小
C. 碎片堆積於孔口
D. 低壓感測管發生洩漏
答案： B.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1773 (P1873)

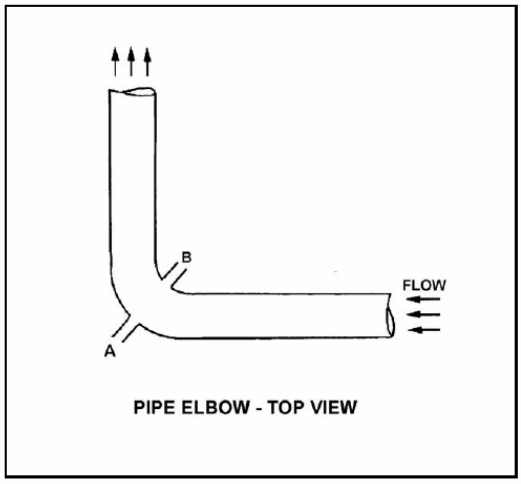
Subcooled water is flowing through each of the following devices. Which one of the devices will produce an outlet pressure that is greater than the inlet pressure?
A. Convergent nozzle
B. Divergent nozzle
C. Orifice
D. Flow restrictor
ANSWER: B.

次冷(Subcooled)水正流過下列各設備。下列何者會產生較其進口壓力為大的出口壓力？
A. 漸縮噴嘴
B. 漸擴噴嘴
C. 孔口
D. 限流器
答案： B.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1907 (P1007)

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below).
A differential pressure (D/P) flow detector is connected to instrument lines A and B. If instrument line A develops a leak, indicated flow rate will _____ due to a _____ measured D/P.
A. increase; larger
B. increase; smaller
C. decrease; larger
D. decrease; smaller
ANSWER: D.

參考下圖，一冷卻水系統中，使用肘形彎管(Pipe Elbow)以量測流量（見下圖）。一差壓流量計連接到儀器管A與B。如果儀器管A發生洩漏，則流量指示將會_____因為量測到的差壓_____。
A. 增加；較大
B. 增加；較小
C. 減小；較大
D. 減小；較小
答案： D.



科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B607 (P8)

How will flow rate indication be affected if the equalizing valve for the associated differential pressure detector is fully opened?
A. Increase temporarily, then return to initial value
B. Decrease temporarily, then return to initial value
C. Increase to the maximum value
D. Decrease to the minimum value
ANSWER: D.

如果差壓感測器的平衡閥全開，則流量指示將會受到何種影響？
A. 暫時增加，然後回復初始值
B. 暫時減小，然後回復初始值
C. 增加到最大值
D. 減小到最小值
答案： D.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B608 (P607)

The flow rate of a fluid passing through a venturi can be determined by measuring the:
A. differential pressure of the fluid as it passes through the venturi.
B. linear displacement of a metering plug installed in the throat of the venturi.
C. change in the velocity of the fluid as it passes through the venturi.
D. rotation of a paddle wheel type device installed in the throat of the venturi.
ANSWER: A.

通過一文氏管(Venturi)流量計的流體流量可以靠量測何者加以決定：
A. 此流體通過文氏管流量計的差壓
B. 安裝於文氏管流量計喉部的計量栓(Metering Plug)的線性位移
C. 此流體通過文氏管流量計的流速變化
D. 安裝於文氏管流量計喉部的蹼輪式(Paddle Wheel Type)設備的旋轉
答案： A.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B708 (P705)

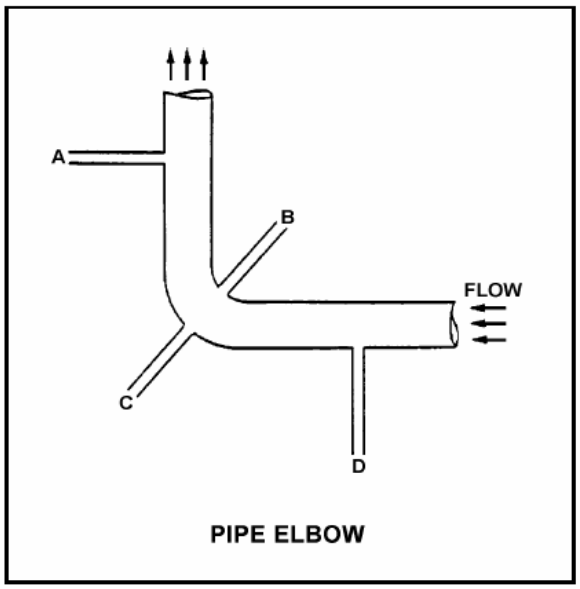
A steam flow measuring instrument uses density compensation and square root compensation to convert the differential pressure across the flow element to flow rate in lbm/hr.
The purpose of square root compensation in this flow measuring instrument is to convert _____ to _____.
A. volumetric flow rate; mass flow rate
B. volumetric flow rate; differential pressure
C. differential pressure; mass flow rate
D. differential pressure; volumetric flow rate
ANSWER: D.

一蒸汽流量量測儀器使用密度補償與平方根補償，將通過流量元件的差壓轉換成以lbm/hr為單位的流量。在此流量量測設備中，平方根補償的目的，是將 _____ 轉換成 _____。
A. 體積流量；質量流量
B. 體積流量；差壓
C. 差壓；質量流量
D. 差壓；體積流量
答案： D.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B908

Refer to the drawing of a pipe elbow used for flow measurement (see figure below). At which one of the following locations is the lowest pressure sensed? (Assume a constant pipe diameter and zero head loss in this section of pipe.)
A. Point A
B. Point B
C. Point C
D. Point D
ANSWER: B.

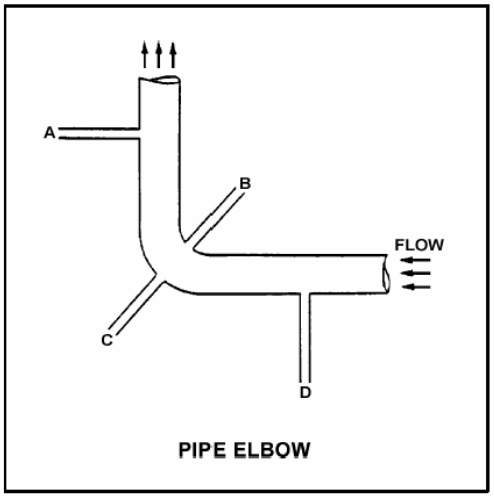
參考用於流量量測的管線彎頭(參閱下圖)。在下列哪一位置感測到的壓力最低？（假設管徑維持固定，同時在此段管線中水頭損失為零。）
A. 位置 A
B. 位置 B
C. 位置 C
D. 位置 D
答案： B.



科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1007 (P2807)

Refer to the drawing of a pipe elbow used for flow measurement (see figure below). At which one of the following locations is the highest pressure sensed? (Assume a constant pipe diameter and zero head loss in this section of pipe.)
A. Point A
B. Point B
C. Point C
D. Point D
ANSWER: C.

參考用於流體量測的肘形彎管(Pipe Elbow)（參閱下圖）。在下列哪一位置感測到的壓力最高？（假設管徑維持固定，同時在此段管線中水頭損失為零。）
A. 位置 A
B. 位置 B
C. 位置 C
D. 位置 D
答案： C.



科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1108

If the flow rate through a differential pressure (D/P) detector flow nozzle doubles, by what factor would the D/P increase?
A. /'2
B. 2
C. 4
D. 8
ANSWER: C.

如果通過差壓感測器流體噴嘴的流量加倍，則差壓增加的倍數為？
A. $\sqrt{2}$
B. 2
C. 4
D. 8
答案： C.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1307

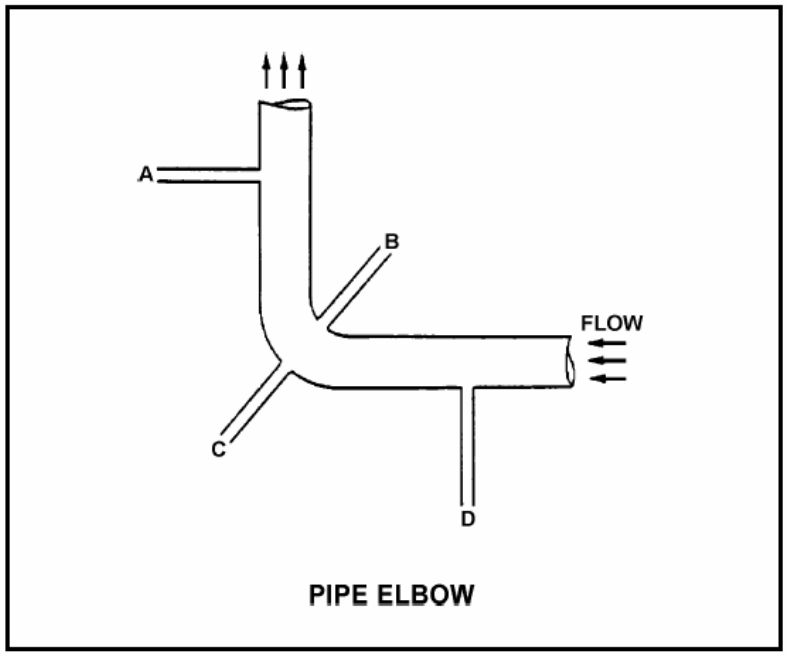
Flow rate in a cooling water system, measured using a differential pressure (D/P) detector, indicates 100 gpm at a D/P of 30 psid. If indicated flow rate increases to 150 gpm, what D/P is being sensed by the detector?
A. 36.7 psid
B. 37.5 psid
C. 66.7 psid
D. 67.5 psid
ANSWER: D.

於一冷卻水系統中，利用差壓感測器量測流量，於差壓 30 psid時指示測量的流量為100 gpm。如果流量指示增加到 150 gpm, 則感測器量測到的差壓為？
A. 36.7 psid
B. 37.5 psid
C. 66.7 psid
D. 67.5 psid
答案： D.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1408 (P1906)

Refer to the drawing of a pipe elbow used for flow measurement (see figure below). At which one of the following pairs of connection points will the greatest differential pressure be sensed?
A. Points A and B
B. Points B and C
C. Points C and D
D. Points D and A
ANSWER: B.

參考用於流體量測的肘形彎管(Pipe Elbow)（參閱下圖）。於下列哪一組連接點會量測到最大的差壓？
A. 位置 A 與 B
B. 位置 B 與 C
C. 位置 C 與 D
D. 位置 D 與 A
答案： B.



科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1608 (P1608)

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below). Three separate bellows differential pressure flow detectors are connected to taps
A, B, C, and D as follows:

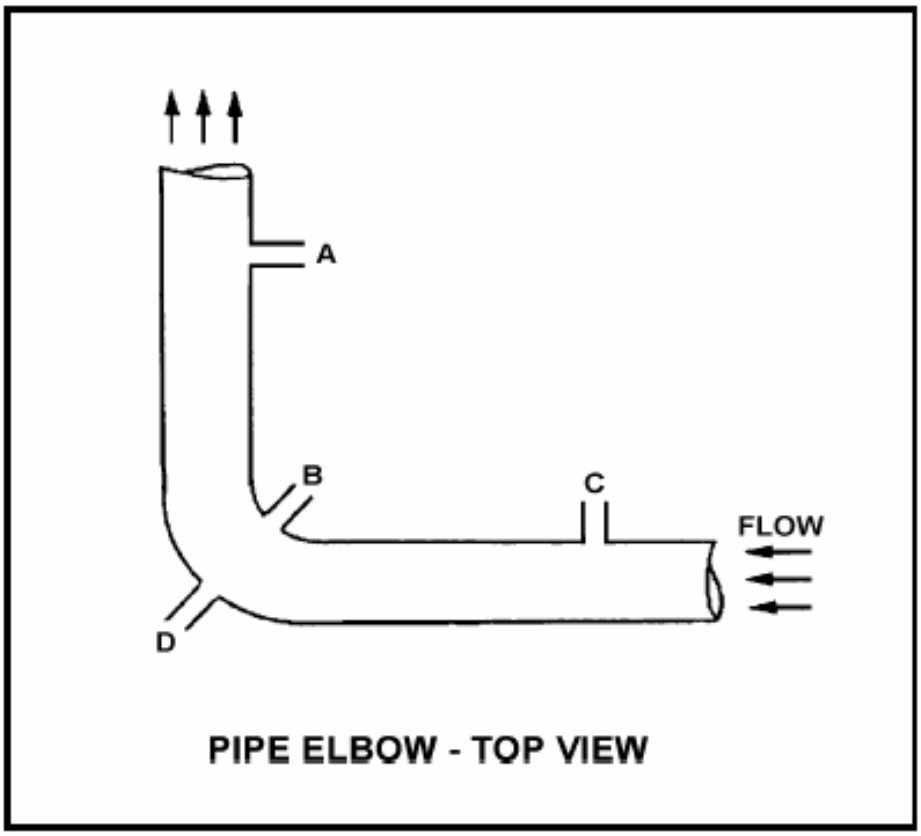
DETECTOR	TAPS
AD	A and D
BD	B and D
CD	C and D

Assuming zero head loss in the elbow, how will the detectors be affected if tap D ruptures?
A. All detectors will fail high.
B. All detectors will fail low.
C. Two detectors will fail high and one will fail low.
D. Two detectors will fail low and one will fail high.
ANSWER: B.

參考用於運轉中的水系統的水平肘形彎管(Pipe Elbow)（頂視圖如下）。三個分開的伸縮囊(Bellow)差壓流量感測器安裝在接頭A, B, C, D處：

感測器	接頭
AD	A 與 D
BD	B 與 D
CD	C 與 D

假設在彎頭處水頭損失為零，則如果接頭D破裂則對感測器有何影響？
A. 所有感測器將高值失效(fail high)
B. 所有感測器將低值失效(fail low)
C. 兩個感測器高值失效，一個低值失效
D. 兩個感測器低值失效，一個高值失效
答案： B.



PIPE ELBOW - TOP VIEW

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B1905 (P907)

A differential (D/P) detector is being used to measure main steam flow rate. At a steam flow rate of 5 x 10_6 lbm/hr measured D/P is 40 psid.
If steam flow changes such that current D/P is 30 psid, what is the current steam flow rate?
A. 2.11 x 10_6 lbm/hr
B. 3.54 x 10_6 lbm/hr
C. 3.75 x 10_6 lbm/hr
D. 4.33 x 10_6 lbm/hr
ANSWER: D.

一差壓感測計被用以測量主蒸汽流量。在蒸汽流量5 x 10^6 lbm/hr時量測之差壓為40 psid。如果蒸汽流量改變使得目前差壓成為 30 psid,則目前的蒸汽流量為？
A. 2.11 x 10^6 lbm/hr
B. 3.54 x 10^6 lbm/hr
C. 3.75 x 10^6 lbm/hr
D. 4.33 x 10^6 lbm/hr
答案： D.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B2112

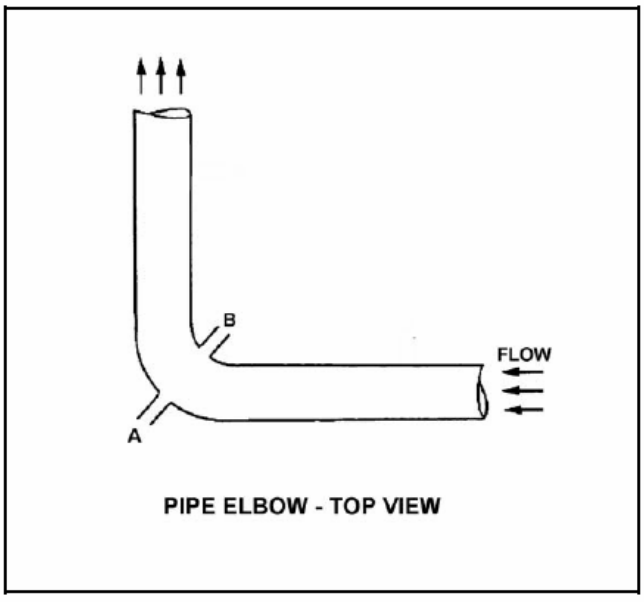
A cooling water system is operating at a steady-state flow rate of 500 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 1000 gpm, differential pressure across the flow transmitter venturi will be approximately...
A. 85 psid.
B. 120 psid.
C. 240 psid.
D. 480 psid.
ANSWER: C.

一冷卻水系統正運轉於500 pgm的穩態流量，而文氏管(Venturi)流量計的差壓為60 psid。如果冷卻水流量增加到 1000 gpm，則文氏管流量計的差壓約為
A. 85 psid.
B. 120 psid.
C. 240 psid.
D. 480 psid.
答案： C.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B2209 (P2107)

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below).
A differential pressure (D/P) flow detector is connected to instrument lines A and B. If instrument line B develops a leak, indicated flow rate will _____ due to a _____ measured D/P.
A. increase; larger
B. increase; smaller
C. decrease; larger
D. decrease; smaller
ANSWER: A.

參考用於一冷卻水系統中之流量量測之肘形彎管(Pipe Elbow)（見下圖）。一差壓流量感測計連接於儀器管A與B。如果儀器管B發生洩漏，則流量指示將會_____因為一_____的量測差壓。
A. 增加；較大
B. 增加；較小
C. 減小；較大
D. 減小；較小
答案： A.



科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B2307 (P2307)

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below). Three separate bellows differential pressure flow detectors are connected to taps
A, B, C, and D as follows:

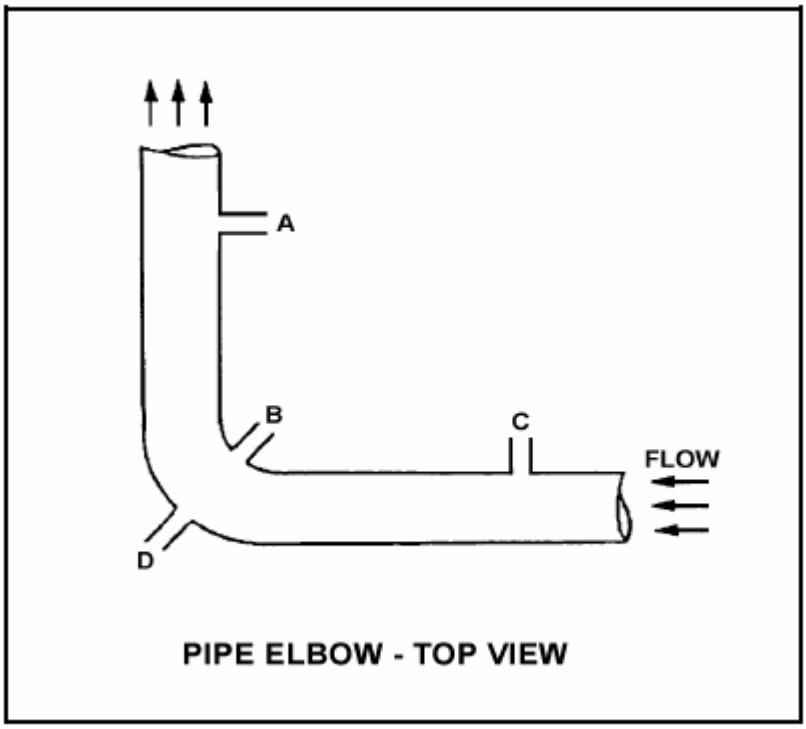
DETECTOR	TAPS
AD	A and D
BD	B and D
CD	C and D

Assume that water is incompressible and there is no head loss in this section of pipe. How will the detectors be affected if system flow rate remains the same while system pressure increases from 1000 psig to 1200 psig?
A. All detectors will indicate higher flow.
B. Only two detectors will indicate higher flow.
C. Only one detector will indicate higher flow.
D. Detector indication will not change.
ANSWER: D.

參考用於運轉中的水系統的水平肘形彎管(Pipe Elbow)（頂視圖如下）（參閱下圖）。三個分開的伸縮囊(Bellow)差壓流量感測計安裝在接頭A, B, C, D處：

感測計	接頭
AD	A 與 D
BD	B 與 D
CD	C 與 D

假設水為不可壓縮，同時在此段管線中水頭損失為零，則當系統流量維持不變，但系統壓力從1000psig 增加到1200 psig時，對量測器會有何影響？
A. 所有感測計將指示較高流量
B. 只有兩個感測計將指示較高流量
C. 只有一個感測計將指示較高流量
D. 感測計指示數值不會改變
答案： D.



PIPE ELBOW - TOP VIEW

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B2508 (P2507)

A differential pressure detector is being used with an orifice plate to measure water flow rate through a pipe. When the flow detector was last calibrated, the following parameters were observed:

Upstream Pressure: 125 psig Actual Flow Rate: 100 gpm
Downstream Pressure: 116 psig Indicated Flow Rate: 100 gpm

Significant erosion of the orifice hole has occurred since the calibration such that actual flow rate through the orifice has increased to 120 gpm while the upstream and downstream pressures have changed to 110 psig and 106 psig respectively.
What is the approximate flow rate that is currently indicated?
A. 44 gpm
B. 67 gpm
C. 81 gpm
D. 120 gpm
ANSWER: B.

一差壓感測計與一孔口板合用以量測流過一管線之水流量。當此流量感測計上次校正時，觀察到以下參數：

上游壓力：125 psig 實際流量：100 gpm
下游壓力：116 psig 流量指示：100 gpm

自從上次校正後，孔口板發生嚴重沖蝕，以致於流過孔口的實際流量達到 120 gpm，而上游與下游壓力分別改變為 110 psig 與 106 psig。
則目前所指示的流量大約是下列何者？
A. 44 gpm
B. 67 gpm
C. 81 gpm
D. 120 gpm
答案： B.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B2607

A cooling water system is operating at a steady-state flow rate of 400 gpm with 60 psid across the flow transmitter venturi. If cooling water flow rate is increased to 600 gpm, differential pressure across the flow transmitter venturi will be approximately...
A. 73 psid.
B. 90 psid.
C. 114 psid.
D. 135 psid.
ANSWER: D.

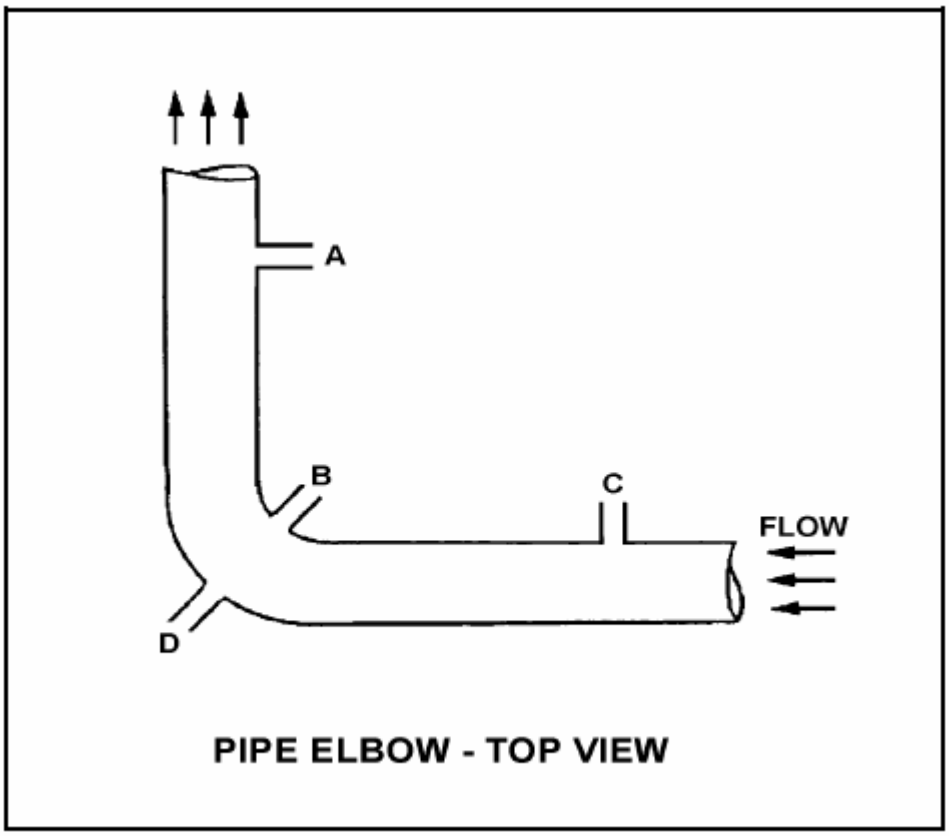
一冷卻水系統正運轉於400 gpm的穩態流量，而文氏管(Venturi)流量計的差壓為60 psid。如果冷卻水流量增加到 600 gpm，則文氏管流量計的差壓將約為
A. 73 psid.
B. 90 psid.
C. 114 psid.
D. 135 psid.

答案： D.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B2807

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below). A differential pressure (D/P) flow detector is properly connected to instrument lines A and C. Connections B and D are capped.
If instrument line A develops a leak, indicated flow rate will _____ due to a _____ measured D/P.
A. increase; larger
B. increase; smaller
C. decrease; larger
D. decrease; smaller
ANSWER: A.

參考用於一冷卻水系統中之流量量測之肘形彎管(Pipe Elbow)（見下圖）。一差壓流量感測計連接於儀器管A與C。接頭B與D被蓋住。如果儀器管A發生洩漏，則流量指示將會_____因為_____的量測差壓。
A. 增加；較大
B. 增加；較小
C. 減小；較大
D. 減小；較小
答案： A.



PIPE ELBOW - TOP VIEW

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B3108 (P2905)

Refer to the drawing of a horizontal pipe elbow (top view) in an operating water system (see figure below).
Three separate bellows-type differential pressure flow detectors are connected to taps A, B, C, and D as follows:

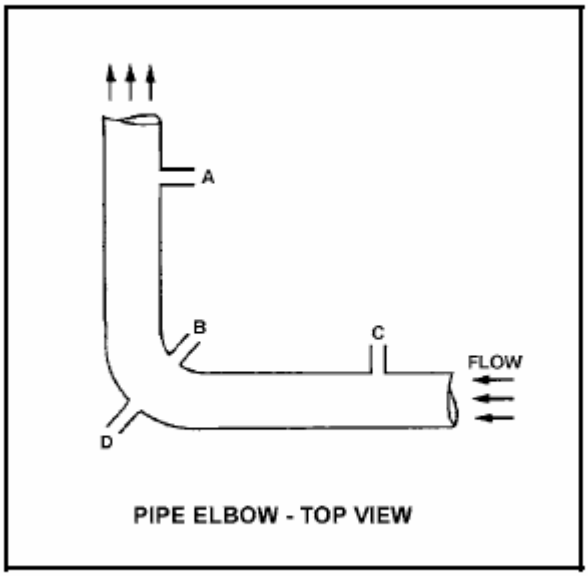
DETECTOR	TAPS
AD	A and D
BD	B and D
CD	C and D

Assuming zero head loss in this section of pipe, how will the detectors be affected if tap B experiences a significant leak? (Assume water system pressure does not change.)
A. All detectors will fail low.
B. All detectors will fail high.
C. Only one detector will fail, and it will fail low.
D. Only one detector will fail, and it will fail high.
ANSWER: D.

參考用於操作水系統的水平肘形彎管(Pipe Elbow)（頂視圖如下）。三個分開的伸縮囊型差壓流量感測計連接於接頭A, B, C, D處：

感測計	接頭
AD	A 與 D
BD	B 與 D
CD	C 與 D

假設在此段管線中水頭損失為零，則當接頭B發生嚴重洩漏時，對量測器會有何影響（假設水系統壓力不變）？
A. 所有感測計將會低值失效(fail low)(fail low)
B. 所有感測計將會高值失效(fail high)(fail high)
C. 只有一個感測計會失效，同時會低值失效(fail low)
D. 只有一個感測計會失效，同時會高值失效(fail high)
答案： D.



PIPE ELBOW - TOP VIEW

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B3608 (P3605)

A steam flow measuring instrument uses density compensation and square root extraction to convert the differential pressure across the flow element to flow rate in lbm/hr.
The purpose of density compensation in this flow measuring instrument is to convert _____ to _____.
A. volumetric flow rate; mass flow rate
B. volumetric flow rate; differential pressure
C. differential pressure; mass flow rate
D. differential pressure; volumetric flow rate
ANSWER: A.

一蒸汽流量量測儀器使用密度補償與開平方根將流經流量元件的差壓轉換成以lbm/hr為單位之流量。在此量測儀器中，密度補償的目的乃將_____轉換成_____。
A. 體積流量(volumetric flow rate)；質量流量(mass flow rate)
B. 體積流量；差壓
C. 差壓；質量流量
D. 差壓；體積流量
答案： A.

科目： 291002
知能類： K1.05 [3.1/3.1]
序號： B4005 (P4003)

A differential pressure detector is being used with an orifice plate to measure water flow rate through a pipe. When the flow instrument was last calibrated, the following parameters were observed:

Upstream Pressure: 125 psig Actual Flow Rate: 100 gpm
Downstream Pressure: 116 psig Indicated Flow Rate: 100 gpm

Since the calibration, debris has collected in the orifice such that the actual flow rate through the orifice has decreased to 80 gpm while the upstream and downstream pressures have changed to 135 psig and 110 psig, respectively.
What is the approximate flow rate that is currently indicated by the flow instrument?
A. 125 gpm
B. 133 gpm
C. 156 gpm
D. 167 gpm
ANSWER: D.

一差壓感測計與一孔口板合用以量測流過一管線之水流量。當此流量感測計上次校正時，觀察到以下參數：

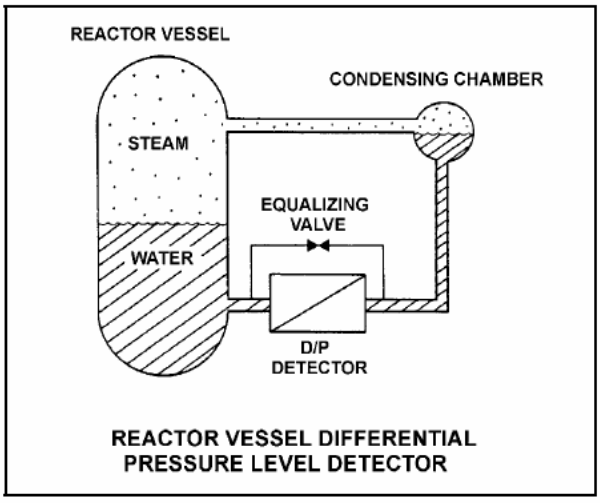
上游壓力：125 psig 實際流量：100 gpm
下游壓力：116 psig 流量指示：100 gpm

自從上次校正後，孔口堆積碎片，以致於流過孔口的實際流量減少到 80 gpm，而上游與下游壓力分別改變為 135 psig 與 110 psig。
則目前流量儀器所指示的流量大約是下列何者？
A. 125 gpm
B. 133 gpm
C. 156 gpm
D. 167 gpm
答案： D.

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B11

Refer to the drawing of a reactor vessel (RV) differential pressure (D/P) level detector (see figure below).
What is the reason for the reference leg being connected to the RV instead of being connected to a water source independent of the RV?
A. To provide a vent path to prevent collapse of the reference leg during a rapid RV Depressurization
B. To remove the need for density compensation of the level signal by keeping the reference leg at the same temperature as the variable leg
C. To make the indicated level proportional to the square root of the D/P pressure between the reference and variable legs for all reactor pressures
D. To provide compensation for the RV pressure exerted on the variable leg
ANSWER: D.

參考反應爐槽差壓液位感測計（見下圖）。其參考柱連接到反應爐槽而非連接到與反應爐槽無關的水源，其原因為何？
A. 為了提供一通氣路徑以預防此參考柱在反應爐槽快速減壓時坍塌
B. 藉由維持參考柱與可變柱的溫度一致，而消除液位信號的密度補償
C. 使指示的液位正比於在所有反應器壓力下，參考與可變柱間差壓的平方根
D. 為施加於可變柱的反應爐槽壓力提供補償
答案： D.

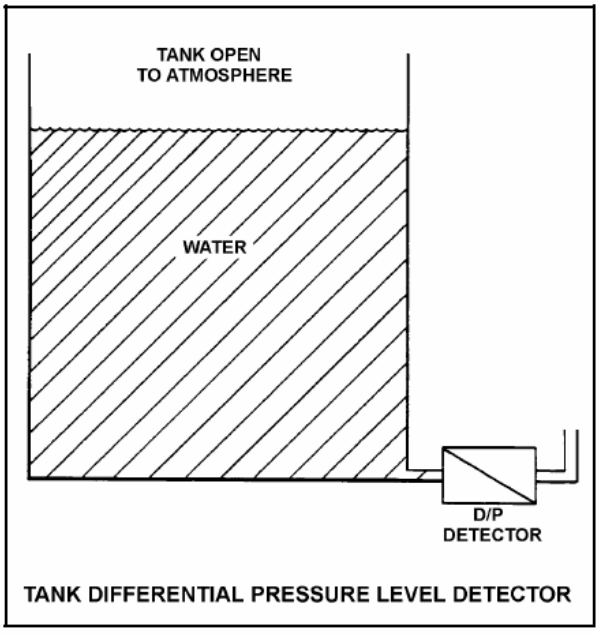


REACTOR VESSEL DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B209

Refer to the drawing of a tank differential pressure level detector (see figure below). The level detector is being used in a level control system that is calibrated to maintain tank level at 80% at the current tank temperature of 100°F. If tank temperature gradually decreases and stabilizes at 70°F, actual tank level will...
A. remain at 80%.
B. increase and stabilize above 80%.
C. oscillate around 80%.
D. decrease and stabilize below 80%.
ANSWER: D.

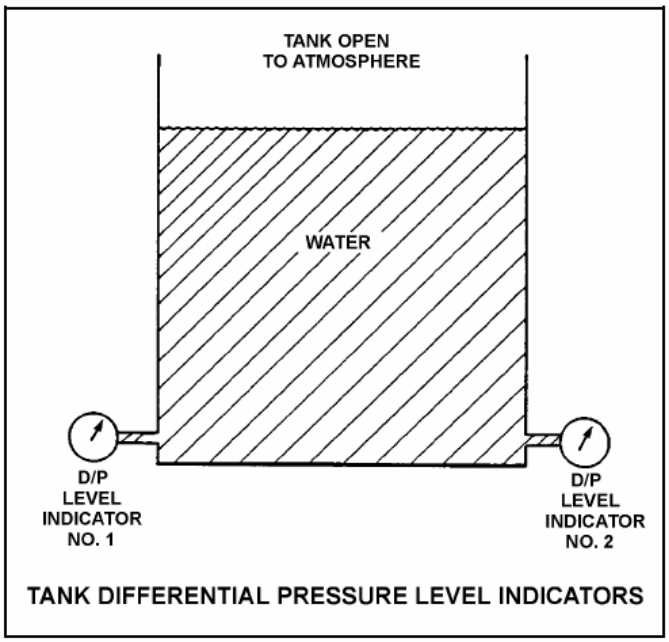
參考水槽之差壓液位感測計（見下圖）。此液位感測計經校正用以維持目前槽溫100°F而槽的液位為80%的水位控制系統。如果槽溫漸漸下降並於70°F達到穩定，則水槽的實際液位將會
A. 維持在80%
B. 升高並在80%以上達到穩定
C. 在80%附近震盪
D. 降低並在80%以下達到穩定
答案： D.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B510 (P14)

Refer to the drawing of a water storage tank with two differential pressure level indicators (see figure below).
Indicator 1 was calibrated at 200°F and indicator 2 was calibrated at 100°F. If tank water temperature is 150°F, then...
A. indicator 1 will read greater than indicator 2.
B. indicator 2 will read greater than indicator 1.
C. indicators 1 and 2 will read the same.
D. both indicators will be inaccurate, but it is impossible to predict which indicator will readgreater.
ANSWER: A.

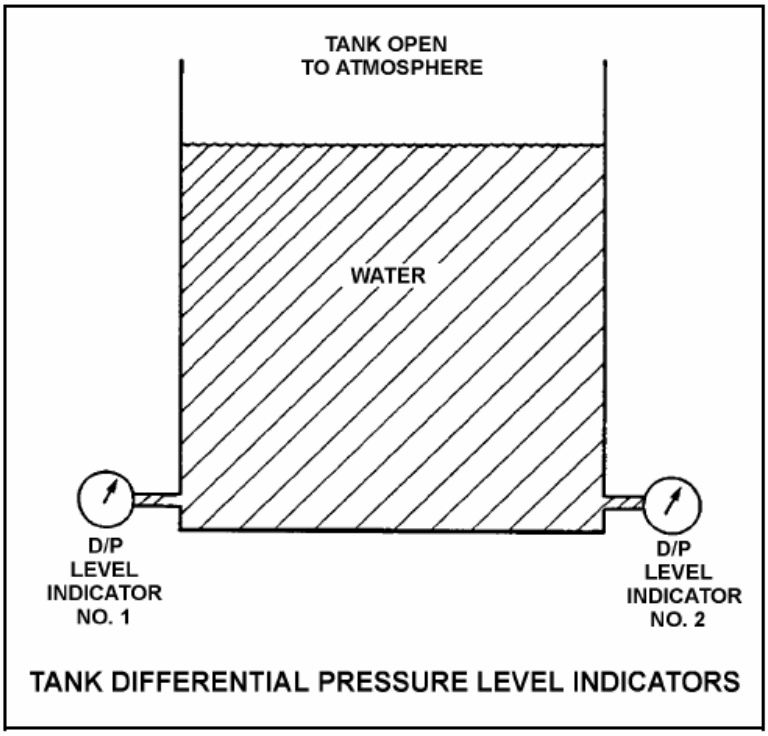
參考一具有兩個差壓液位計的儲水槽（見下圖）。液位計1校正於200°F，而液位計2校正於100°F。如果槽的水溫150°F，則
A. 液位計1較液位計2之讀數為大
B. 液位計2較液位計1之讀數為大
C. 液位計1與液位計2之讀數相同
D. 兩個液位計均不正確，但無法預測何者的讀數較大
答案： A.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B709

Refer to the drawing of a water storage tank with two differential pressure level indicators (see figure below).
Indicator 1 was calibrated at 120°F and indicator 2 was calibrated at 180°F. If tank water temperature is 150°F, then indicator...
A. 1 will read greater than indicator 2.
B. 2 will read greater than indicator 1.
C. 1 and 2 readings will increase by the same amount.
D. 1 and 2 readings will decrease by the same amount.
ANSWER: B.

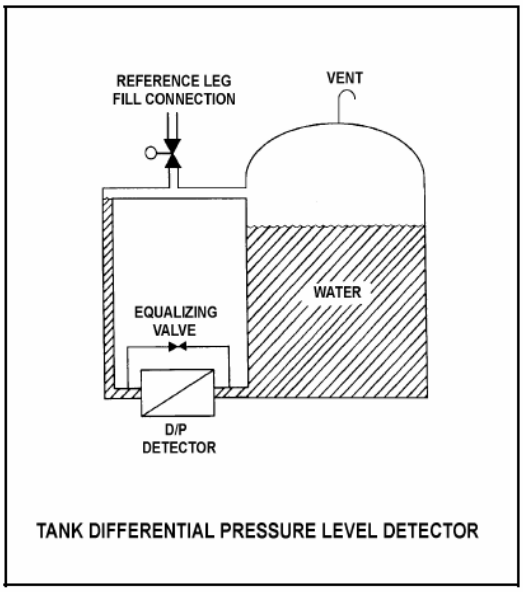
參考具有兩個差壓液位計的儲水槽（見下圖）。液位計1校正於120°F，液位計2校正於180°F。如果槽的水溫150°F，則
A. 液位計1較液位計2之讀數為大
A. 液位計2較液位計1之讀數為大
B. 液位計1與液位計2會增加同樣的讀數
C. 液位計1與液位計2會減小同樣的讀數
答案： B.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B809 (P808)

Refer to the drawing of a tank differential pressure level detector (see figure below). The level detector is being used in a level control system that is calibrated to maintain tank level at 80% at the current tank temperature of 100°F. If tank temperature gradually increases and
stabilizes at 150°F, actual tank level will...
A. remain stable at 80%.
B. increase and stabilize above 80%.
C. oscillate and then stabilize at 80%.
D. decrease and stabilize below 80%.
ANSWER: B.

參考水槽之差壓液位感測計（見下圖）。此液位感測計經校正用以維持目前槽溫100°F而槽的液位為80%的之水位控制系統。如果槽溫漸漸增加並於150°F達到穩定，水槽實際液位將會
A. 維持穩定在 80%
B. 升高並在80%以上達到穩定
C. 震盪，並在80%達到穩定
D. 降低並在80%以下達到穩定
答案： B.

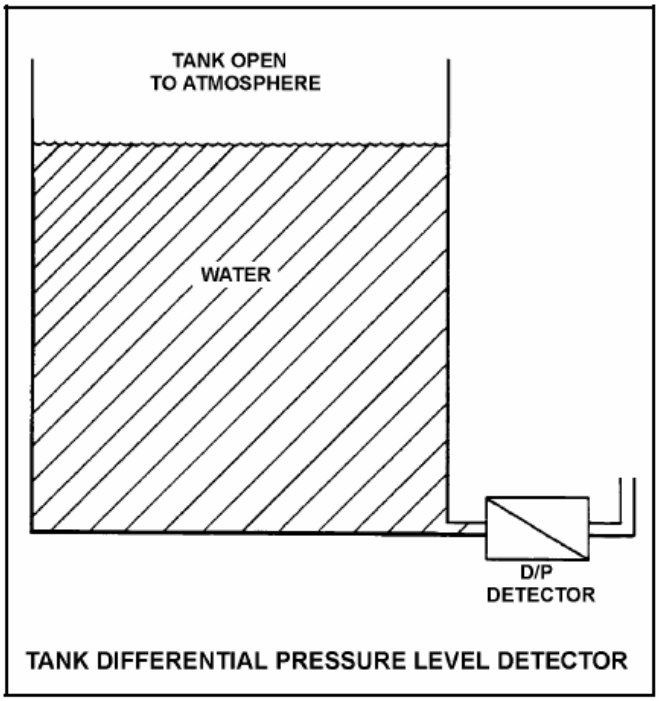


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B909 (P208)

Refer to the drawing of a tank differential pressure level detector (see figure below). The associated level instrument was calibrated with the water storage tank at 100°F. If mass in the tank remains constant and the water temperature increases to 120°F, the indicated level will...
A. remain the same although actual level increases.
B. increase but remain less than actual level.
C. decrease in direct proportion to the temperature rise.
D. increase in direct proportion to the temperature rise.
ANSWER: A.

參考水槽之差壓液位感測計（見下圖）。相關的液位儀器校正於儲水槽水溫100 °F。如果此槽的質量維持固定，而水溫增加到120°F，則槽位指示將會
A. 維持不變，儘管實際液位增加
B. 升高，但是會維持小於實際液位的數值
C. 隨溫度上升成正比的降低
D. 隨溫度上升成正比的升高
答案： A.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B1209

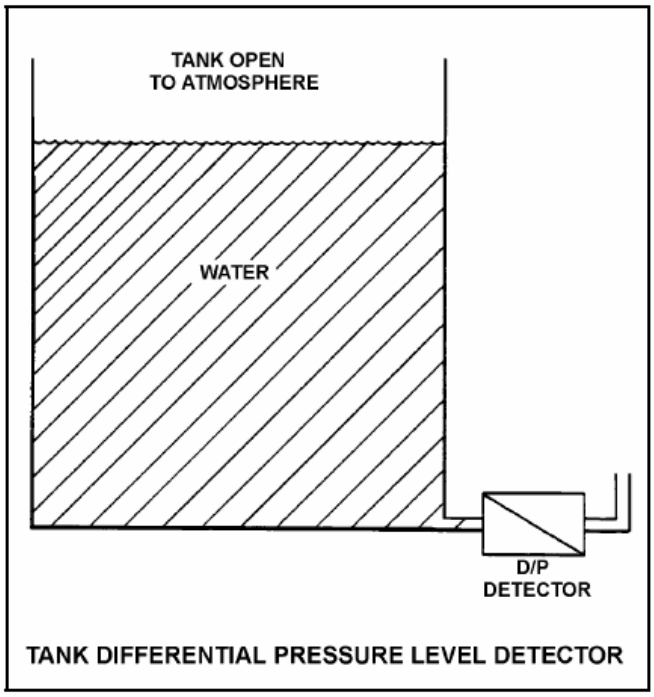
Two differential pressure level transmitters are installed on a large water storage tank. Transmitter I is calibrated at 100°F and transmitter II is calibrated at 200°F water temperature.
Which transmitter will indicate a higher level?
A. Transmitter I below 150°F, transmitter II above 150°F
B. Transmitter II below 150°F, transmitter I above 150°F
C. Transmitter I at all water temperatures
D. Transmitter II at all water temperatures
ANSWER: D.

兩差壓液位計安裝於一大型儲水槽中。液位計I校正於水溫100˚F，液位計II則校正於200˚F。
下列液位計何者會指示較高的液位？
A. 低於150˚F以下的液位計I，高於150˚F以上的液位計II
B. 低於150˚F以下的液位計II，高於150˚F以上的液位計I
C. 所有水溫的液位計I
D. 所有水溫的液位計II
答案： D.

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B1409 (P1607)

Refer to the drawing of a tank differential pressure level detector (see figure below). The associated level instrument was calibrated with the water storage tank at 120°F. If mass in the tank remains constant and the water temperature decreases to 100°F, the indicated level will...
A. remain the same although actual level decreases.
B. remain the same although actual level increases.
C. increase in direct proportion to the temperature decrease.
D. decrease in direct proportion to the temperature decrease.
ANSWER: A.

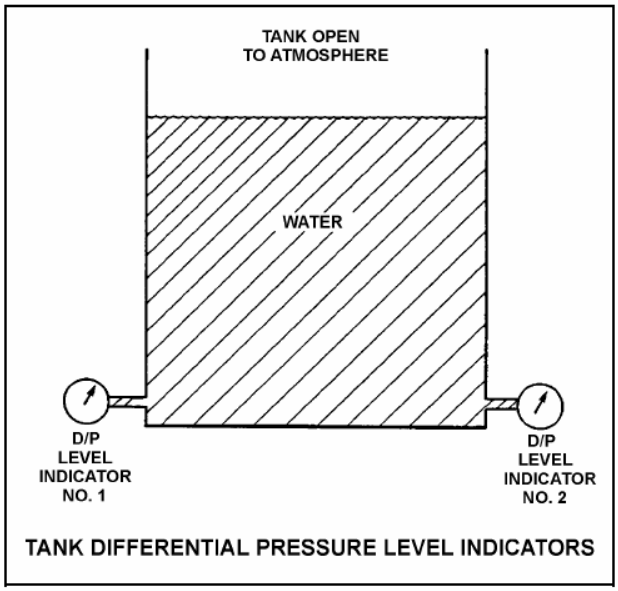
參考水槽之差壓液位感測計圖示（見下圖）。相關的液位儀器校正於儲水槽水溫120˚F。如果此槽的質量維持固定，而水溫降至100˚F，則槽位指示將會
A. 維持不變，儘管實際液位降低
B. 維持不變，儘管實際液位上升
C. 隨溫度降低成正比的升高
D. 隨溫度降低成正比的降低
答案： A.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B1706 (P1706)

Refer to the drawing of two tank differential pressure (D/P) level indicators (see figure below).
Two D/P level indicators are installed on a large water storage tank. Indicator No. 1 wascalibrated at 200°F water temperature and indicator No. 2 was calibrated at 100°F water temperature.
Assuming both indicators are on scale, which indicator will indicate the lower level?
A. Indicator 1 at all water temperatures
B. Indicator 2 at all water temperatures
C. Indicator 1 below 150°F, indicator 2 above 150°F
D. Indicator 2 below 150°F, indicator 1 above 150°F
ANSWER: B.

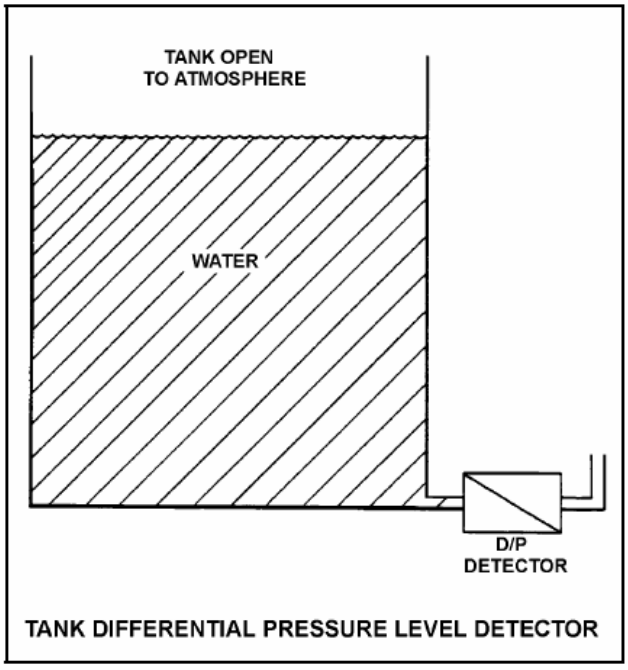
參考兩水槽之差壓液位指示器圖示（見下圖）。兩差壓液位計安裝於一大型儲水槽上。液位計1校正於200˚F，液位計2校正於100˚F。
假設兩個液位計的指示均在刻度範圍內(on scale)， 則下列何者液位指示較低？
A. 所有的水溫的液位計1
B. 所有的水溫的液位計2
C. 在150˚F以下的液位計1，在150˚F以上的液位計2
D. 在150˚F以下的液位計2，在150˚F以上的液位計1
答案： B.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B1809

Refer to the drawing of a tank differential pressure level detector that was recently calibrated at a tank water temperature of 80°F (see figure below).
If the mass of the water in the tank remains the same while the tank water temperature is raised from 80°F to 150°F, the indicated level will...
A. remain equal to actual level.
B. increase due to the expansion of the water.
C. remain the same.
D. decrease due to the expansion of the water.
ANSWER: C.

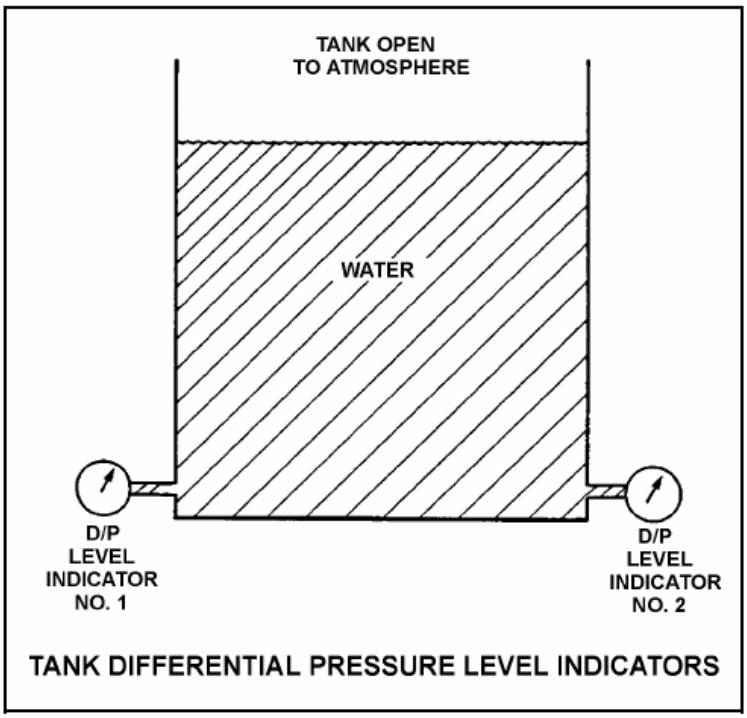
參考最近校正於水溫80°F之水槽之差壓液位感測計圖示（見下圖）。如果槽中水的質量維持不變，而水溫從80°F增加到150°F，則液位指示會
A. 等於實際液位，維持不變
B. 因為水的膨脹而上升
C. 維持不變
D. 因為水的膨脹而下降
答案： C.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B2408 (P2407)

Refer to the drawing of a water storage tank with two differential pressure (D/P) level indicators (see figure below).
Indicator 1 was calibrated at 180°F and indicator 2 was calibrated at 120°F. If tank water temperature is 150°F, then indicator...
A. 1 will read greater than indicator 2, and greater than actual level.
B. 1 will read greater than indicator 2, and less than actual level.
C. 2 will read greater than indicator 1, and greater than actual level.
D. 2 will read greater than indicator 1, and less than actual level.
ANSWER: A.

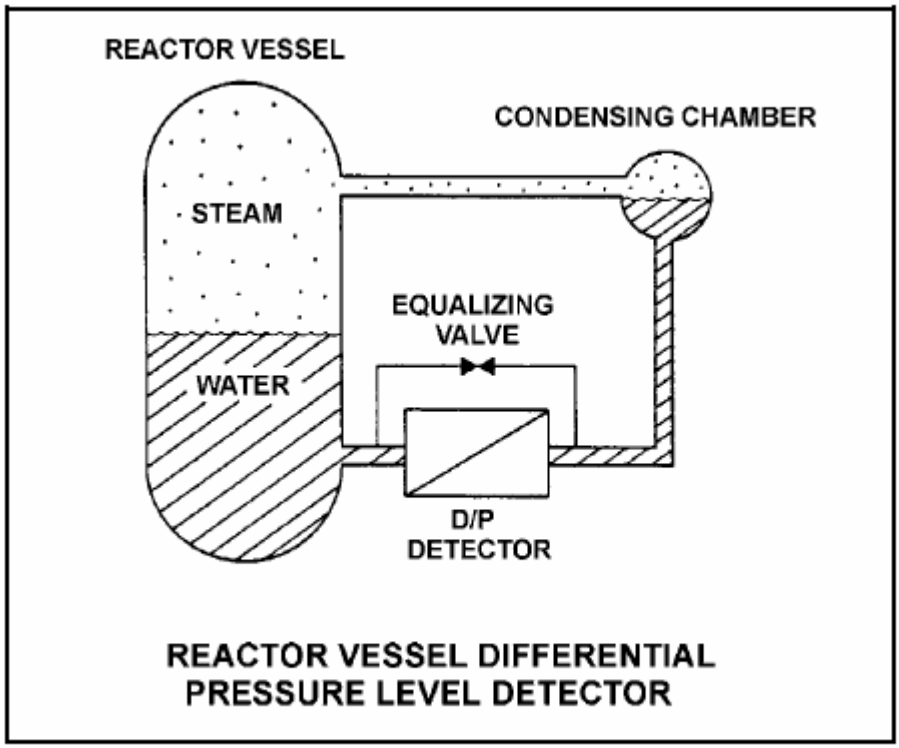
參考配有二差壓液位計之儲水槽圖示（見下圖）。液位計1校正於180˚F，液位計2校正於120˚F。如果槽中水溫為150˚F，則
A. 液位計1較液位計2會有較大讀數，並且大於實際液位
B. 液位計1較液位計2會有較大讀數，並且小於實際液位
C. 液位計2較液位計1會有較大讀數，並且大於實際液位
D. 液位計2較液位計1會有較大讀數，並且小於實際液位
答案： A.



科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B2409

Refer to the drawing of a reactor vessel differential pressure (D/P) level detector that was calibrated at 1,000 psia (see figure below).
A reactor vessel cooldown has resulted in a decrease in reactor vessel pressure from 1,000 psia to 500 psia over several hours. Without density compensation of the level instrumentation, at the end of the cooldown, reactor vessel level indication would indicate _____ than actual level because the density of the water in the _____ has changed significantly. (Assume the reference leg does not flash to steam.)
A. higher; reactor vessel
B. higher; reference leg
C. lower; reactor vessel
D. lower; reference leg
ANSWER: A.

參考一校正於1,000psia 之反應爐槽差壓液位感測計圖示（見下圖）。反應爐的冷卻導致反應爐的壓力在數小時內從1,000psia降到500psia。液位儀器並無密度補償，在冷卻結束時，反應爐的液位指示將會_____於實際液位，因為在_____中的水密度會有顯著改變。（假設參考柱並沒有閃化）
A. 較高，反應爐槽
B. 較高，參考柱
C. 較低，反應爐槽
D. 較低，參考柱
答案： A.

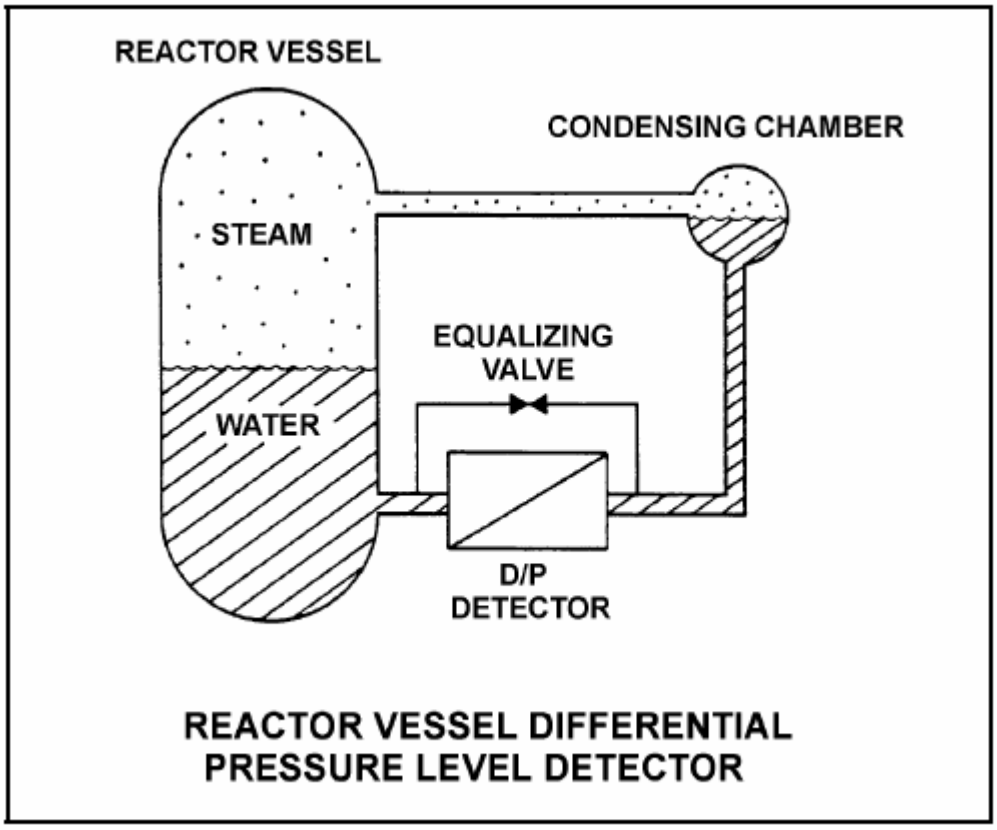


REACTOR VESSEL DIFFERENTIAL
PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B2509

Refer to the drawing of a reactor vessel differential pressure (D/P) level detector that was calibrated at 500 psia (see figure below).
A reactor vessel heatup has resulted in an increase in reactor vessel pressure from 500 psia to 1000 psia over several hours. Without density compensation of the level instrumentation, at the end of the heatup, reactor vessel level indication would indicate _____ than actual level because the density of the water in the _____ has changed significantly.
A. higher; reactor vessel
B. higher; reference leg
C. lower; reactor vessel
D. lower; reference leg
ANSWER: C.

參考一校正於500 psia之反應爐槽差壓液位感測計圖示（見下圖）。反應爐槽的升溫導致反應爐的壓力在數小時內從500 psia增加到1,000 psia。液位儀器並無密度補償，在升溫結束時，反應爐槽液位指示將會_____於實際液位，因為在_____中的水密度會有顯著改變。
A. 較高，反應爐槽
B. 較高，參考柱
C. 較低，反應爐槽
D. 較低，參考柱
答案： C.



REACTOR VESSEL DIFFERENTIAL
PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B3210

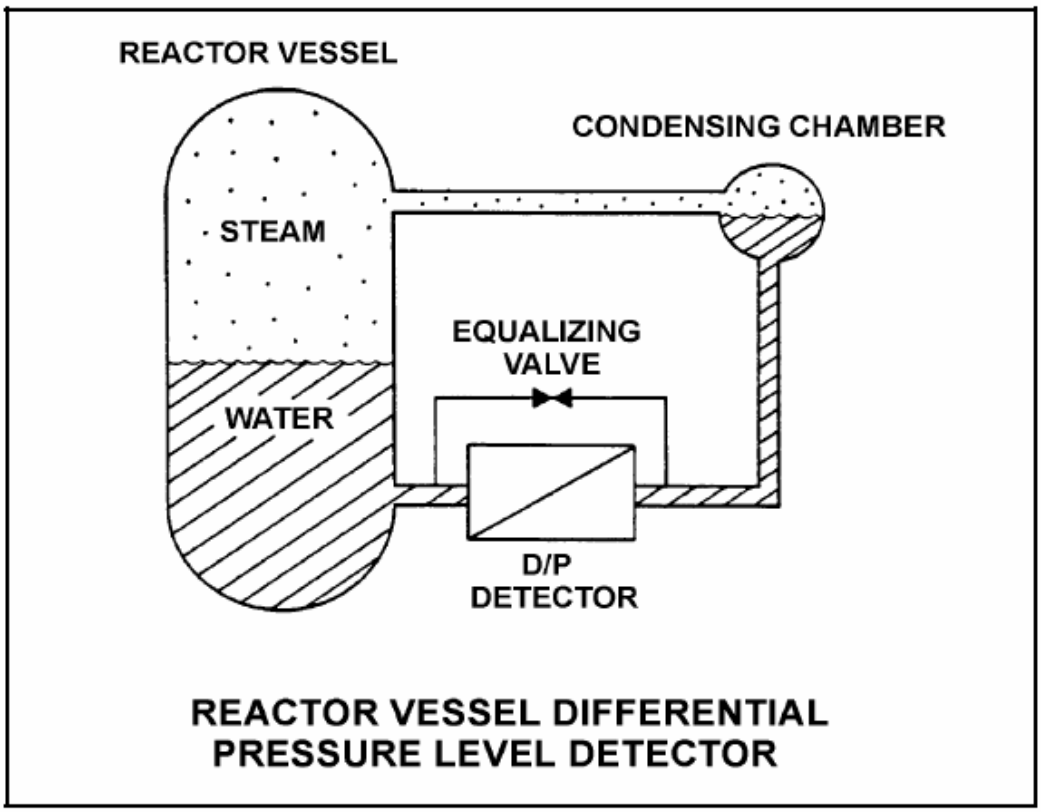
A reactor is currently shut down at 180°F. Reactor vessel (RV) level is being monitored using a normal at-power RV level instrument that was calibrated at normal plant operating conditions.
The RV level instrument indicates _____ than actual RV level because, compared to the calibration conditions, there has been a significant change in the density of the fluid in the
_____.
A. less; reference leg
B. less; reactor vessel
C. greater; reference leg
D. greater; reactor vessel
ANSWER: D.

反應器目前停機於180°F。反應爐的水位是利用校正於電廠正常運轉情況下的正常的反應爐水位儀器來監控。此反應爐水位儀器的指示_____實際反應爐水位之數值，因為與校正狀況相比，在_____中的液體密度有明顯改變。
A. 小於；參考柱
B. 小於；反應爐槽
C. 大於；參考柱
D. 大於；反應爐槽
答案： D.

科目： 291002
知能類： K1.06 [2.8/2.9]
序號： B3508 (P911)

Refer to the drawing of a reactor vessel (RV) differential pressure level detector (see figure below) that was recently calibrated at normal operating conditions.
With the reactor shut down, RV pressure was inadvertently decreased from 1,000 psig to 500 psig in 5 minutes due to operator error. RV pressure was stabilized at 500 psig, but during the pressure decrease a small amount of water in the condensing chamber flashed to steam. Assume the reference leg water remains subcooled, except for the small amount of water that flashes to steam
in the condensing chamber.
As a result of the small loss of condensing chamber water, RV level will indicate _____ than actual level; and as the condensing chamber refills, indicated level will _____.
A. higher; decrease and stabilize above the actual level
B. higher; decrease and stabilize below the actual level
C. lower; increase and stabilize above the actual level
D. lower; increase and stabilize below the actual level
ANSWER: A.

參考最近校正在正常運轉狀況下之反應爐差壓水位感測計圖示（見下圖）。由於反應器停機，反應爐壓力由於操作員的錯誤而意外地在5分鐘內從1,000psig降低到500 psig。反應爐的壓力維持穩定在500psig，但是在壓力降低的過程當中，凝結室中少量的水閃化為蒸汽。假設除了少量在凝結室中的水閃化為蒸汽外，參考柱中的水仍維持在過冷狀態。由於凝結室少量的水損失，反應爐水位的指示數值將_____實際液位；而當凝結室重新補水時，指示的水位將會_____。
A. 高於；降低並在實際液位以上達到穩定
B. 高於；降低並在實際液位以下達到穩定
C. 低於；升高並在實際液位以上達到穩定
D. 低於；升高並在實際液位以下達到穩定
答案： A.

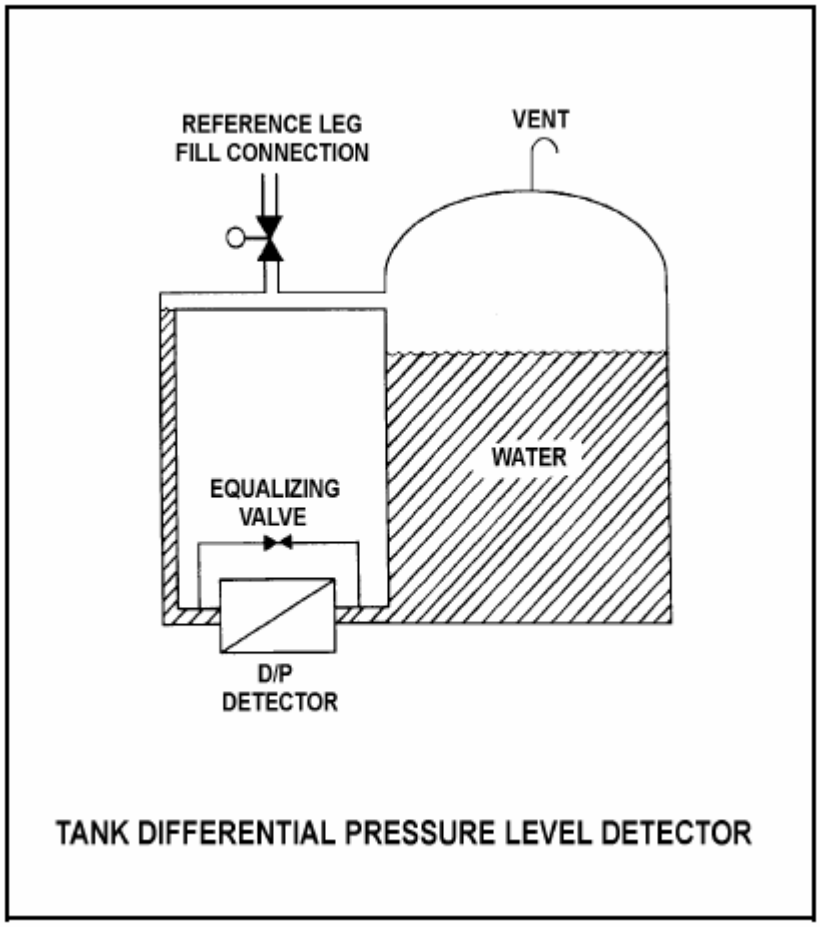


REACTOR VESSEL DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.07 [3.2/3.2]
序號： B910 (P910)

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure below).
The D/P sensed by the detector varies in the _____ direction as the temperature of the water in the tank if the _____ of the tank water is constant. (Assume reference leg and tank water temperatures are initially the same.)
A. same; level
B. inverse; level
C. same; mass
D. inverse; mass
ANSWER: A.

參考水槽之差壓液位感測計圖示（見下圖）。由感測計所量測的差壓會以_____方向隨著水槽中溫度而變化，如果槽中水之_____維持不變。（假設參考柱與槽中水溫自始相同。）
A. 同；液位
B. 反；液位
C. 同；質量
D. 反；質量
答案： A.



TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.07 [3.2/3.2]
序號： B1211 (P1807)

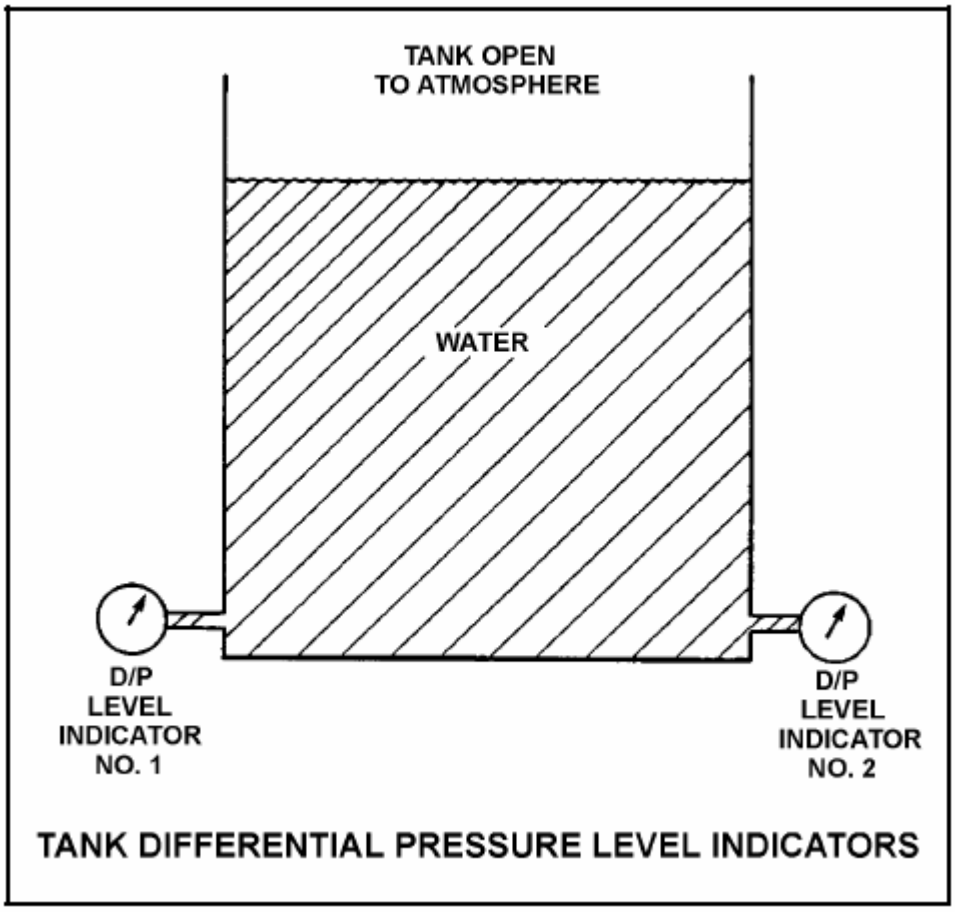
A cooling water system is cooling a lube oil heat exchanger. Cooling water system surge tank level is being measured using a differential pressure level detector that has been calibrated at the current water temperature in the tank. A leak in the heat exchanger results in lube oil collecting in the surge tank.
Assuming that the temperature of the contents in the surge tank does not change, indicated tank level will be _____ than actual tank level because lube oil is _____ than water.
A. higher; more dense
B. higher; less dense
C. lower; more dense
D. lower; less dense
ANSWER: D.

一冷卻水系統正冷卻一潤滑油熱交換器。冷卻水系統平壓槽液位利用一校正在目前的槽水溫之差壓液位感測計量測。熱交換器發生洩漏導致潤滑油累積在平壓槽中。假設平壓槽中內之溫度不變，則指示液位將會_____實際液位，因為潤滑油的密度較水的密度_____。
A. 高於，高
B. 高於，低
C. 低於，高
D. 低於，低
答案： D.

科目： 291002
知能類： K1.07 [3.2/3.2]
序號： B1507 (P1107)

Refer to the drawing of two tank differential pressure (D/P) level indicators (see figure below).
Two D/P level indicators are installed on a large water storage tank. Indicator 1 was calibrated at100^{o}F water temperature and indicator 2 was calibrated at 200^{o}F water temperature.
Assuming both indicators are on scale, which indicator will indicate the lower level?
A. Indicator 1 at all water temperatures
B. Indicator 2 at all water temperatures
C. Indicator 1 below 150^{o}F, indicator 2 above 150^{o}F
D. Indicator 2 below 150^{o}F, indicator 1 above 150^{o}F
ANSWER: A.

參考兩水槽之差壓液位計圖示(見下圖)。兩差壓液位計安裝在一大型儲水槽上。液位計1校正於100˚F水溫，液位計2校正於200˚F水溫。
假設兩液位計的指示均在刻度範圍內(on scale)，下列何者指示的液位較低？
A. 在所有水溫下的液位計1
B. 在所有水溫下的液位計2
C. 在150˚F以下的液位計1，在150˚F以上的液位計2
D. 在150˚F以下的液位計2，在150˚F以上的液位計1
E. 答案： A.



TANK DIFFERENTIAL PRESSURE LEVEL INDICATORS

科目： 291002
知能類： K1.07 [3.2/3.2]
序號： B1708

Many reactor water-level instruments are designed with a condensing chamber in the reference leg. The purpose of the condensing chamber is to...
A. maintain a constant water level in the reference leg during normal operations.
B. provide pressure compensation for the reactor pressure exerted on the variable leg.
C. prevent reference leg flashing during a rapid depressurization of the reactor vessel.
D. ensure the reference leg temperature remains close to the temperature of the variable leg.
ANSWER: A.

許多反應器水位儀器的參考柱設計上均有凝結室。此凝結室的目的是
A. 在正常運轉情況下維持參考柱固定的的水位
B. 對施加於可變柱的反應器壓力提供壓力補償
C. 預防在反應爐快速減壓過程當中參考柱發生閃化現象
D. 確保參考柱溫度維持接近可變柱的溫度
答案： A.

科目： 291002
知能類： K1.07 [3.2/3.2]
序號： B2014 (P2009)

Many reactor vessel water level instruments are designed with a condensing chamber in the reference leg. The purpose of the condensing chamber is to...

A. provide a steady source of makeup water to the reference leg during normal operations.
B. provide reference leg compensation for the reactor pressure exerted on the variable leg.
C. prevent reference leg flashing during a rapid depressurization of the reactor vessel.
D. ensure the reference leg temperature remains near the temperature of the water in the reactor vessel.

ANSWER: A.

許多反應器水位儀器的參考柱設計上均有凝結室。此凝結室的目的是

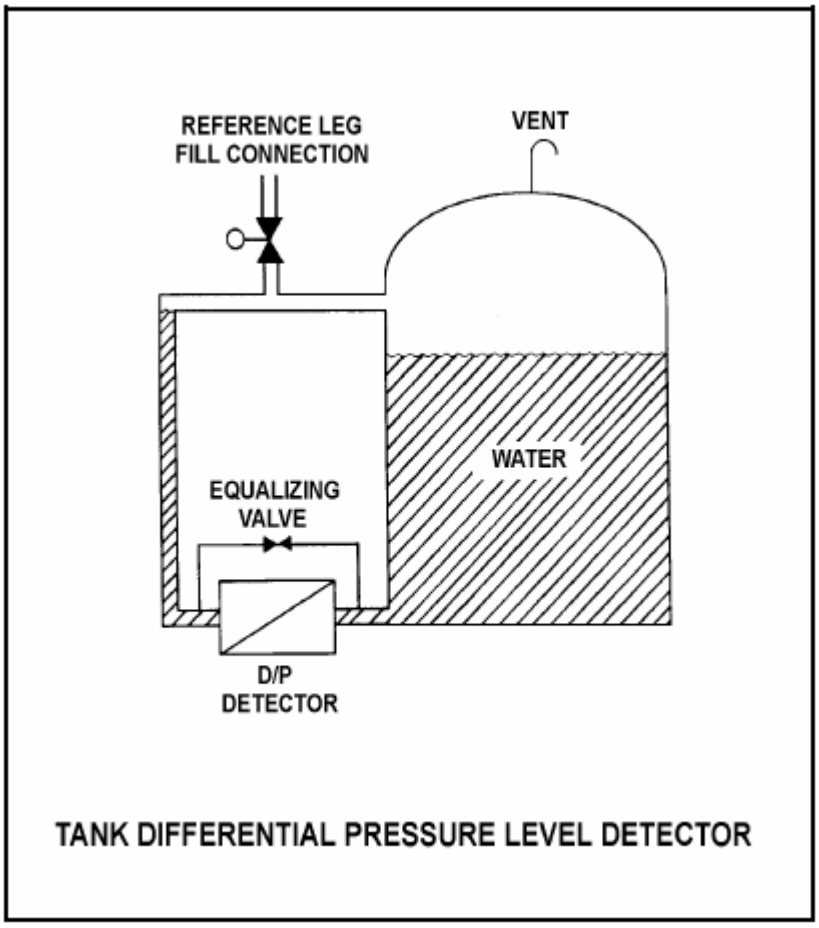
A. 在正常運轉情況下提供參考柱穩定的補給水來源
B. 對參考柱提供施加於可變柱的反應器壓力的補償
C. 預防在反應爐快速減壓過程中，參考柱發生閃化的現象
D. 確保參考柱溫度維持接近於反應爐的水溫

答案： A.

科目： 291002
知能類： K1.07 [3.2/3.2]
序號： B3010 (P3008)

Refer to the drawing of a tank with differential pressure (D/P) level detector (see figure below).
Assume the initial temperature of the reference leg and the water in the tank is 100^{o}F, and that reference leg temperature does not change.
If the temperature of the water in the tank increases by 20^{o}F, the D/P sensed by the detector will _____ as long as the water _____ is maintained constant.
A. increase; level
B. decrease; level
C. increase; mass
D. decrease; mass
ANSWER: A.

參考水槽之差壓液位感測計圖示（見下圖）。假設參考柱及槽中水溫的起始溫度為100˚F，而參考柱的溫度不變。如果槽中水溫增加20˚F，則由感測計所量測的差壓會_____，只要槽中水之_____維持不變。
A. 增加；液位
B. 減小；液位
C. 增加；質量
D. 減小；質量
答案： A.

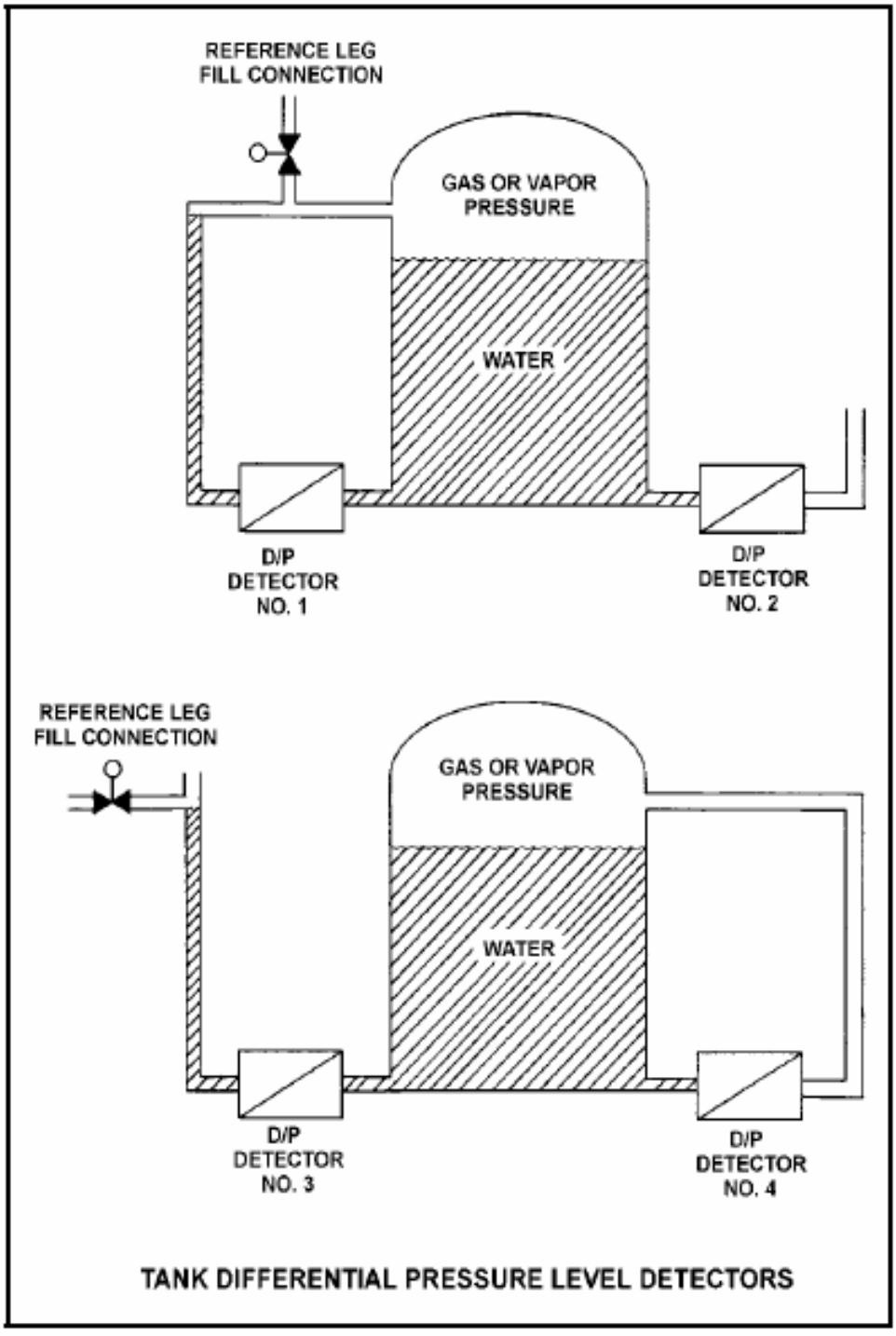


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B12 (P609)

Refer to the drawing of four tank differential pressure level detectors (see figure below).
The tanks are identical with equal water levels and both are pressurized to 20 psig. All detectors were calibrated at the current water temperature and 70°F external (ambient) temperature.
Which detectors will provide the most accurate level indication following an increase in external (ambient) temperature from 70°F to 100°F? (Assume tank contents temperatures and external pressure do not change.)
A. 1 and 3
B. 2 and 4
C. 1 and 4
D. 2 and 3
ANSWER: B.

參考四個水槽之差壓液位感測計圖示（見下圖）。槽中水位相等，兩者壓力均為20 psig.，所有感測計校正於目前的水溫以及70°F的外部（環境）溫度。在外部（環境)溫度從70°F增加到100°F時，下列何感測計將會提供最正確的液位指示？（假設槽中溫度以及外部壓力不變。）
A. 1與3
B. 2與4
C. 1與4
D. 2與3
答案： B.

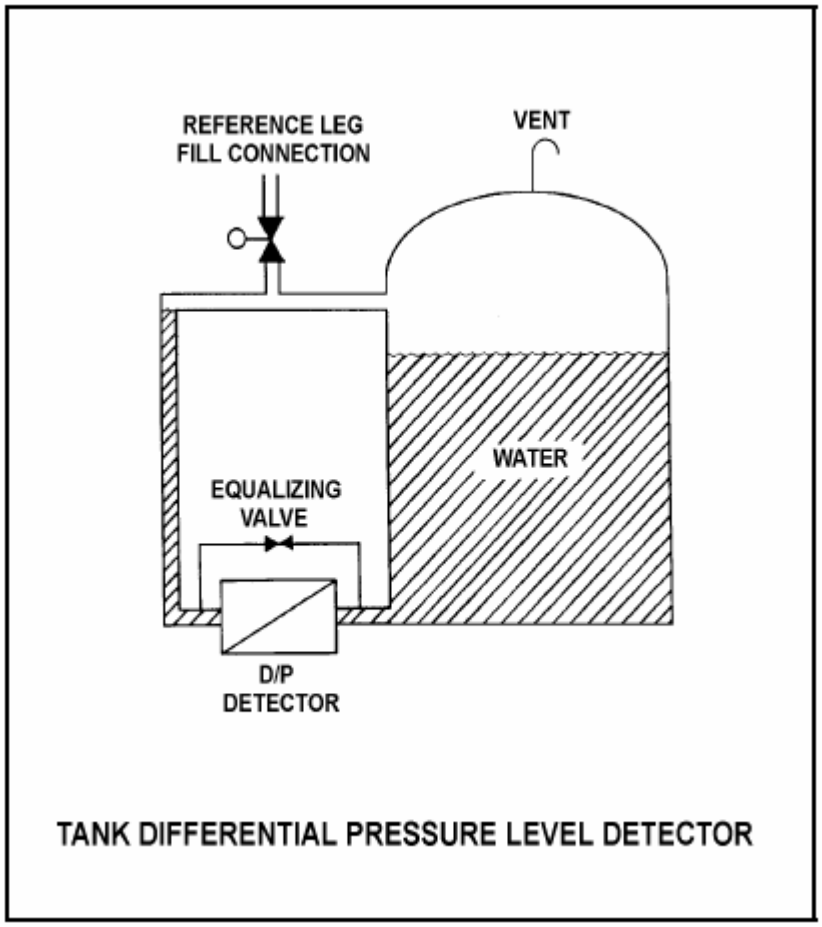


TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B308 (P309)

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure below).
Tank water level indication will be lower than actual level when reference leg temperature is _____ than calibration conditions or when there is a break in the _____ leg of the D/P detector.
A. less; reference
B. less; variable
C. greater; reference
D. greater; variable
ANSWER: B.

參考一水槽之差壓液位感測計（見下圖）。當參考柱溫度_____校正的狀況，或是當差壓感測計的_____有破裂時，槽水位指示將會較實際水位為低。
A. 低於；參考柱
B. 低於；可變柱
C. 高於；參考柱
D. 高於；可變柱
答案： B.

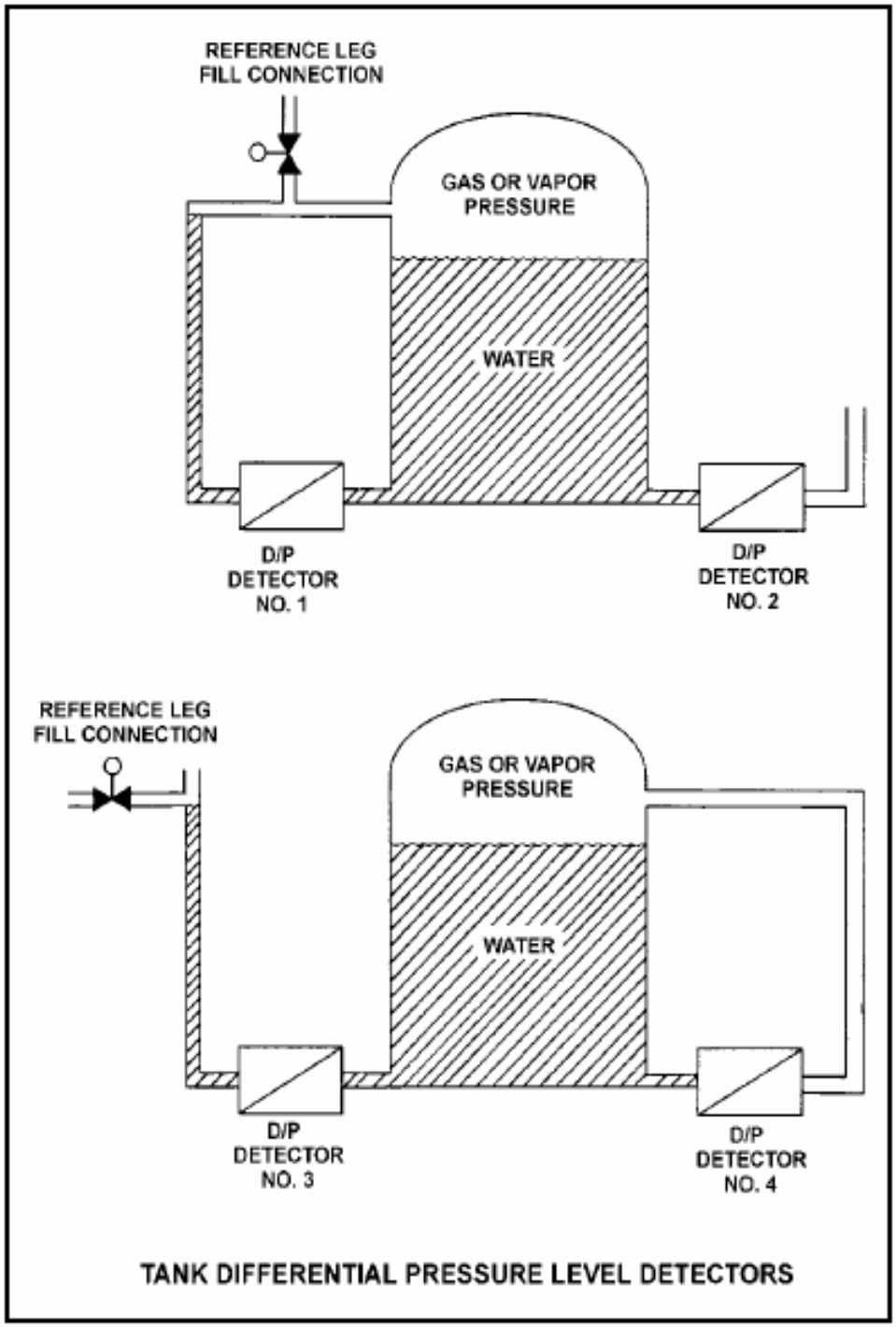


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B710 (P709)

Refer to the drawing of four differential pressure level detectors (see figure below). The tanks are identical and are being maintained at 17 psia and 70% water level (calibration conditions). They are contained in a building that is open to atmospheric pressure.
Which of the level detectors will provide the lowest level indication if atmospheric pressure decreases?
A. 1 and 3
B. 1 and 4
C. 2 and 3
D. 2 and 4
ANSWER: B.

參考四個水槽之差壓液位感測計圖示（見下圖）。水槽均相同，同時維持在17 psia與70%水位（校正狀況）。水槽置於承受大氣壓力的廠房內。如果大氣壓力下降，下列感測計何者將會提供最低的液位指示？
A. 1與3
B. 1與4
C. 2與3
D. 2與4
答案： B.

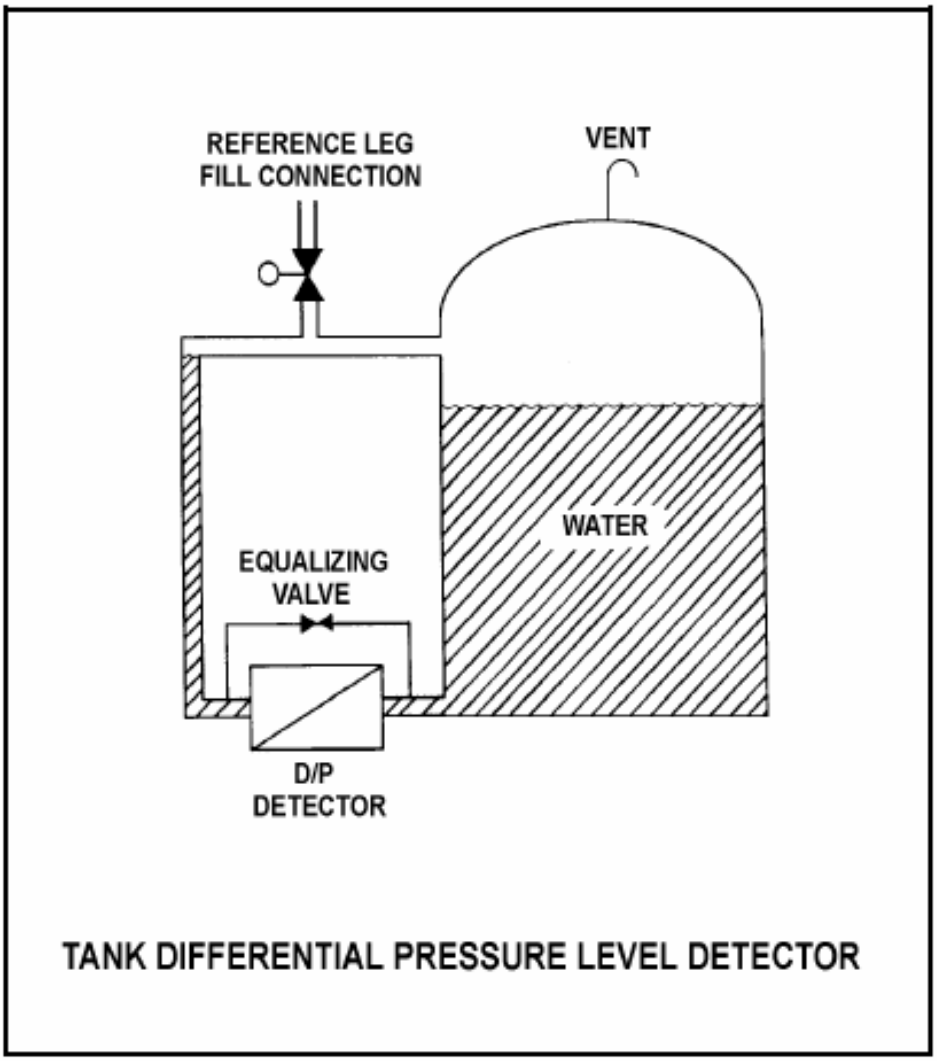


TANK DIFFERENTIAL PRESSURE LEVEL DETECTORS

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B1609 (P1108)

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure below).
The D/P level detector is being used to measure level in a vented tank inside the containment building. If building pressure decreases with no change in temperature, the associated level indication will...
A. decrease, then increase and stabilize at the actual level.
B. decrease and stabilize below the actual level.
C. increase and stabilize above the actual level.
D. remain at the actual level.
ANSWER: D.

參考水槽之差壓液位感測計圖示（見下圖）。此差壓液位感測計用以量測置於圍阻體廠房內之有通氣的水槽的液位。如果廠房壓力下降，但溫度不變，則對應之液位指示將
A. 降低，然後增加並在實際液位達到穩定
B. 降低，並且在實際液位以下達到穩定
C. 升高，並且在實際液位以上達到穩定
D. 維持在實際液位
答案： D.

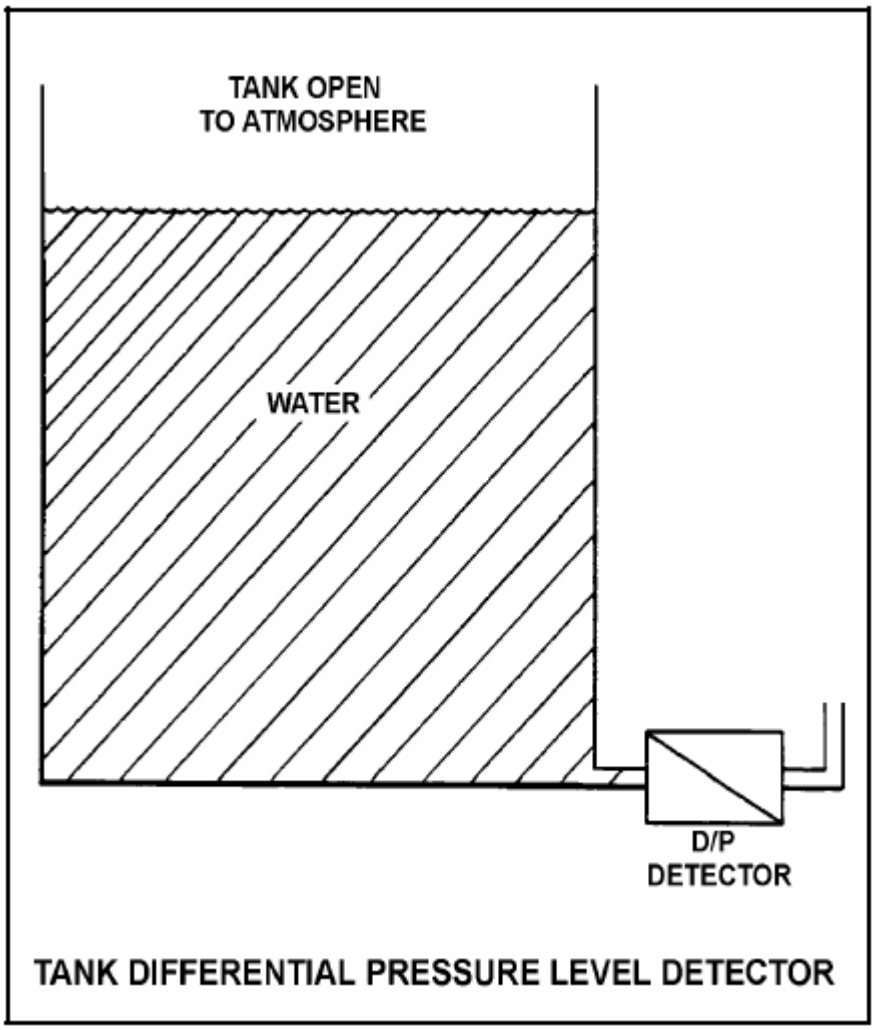


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B1909 (P1008)

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure below).
The level detector is being used in a level control system that is calibrated to maintain tank level at 75% at the current water temperature of 120°F. If water temperature gradually decreases and stabilizes at 90°F, actual tank level will...
A. remain at 75%.
B. increase and stabilize above 75%.
C. oscillate around 75%.
D. decrease and stabilize below 75%.
ANSWER: D.

參考差壓液位感測計圖示（見下圖）。校正於目前120°F水溫的液位感測計，用於一水位控制系統，以維持75%的槽位。如果水溫慢慢下降，並在90°F達到穩定，則槽的實際水位將會
A. 維持在75%
B. 升高並在75%以上達到穩定
C. 在75%附近震盪
D. 降低並在75%以下達到穩定
答案： D.

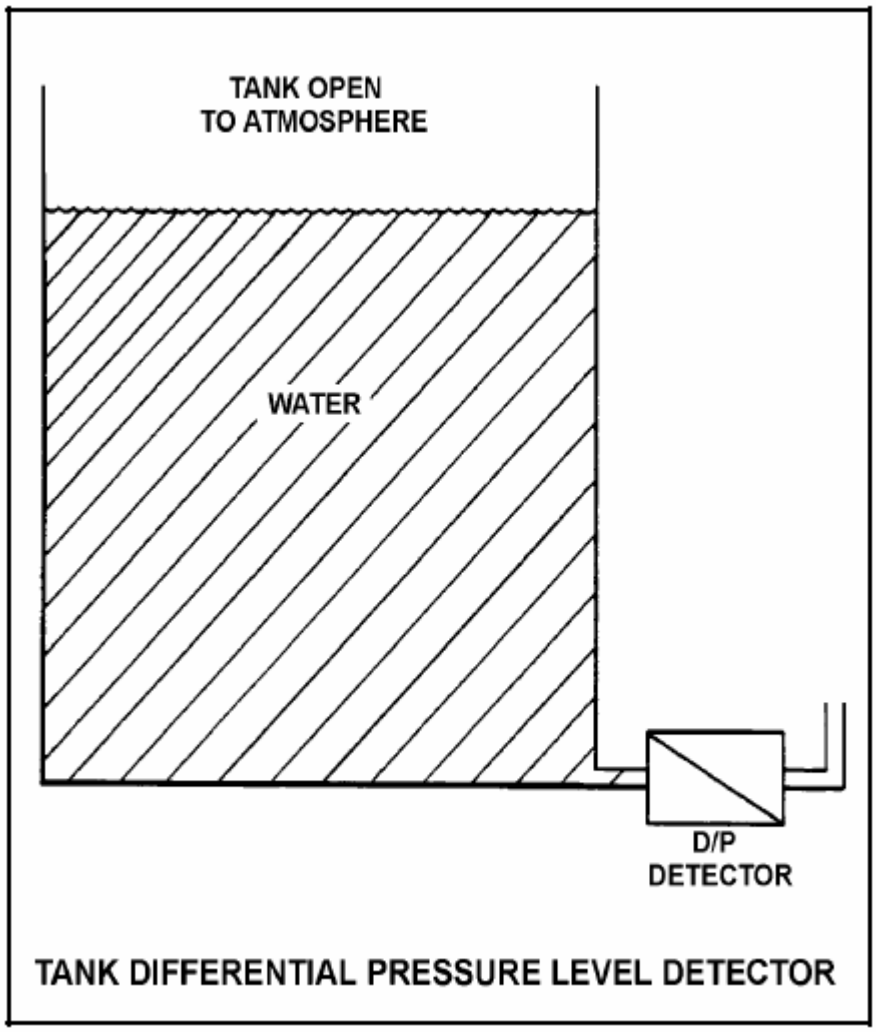


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B2210

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure below).
The level detector is being used in a level control system that is calibrated to maintain tank level at 80% at the current water temperature of 70°F. If water temperature gradually increases and stabilizes at 90°F, the level control system will cause actual tank level to...
A. remain at 80%.
B. increase and stabilize above 80%.
C. oscillate around 80%.
D. decrease and stabilize below 80%.
ANSWER: B.

參考差壓液位感測計圖示（見下圖）。校正於目前70°F水溫的液位感測計用於一液位控制系統，以維持80%的槽位。如果水溫慢慢上升，並在90°F 達到穩定，則液位控制系統將會導致槽的實際水位
A. 維持在80%
B. 升高並在80%以上達到穩定
C. 在80%附近震盪
D. 降低並在80%以下達到穩定
答案： B.

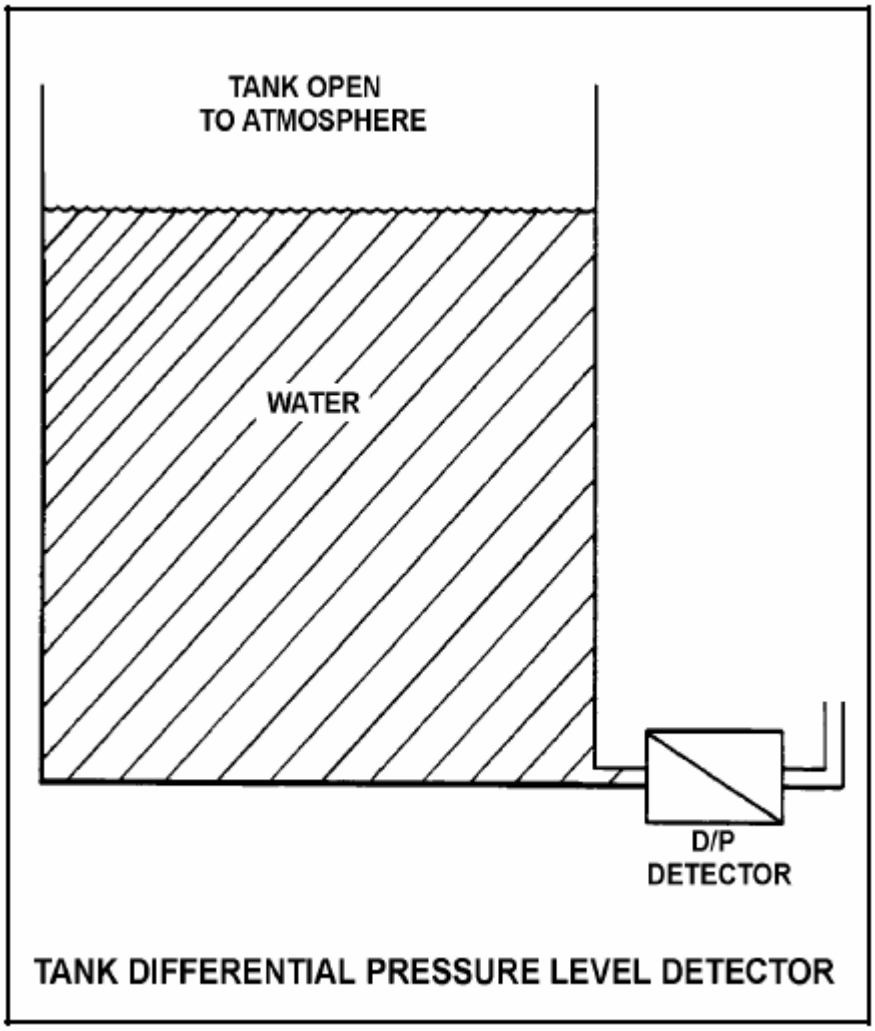


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B2609 (P708)

Refer to the drawing of a tank differential pressure (D/P) level detector (see figure below).
The level detector is being used in a level control system that is calibrated to maintain tank level at 75% at the current water temperature of 90°F. If water temperature gradually increases and stabilizes at 120°F, the level control system will cause actual tank level to...
A. remain at 75%.
B. increase and stabilize above 75%.
C. oscillate around 75%.
D. decrease and stabilize below 75%.
ANSWER: B.

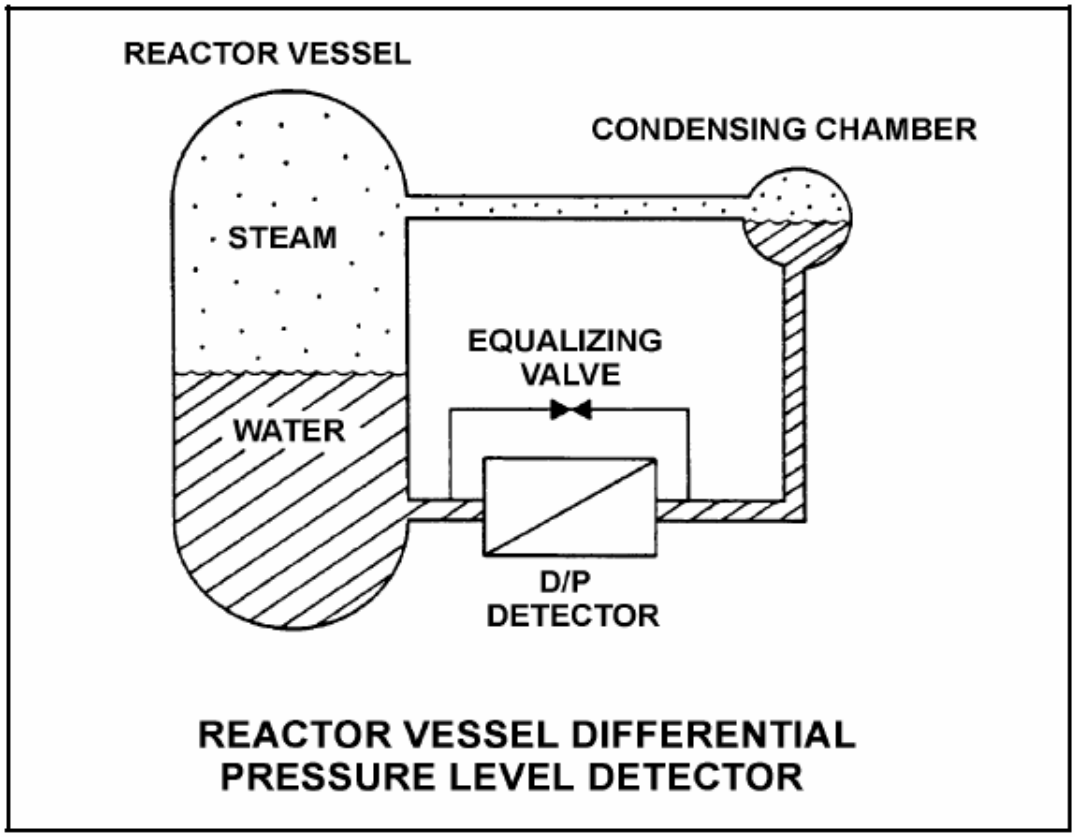
參考差壓液位感測計圖示（見下圖）。校正於目前90°F水溫的液位感測計用於一液位控制系統，以維持75%的槽位。如果水溫慢慢增加，並在120°F達到穩定，則液位控制系統將會導致槽的實際水位
A. 維持在75%
B. 升高並在75%以上達到穩定
C. 在75%附近震盪
D. 降低並在75%以下達到穩定
答案： B.


TANK OPEN
TO ATMOSPHERE
WATER
D/P
DETECTOR
TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B2808 (P2810)

Refer to the drawing of a reactor vessel level detection system (see figure below). The differential pressure (D/P) detector was calibrated while the plant was at normal operating conditions.
With the plant initially at normal operating conditions, a reactor vessel head leak has occurred.
The reactor pressure has decreased by 300 psia, and ambient air temperature surrounding the reference leg has increased by 80°F, where these parameters have stabilized.
If the actual reactor vessel level is 6 feet above the fuel, the reduced reactor vessel pressure will tend to make the indicated reactor vessel level read _____ than actual; the increased reference leg temperature will tend to make the indicated reactor vessel level read _____ than actual.
A. higher; higher
B. higher; lower
C. lower; higher
D. lower; lower
ANSWER: A.

參考反應統液位感測系統圖示（見下圖）。差壓感測計校正於電廠的正常運轉環境。電廠在正常運轉情況下，反應爐蓋發生洩漏。在反應壓力降低300 psia，而參考柱週遭的環境溫度增加80°F時，這些參數達於穩定狀態。如果實際反應爐的水位為燃料之上6英呎，則下降的反應爐壓力將會使得指示的反應爐液位讀數_____實際值；而增加之參考柱溫度將會使得指示之反應爐液位讀數_____實際值。
A. 高於；高於
B. 高於；低於
C. 低於；高於
D. 低於；低於
答案： A.

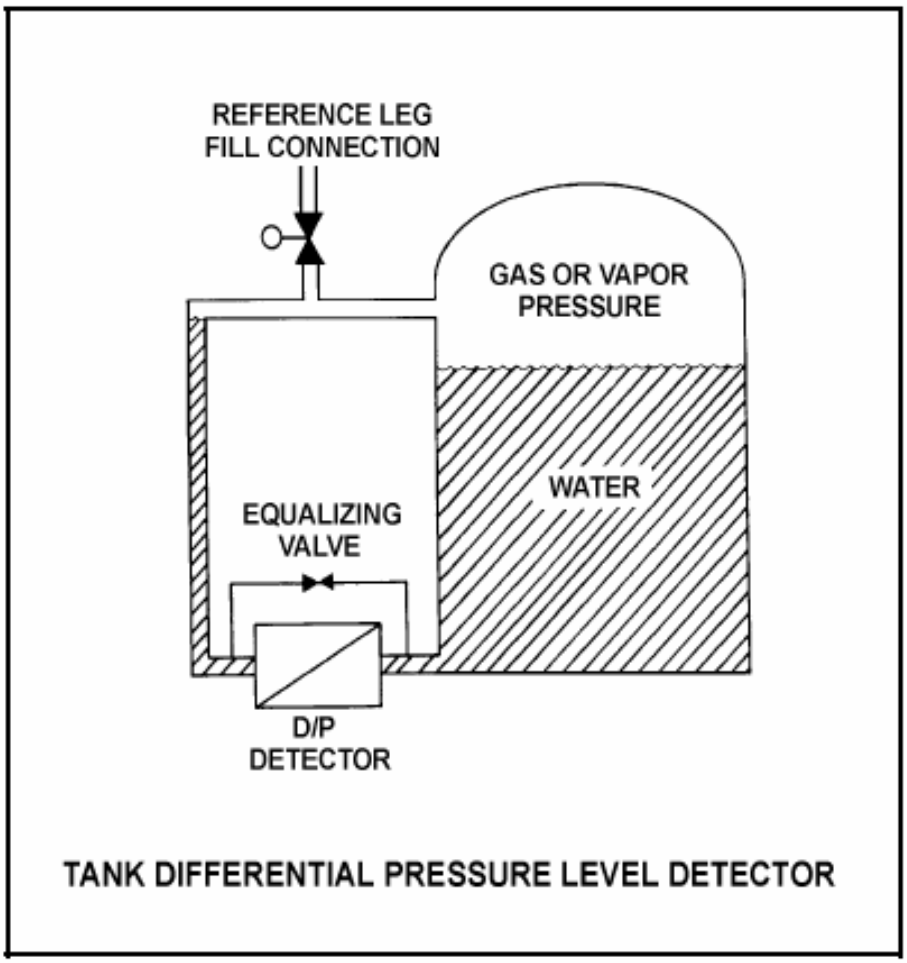


REACTOR VESSEL DIFFERENTIAL
PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B3408 (P3407)

Refer to the drawing of a tank with a differential pressure (D/P) level detector (see figure below).
Assume that the initial temperature of the reference leg and the water in the tank are the same, and that reference leg temperature and level do not change.
The level detector is being used in a level control system (not shown) that is calibrated to maintain tank level at 75% at the current tank water temperature (70^{o}F) and pressure (5 psig).
If the tank water temperature remains constant, but the tank pressure is increased by 10 psig, the level control system will cause actual tank level to...
A. remain at 75%.
B. increase and stabilize above 75%.
C. oscillate around 75%.
D. decrease and stabilize below 75%.
ANSWER: A.

參考水槽之差壓液位感測計圖示（見下圖）。假設參考柱起始溫度以及槽中水溫相等，而參考柱的溫度與液位不變。此液位感測計校正於目前槽中水溫 (70°F) 與壓力(5 psig)，被用於一液位控制系統中（圖中未顯示），以維持槽中的液位。如果槽的水溫維持固定，但是槽壓增加10 psig，則此液位控制系統將會導致實際槽中的液位
A. 維持在75%
B. 升高並在75%以上達到穩定
C. 在75%附近震盪
D. 降低並在75%以下達到穩定
答案： A.

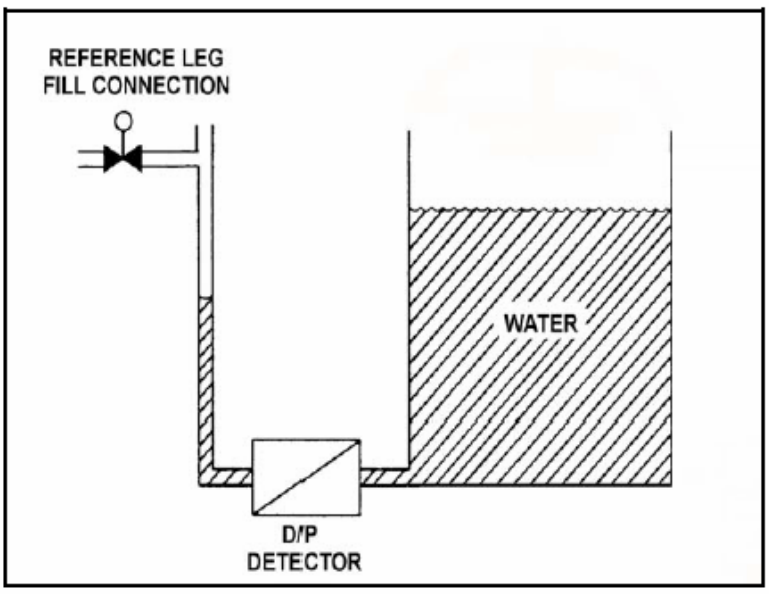


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.08 [2.8/2.9]
序號： B4006 (P4004)

Refer to the drawing of an open water storage tank with a differential pressure (D/P) level detector (see figure below).
The level instrument has just been calibrated to indicate actual tank water level.
Assume that tank water temperature and level remain constant. If the reference leg temperature increases by 20°F, indicated tank water level will...
A. be unpredictable.
B. equal the actual level.
C. read less than the actual level.
D. read greater than the actual level.
ANSWER: B.

參考一配有差壓液位感測計之開放式儲水槽圖示（見下圖）。該液位計剛經過校正。假設槽的水溫與液位維持不變。如果參考柱溫度增加 20°F，則槽之指示水位將會
A. 無法預測
B. 等於實際液位
C. 讀數小於實際液位
D. 讀數大於實際液位
答案： B.



科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B165

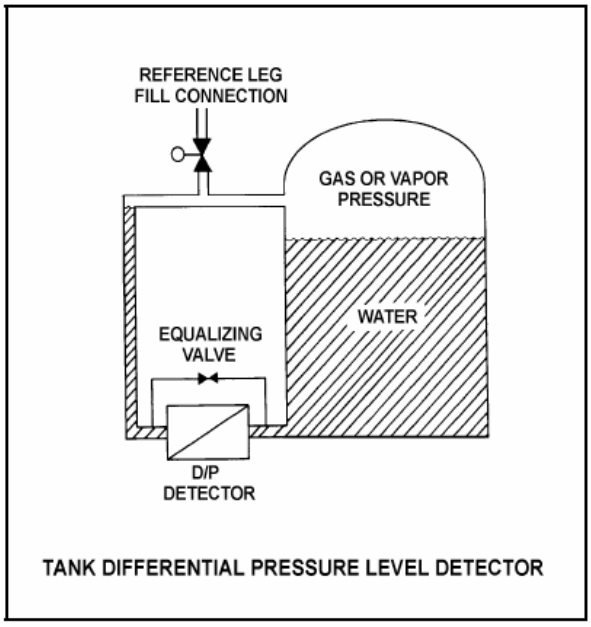
Reactor feedwater flow and vessel level detectors use differential pressure (D/P) cells to measure flow and level. If a level D/P cell diaphragm fails, the level indication...
A. will go to 0.
B. will slowly move to 50% (midrange).
C. will indicate 100% (full range).
D. remains the same.
ANSWER: C.

反應器飼水流量與反應爐水位控制器都是使用差壓室以測量流量與液位。如果水位的差壓室膜片破裂，則水位指示會
A. 變為0
B. 緩慢地指到50%（中間數值）
C. 指示100%(全域)
D. 維持不變
答案： C.

科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B207

Refer to the drawing of a tank differential pressure (D/P) level detector connected to a pressurized tank (see figure below).
Which one of the following failures of a wet reference leg D/P level detector will cause its level indicator to indicate the lowest stable water level? (Assume no operator action and no tank makeup.)
A. The tank level sensing line ruptures at the detector.
B. The reference leg ruptures at the detector.
C. The gas or vapor space ruptures.
D. The D/P cell diaphragm ruptures.
ANSWER: A.

參考一連接於加壓槽之水槽之差壓液位計圖示（見下圖）。
下列何種濕式參考柱差壓液位計失效情況，將會導致其液位計指示最低之穩定水位（假設無操作員採取對策，亦無補水）。
A. 水槽液位感測管於液位計處破裂
B. 參考柱於液位計處破裂
C. 氣體或蒸汽的空間破裂
D. 差壓室膜片破裂
答案： A.

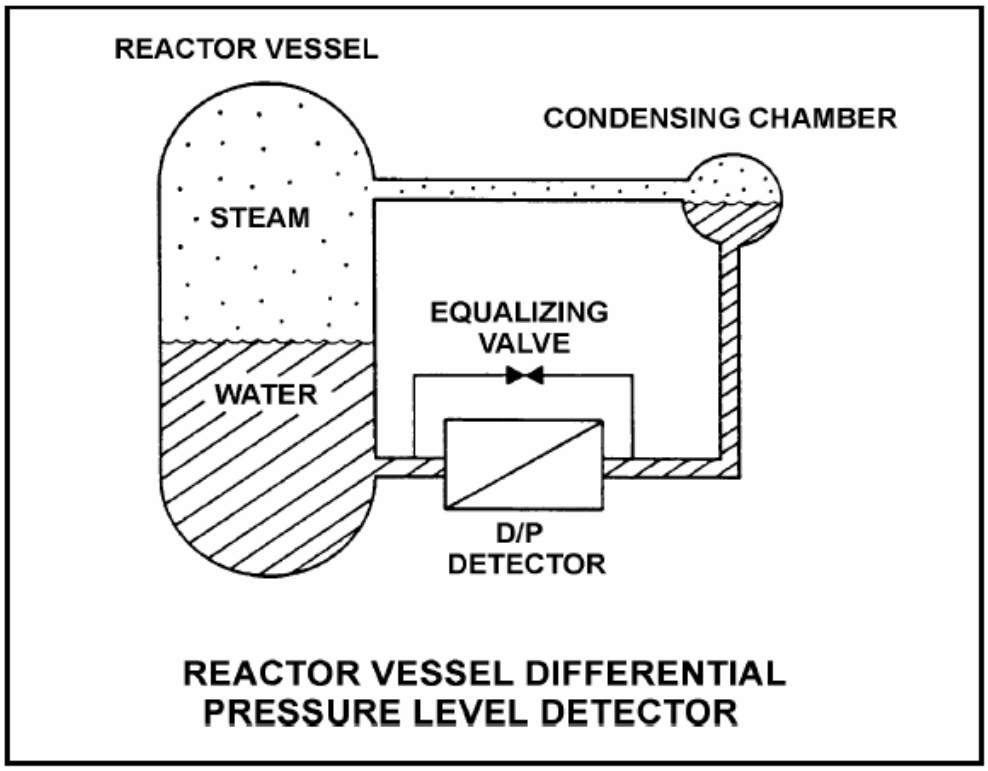


TANK DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B1010 (P209)

Refer to the drawing of a reactor vessel differential pressure (D/P) level detector (see figure below).
The D/P detector was calibrated at the current conditions. Which one of the following will cause the level instrument to indicate lower than actual level? (Assume actual level remains the same.)
A. The variable leg ruptures.
B. The equalizing valve is opened.
C. The reference leg temperature increases.
D. The D/P cell diaphragm ruptures.
ANSWER: A.

參考反應器槽差壓液位偵檢器圖示（見下圖）。此差壓偵檢器在目前狀況下接受校正。下列何者將會導致此液位設備指示低於實際液位？（假設液位維持不變。）
A. 變動柱破裂
B. 平衡閥 (Equating valve)開啟
C. 參考柱溫度增加
D. 差壓室膜片破裂
答案： A.

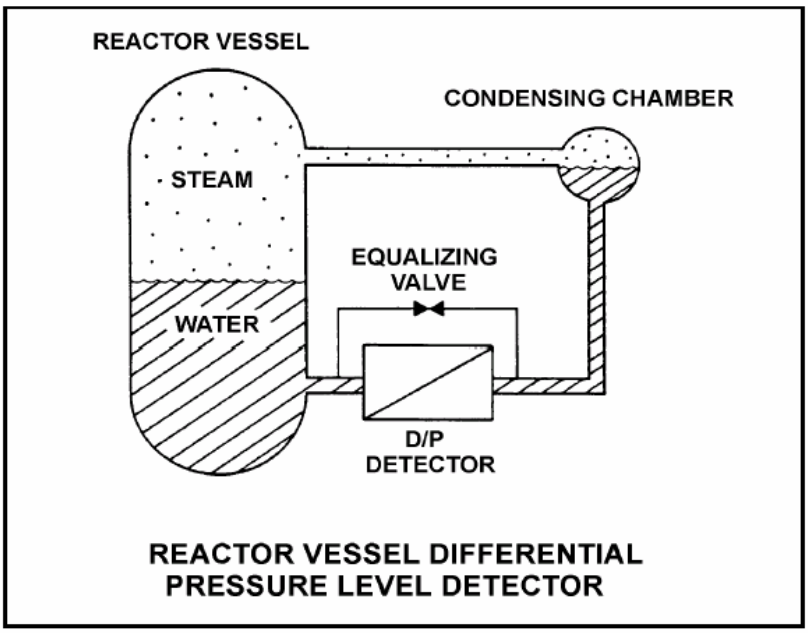


REACTOR VESSEL DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B1212 (P2408)

Refer to the drawing of a reactor vessel (RV) with a differential pressure (D/P) level detector (see figure below).
Which one of the following events will result in a reactor vessel level indication that is greater than actual level?
A. The RV pressure increases by 50 psia.
B. The variable leg breaks and completely drains.
C. A portion of the reference leg water flashes to steam.
D. The temperature surrounding the RV and reference leg decreases by 30°F.
ANSWER: C.

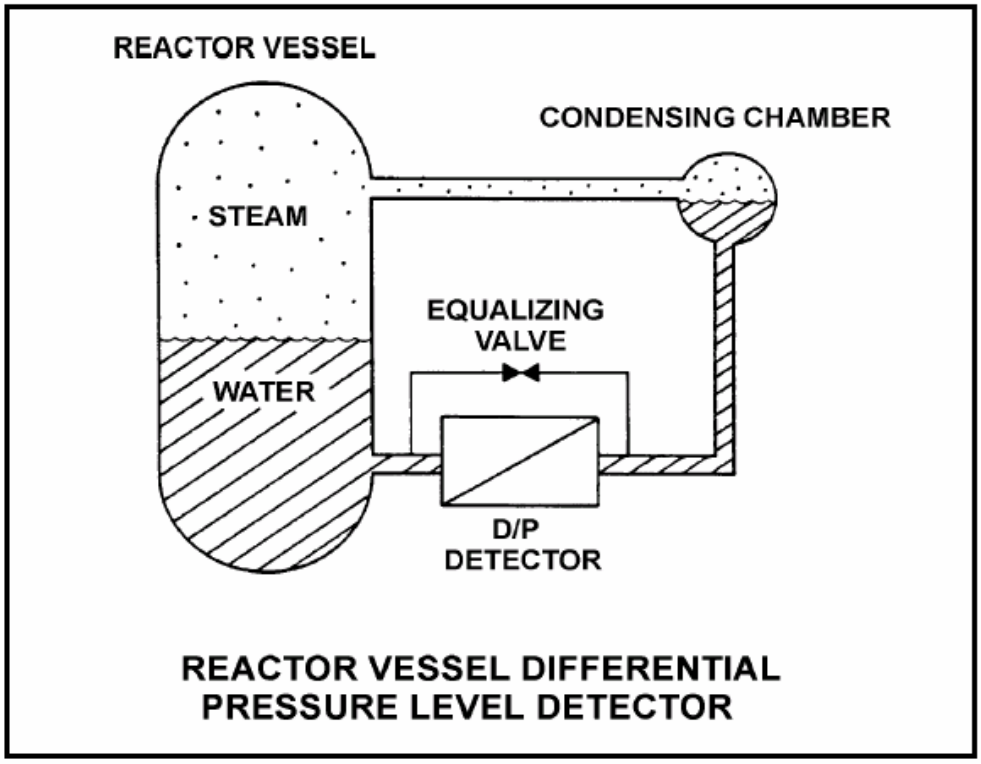
參考反應管氣槽壓液位偵檢器圖示（見下圖）。下列何者會導致反應器槽液位指示大於實際液位？
A. 反應器槽壓力增加 50 psia
B. 破裂，並且完全漏光
C. 一部份的水分閃化 (flash) 成蒸汽
D. 反應器槽周圍以及參考柱溫度減少30˚F
答案： C.



科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B1308

Refer to the drawing of a reactor vessel differential pressure (D/P) level detector (see figure below).
Which one of the following will result in the lowest reactor vessel level indication?
A. The reactor pressure increases by 100 psig.
B. The D/P cell equalizing valve leaks by.
C. The reference leg flashes to steam.
D. The temperature of the reference leg decreases by 20°F.
ANSWER: D.

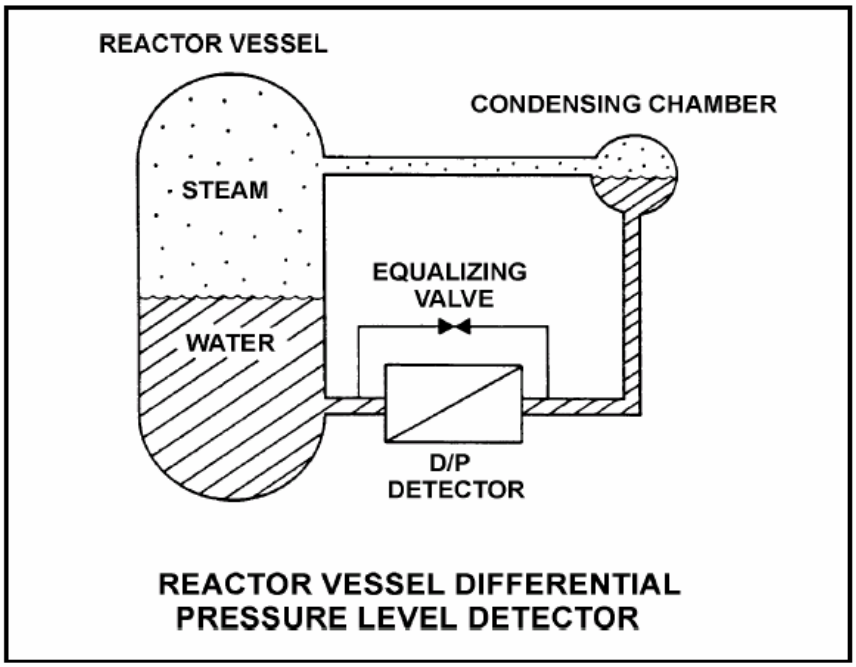
參考反應器槽差壓液位偵檢器圖示（見下圖）。下列何者會導致最低的反應器槽液位指示值？
A. 反應器壓力增加100 psig
B. 差壓計平衡閥 (equating valve)洩漏
C. 參考柱閃化成蒸汽
D. 參考柱的溫度增加 20°F
答案： D.



科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B1410 (P2609)

Refer to the drawing of a reactor vessel differential pressure (D/P) level detector (see figure below).
Which one of the following events will result in a reactor vessel level indication that is greater than actual level?
A. The external pressure surrounding the D/P detector decreases by 2 psi.
B. Reactor vessel pressure increases by 10 psi with no change in actual water level.
C. Actual vessel level increases by 6 inches.
D. The temperature surrounding the reference leg increases by 20°F.
ANSWER: D.

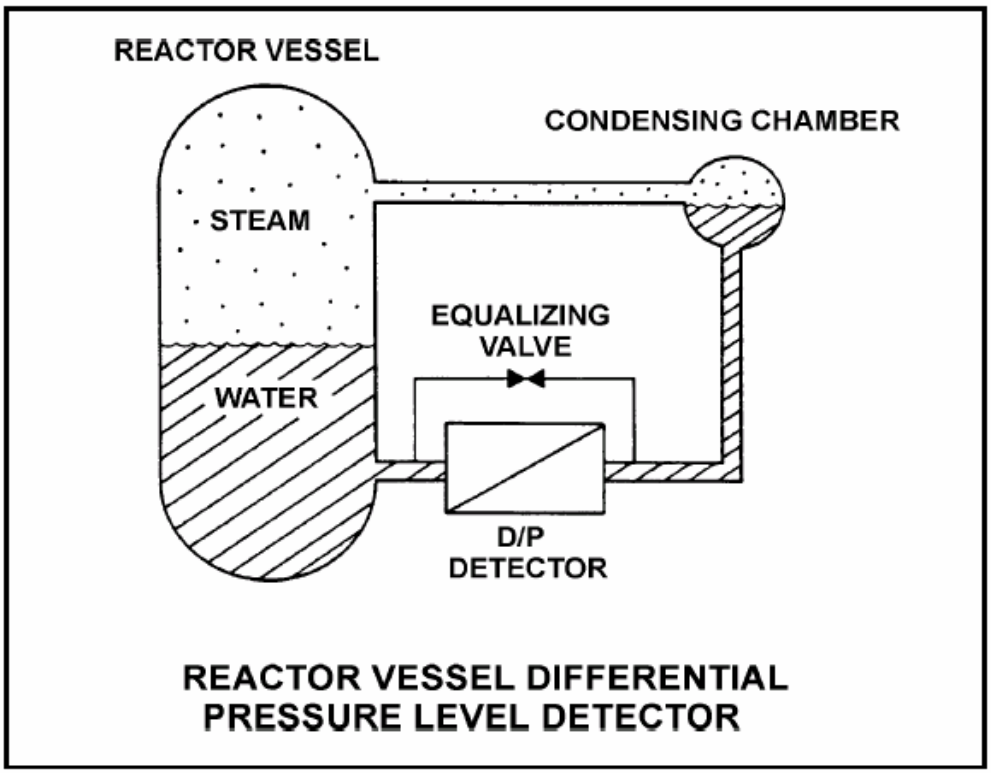
參考反應器槽差壓液位偵檢器圖示（見下圖）。下列何者會導致反應器槽液位指示大於實際液位？
A. 差壓偵檢器周圍之外部壓力減少2 psi。
B. 於實際水位不變情況下，反應器槽壓力增加10 psi
C. 實際反應器槽液位增加6吋
D. 參考柱周圍溫度增加20°F
答案： D.



科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B2308 (P2308)

Refer to the drawing of a reactor vessel differential pressure (D/P) level detector that was calibrated at normal operating conditions (see figure below).
A reactor vessel cooldown has resulted in a decrease in reactor vessel pressure from 900 psia to 400 psia in one hour. Without density compensation of the level instrumentation, at the end of the cooldown, reactor vessel level indication would indicate _____ than actual level because the density of the water in the _____ has changed significantly.
A. higher; reference leg
B. higher; reactor vessel
C. lower; reference leg
D. lower; reactor vessel
ANSWER: B.

參考在正常運轉狀況下經過校正之反應器槽差壓液位偵檢器圖示（見下圖）。反應器槽因冷卻導致反應器槽壓力從 900psia 在一小時內降到 400psia。液位設備並無密度補償，在冷卻結束時，反應器槽液位之指示值將會_____實際液位，因為在_____中的水密度會有顯著改變。
A. 高於，參考柱
B. 高於，反應器槽
C. 低於，參考柱
D. 低於，反應器槽
答案： B.

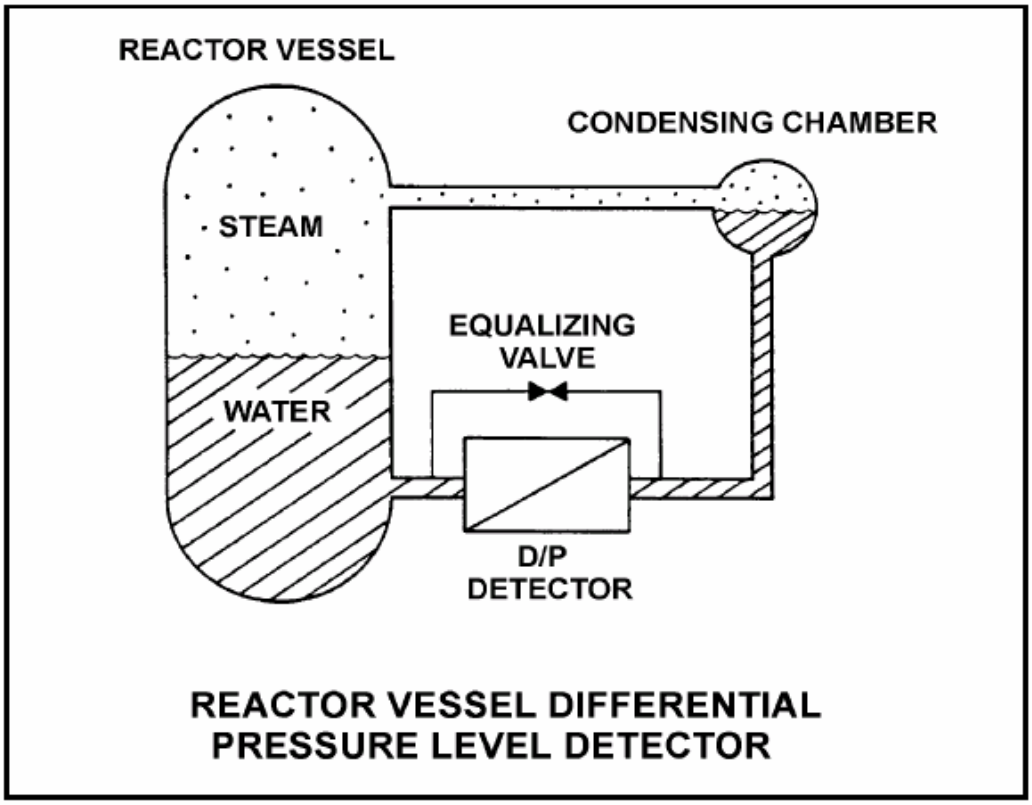


REACTOR VESSEL DIFFERENTIAL
PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B2709 (P2708)

Refer to the drawing of a reactor vessel (RV) differential pressure (D/P) level detector (see figure below).
The reactor vessel is supplying steam at normal operating temperature and pressure with accurate level indication. Which one of the following events will result in a vessel level indication that is less than actual level?
A. Actual RV water level decreases by 6 inches.
B. The external pressure surrounding the D/P detector decreases by 2 psi.
C. The temperature surrounding the reference leg increases by 20^{o}F.
D. RV pressure increases by 50 psi with no change in actual water level.
ANSWER: D.

參考反應管器槽壓液位偵檢器圖示（見下圖）。反應器槽在正常操作溫度、壓力與正確液位指示下，提供蒸汽。下列何者將會導致反應器槽液位指示值小於實際液位？
A. 實際反應器槽水液位減少6吋。
B. 差壓偵檢器周圍之外部壓力減少2 psi。
C. 參考柱周圍之溫度增加20°F。
D. 但實際水位不變，反應器槽壓力增加50 psi。
答案： D.



REACTOR VESSEL DIFFERENTIAL PRESSURE LEVEL DETECTOR

科目： 291002
知能類： K1.09 [3.3/3.3]
序號： B3808

Refer to the drawing of a reactor vessel (RV) differential pressure (D/P) level detector (see figure below).A reactor is shutdown with the reactor coolant system being maintained at 100 psia. The level detector has just been calibrated. Suddenly a rupture in the condensing chamber of the level detector results in a rapid drop of the condensing chamber pressure to atmospheric pressure.
Given the following current conditions:

- The condensing chamber is at atmospheric pressure.
- RV pressure is 98 psia and slowly decreasing.
- Bulk reference leg temperature is 120^{o}F.
- Actual RV level has not changed significantly.

Which one of the following describes the current RV level indication from the detector?

A. Offscale low because the bulk of the water in the reference leg has flashed to steam.
B. Offscale high because the bulk of the water in the reference leg has flashed to steam.
C. Offscale low because the static pressure on the reference leg is much less than the static pressure in the RV.
D. Offscale high because the static pressure on the reference leg is much less than the static pressure in the RV.

ANSWER: D.

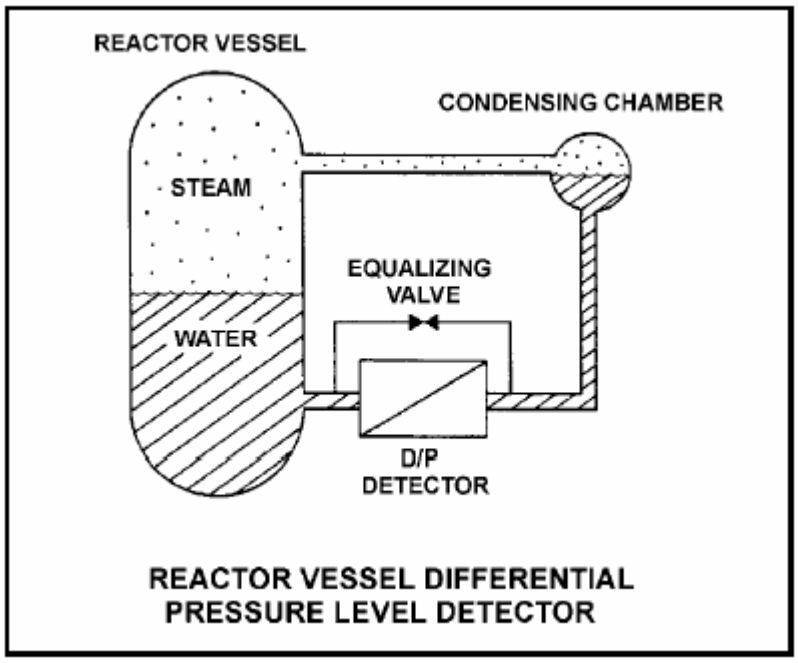
參考反應管差壓液位偵檢器圖示(見下圖)。一反應迄於反應冷媒系統維持在100 psia情況下停機。液位偵檢器經過校准不久。液位偵檢器冷凝室 (condensing chamber) 突然發生破裂，導致冷凝室壓力快速降至大氣壓力。
假設以下為目前情況：

- 冷凝室維持於大氣壓力
- 反應管壓力為 98 psia 並緩慢下降
- Bulk reference leg 溫度為 120 ˚F
- 實際反應管液位沒有顯著改變

下列何者描述了由偵檢器所指示的反應器液位狀況？

A. 低值失衡，因為reference leg 中的大部分水驟沸成蒸汽
B. 高值失衡，因為reference leg 中的大部分水驟沸成蒸汽

C. 低值失衡，因為reference leg 中的靜壓遠小於反應管中之靜壓
D. 高值失衡，因為reference leg 中的靜壓遠小於反應管中之靜壓
答案： D.



科目： 291002
知能類： K1.10 [2.4/2.5]
序號： B410 (P413)

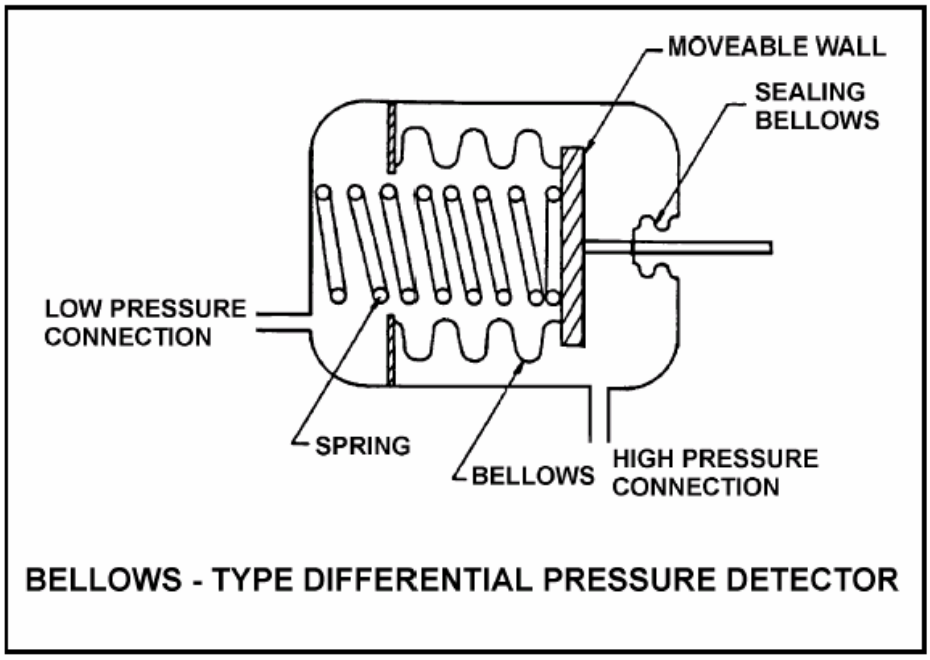
If the pressure sensed by a bourdon tube increases, the curvature of the detector will _____ because of the greatest force being applied to the _____ curve of the detector.
A. increase; inner
B. decrease; inner
C. increase; outer
D. decrease; outer
ANSWER: D.

如果由波登管(bourdon tube)所感測的壓力增加，則此偵檢器的曲率將會_____因為最大力乃施加在此偵檢器的_____曲線上。
A. 增加；內
B. 減小；內
C. 增加；外
D. 減小；外
答案： D.

科目： 291002
知能類： K1.10 [2.4/2.5]
序號： B610 (P2610)

Refer to the drawing of a bellows-type differential pressure (D/P) detector (see figure below).
The spring in this detector (shown in a compressed state) has weakened from long-term use. If the actual D/P is constant, how will indicated D/P respond as the spring weakens?
A. Decrease, because the high pressure will compress the spring more
B. Increase, because the high pressure will compress the spring more
C. Decrease, because the spring will expand more
D. Increase, because the spring will expand more
ANSWER: B.

參考一伸縮囊(bellow)差壓偵檢器圖示（見下圖）。此偵檢器的彈簧（圖示為壓縮狀態）因為長期使用而弱化。如果實際的差壓維持固定，則由於彈簧弱化所得的指示值會
A. 減小，因為高壓將會使彈簧壓縮更多
B. 增加，因為高壓將會使彈簧壓縮更多
C. 減小，因為彈簧會伸張更多
D. 增加，因為彈簧會伸張更多
答案： B.



BELLOWS - TYPE DIFFERENTIAL PRESSURE DETECTOR

科目： 291002
知能類： K1.10 [2.4/2.5]
序號： B1011 (P1508)

A bourdon tube works on the principle that when the pressure inside the tube decreases, the tube tends to: (Assume detected pressure remains above atmospheric pressure.)

A. coil due to an increased pressure-induced force on the outside of the tube.
B. straighten due to an increased pressure-induced force on the outside of the tube.
C. coil due to the spring action of the metal overcoming the pressure-induced force on the inside of the tube.
D. straighten due to the spring action of the metal overcoming the pressure-induced force on the inside of the tube.

ANSWER: C.

波登管(bourdon tube)的運作原理是:當管內壓力減少時，此管將會（假設感測壓力維持在大氣壓力以上）

A. 盤捲，因為壓力所導致作用於管外部的施力增加
B. 變直，因為壓力所導致作用於管外部的施力增加
C. 盤捲，因為金屬的彈力作用克服壓力所導致作用於管內部的施力
D. 變直，因為金屬的彈力作用克服壓力所導致作用於管內部的施力

答案： C.

科目： 291002
知能類： K1.10 [2.4/2.5]
序號： B2109 (P2109)

A centrifugal pump is taking suction from the bottom of a vented cylindrical storage tank that contains 100,000 gallons of water at 60°F. A pressure gauge at the inlet to the pump indicates 40 psig. Over the next several days storage tank temperature increases to 90°F with no change in tank water level and no change in head loss in the pump suction line.
Which one of the following is the current approximate pressure at the inlet to the pump?
A. 39.8 psig
B. 37.4 psig
C. 34.6 psig
D. 31.2 psig
ANSWER: A.

一離心泵從一含60°F，儲水100,000加侖水之通氣圓柱形儲存槽底部取水。泵入口處的壓力計指示值為40 psig。在其後幾天當中，儲存槽溫度上升到90°F,而儲存槽水位沒有變化，同時泵進水管沒有水頭損失。
下列何者是目前泵入口處的大約壓力？
A. 39.8 psig
B. 37.4 psig
C. 34.6 psig
D. 31.2 psig
答案： A.

科目： 291002
知能類： K1.11 [2.4/2.5]
序號： B210 (P210)

A simple bellows pressure detector is connected to a cooling water system. The detector is located in the reactor containment and has its low pressure side vented to the containment atmosphere. Current system pressure indication is 100 psig.
If a main steam line break raises containment pressure by 40 psig, the system pressure indication will: (Disregard any temperature effect on the pressure detector.)
A. increase by 40 psig.
B. increase by the square root of 40 psig.
C. decrease by 40 psig.
D. decrease by the square root of 40 psig.
ANSWER: C.

一簡單伸縮囊(bellow)差壓偵檢器連接於一冷卻水系統。此偵檢器安裝於反應器圍阻體內，同時其低壓側通向圍阻體之大氣。目前系統壓力指示100psig。如果一主蒸汽管破裂將圍阻體壓力升高40psig, 則系統壓力指示將會：（忽略對壓力偵檢器的所有溫度效應。）
A. 增加 40 psig
B. 增加 40 psig的平方根
C. 減少 40 psig
D. 減少 40 psig的平方根
答案： C.

科目： 291002
知能類： K1.11 [2.3/2.5]
序號： B711 (P710)

Cooling water system pressure is being monitored by a simple diaphragm pressure detector with its low pressure side vented to the containment. If a main steam break raises containment pressure by 20psi, system pressure indication will: (Disregard any temperature effect on the
detector.)
A. increase by the square root of 20psi.
B. decrease by the square root of 20psi.
C. increase by 20psi.
D. decrease by 20psi.
ANSWER: D.

冷卻水系統正受到一簡單型薄膜壓力偵檢器之監測該偵檢器的低壓側通向圍阻體大氣。如果一主蒸汽管線破裂將圍阻體壓力升高20psig, 則系統壓力指示將會：（忽略對壓力偵檢器的所有溫度效應。）
A. 增加20 psi的平方根
B. 減小20 psi的平方根
C. 增加20 psi
D. 減小20 psi
答案： D.

科目： 291002
知能類： K1.11 [2.3/2.5]
序號： B1310 (P509)

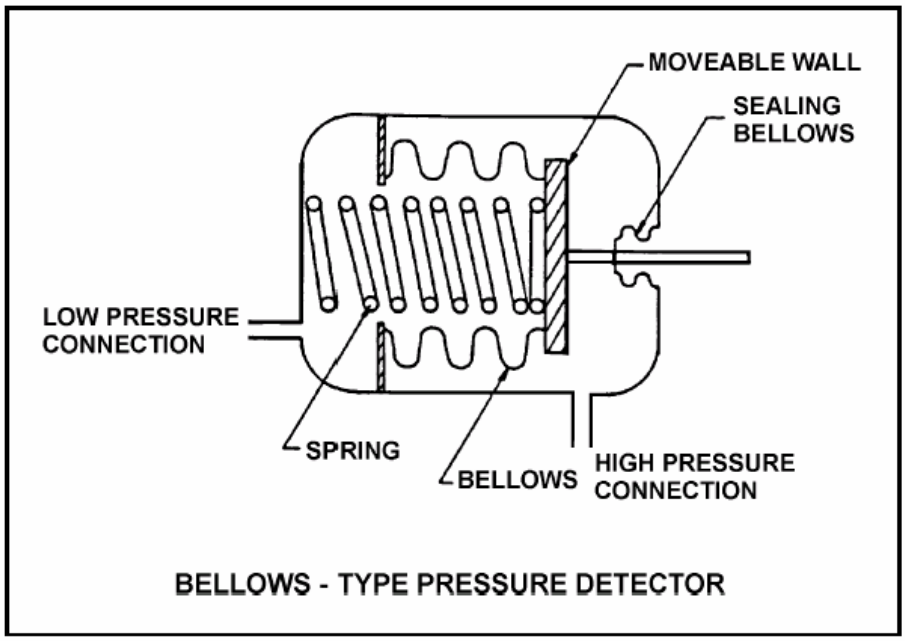
A bourdon tube system pressure detector is located inside a sealed building and currently indicates 100 psig. A building ambient temperature increase of 100^{o}F will cause a _____ change in indicated system pressure, and a building pressure increase of 40 psig will cause a _____ change in indicated system pressure.
A. significant; significant
B. negligible; significant
C. significant; negligible
D. negligible; negligible
ANSWER: B.

一波登管(bourdon tube)壓力偵檢器置於一密閉廠房內，同時目前的壓力指示為100 psig。廠房環境溫度增加100˚F將會導致指示之系統壓力產生_____變化，而廠房壓力增加20 psig將會導致指示之系統壓力產生_____變化。
A. 顯著；顯著
B. 微小；顯著
C. 顯著；微小
D. 微小；微小
答案： B.

科目： 291002
知能類： K1.11 [2.3/2.5]
序號： B1908 (P2211)

Refer to the drawing of a bellows-type pressure detector (see figure below).
A bellows-type pressure detector with its low-pressure side vented to containment atmosphere is being used to measure reactor vessel pressure. A decrease in the associated pressure indication will be caused by either a containment pressure _____ or a _____.
A. increase; ruptured bellows
B. increase; broken spring
C. decrease; ruptured bellows
D. decrease; broken spring
ANSWER: A.

參考一伸縮囊(bellow)差壓偵檢器圖示（見下圖）。一具有低壓側通向圍阻體大氣之伸縮囊差壓偵檢器，正用以量測反應器壓力。圍阻體壓力_____或_____將會導致反應器本體壓力指示減小。
A. 增加；波紋管破裂
B. 增加；彈簧斷裂
C. 減小；波紋管破裂
D. 減小；彈簧斷裂
答案： A.



BELLOWS - TYPE PRESSURE DETECTOR

科目： 291002
知能類： K1.11 [2.3/2.5]
序號： B2910 (P1011)

A properly calibrated 0 to 100 psia diaphragm pressure detector is connected to a pressurized system; the low pressure side of the detector is vented to the atmosphere. The detector is currently producing a system pressure indication of 75 psia.
If the detector diaphragm ruptures, indicated pressure will be approximately...
A. 0 psia.
B. 15 psia.
C. 60 psia.
D. 90 psia.
ANSWER: B.

一於 0 至 100 psia 經過適當校正之薄膜壓力偵檢器連接於一加壓系統上；此偵檢器之低壓側通至大氣。此偵檢器目前指示之系統壓力為 75 psia。如果此偵檢器薄膜破裂，則指示之壓力將約為
A. 0 psia.
B. 15 psia.
C. 60 psia.
D. 90 psia.
答案： B.

科目： 291002
知能類： K1.11 [2.3/2.5]
序號： B2912 (P3509)

The water pressure within a cooling water system is 100 psig, as indicated by a bourdon tube pressure detector. The cooling water system and the detector are located inside a reactor containment building. The pressure detector case is vented to the containment building, which is currently at atmospheric pressure.
If a steam line rupture raises the containment building pressure by 20 psig, the cooling water system pressure indication will: (Disregard any temperature effect on the detector.)
A. increase to 120 psig.
B. increase by a small, but indeterminate amount.
C. decrease by a small, but indeterminate amount.
D. decrease to 80 psig.
ANSWER: D.

由波登管(bourdon tube)差壓偵檢器所指示之冷卻水系統壓力為100psig。此冷卻水系統與此偵檢器安裝於一反應器圍阻體廠房內。而壓力偵檢器之外殼通氣至圍阻體廠房，其壓力目前為大氣壓。如果一蒸汽管破裂將圍阻體廠房壓力提高 20 psig，則冷卻水系統壓力指示將會：（忽略對於偵檢器之任何溫度效應）
A. 增加至 120 psig
B. 增加一微小，但無法確定的數值
C. 減小一微小，但無法確定的數值
D. 減小至 80 psig
答案： D.

科目： 291002
知能類： K1.12 [2.3/2.5]
序號： B611 (N/A)

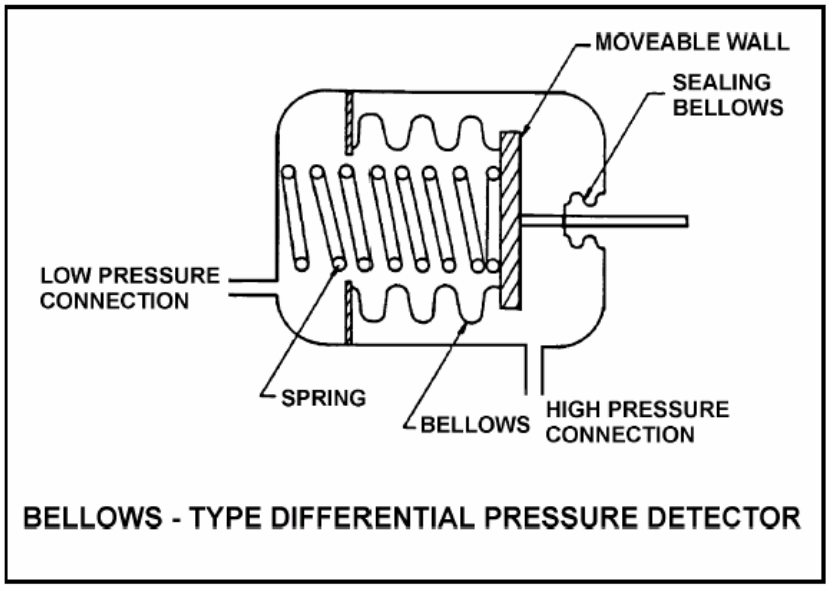
Which one of the following parameters requires square root compensation when measured by a differential pressure detector?
A. Reactor vessel level
B. Condenser vacuum
C. Reactor vessel pressure
D. Recirculation pump flow rate
ANSWER: D.

當由一差壓偵檢器量測時，下列哪一變數需要作平方根補償？
A. 反應器槽液位
B. 冷凝器真空
C. 反應器槽壓力
D. 再循環泵流量
答案： D.

科目： 291002
知能類： K1.12 [2.3/2.5]
序號： B1610 (P510)

Refer to the drawing of a bellows-type differential pressure (D/P) detector (see figure below).
The spring in this detector (shown in a compressed state) has weakened from long-term use. If the actual D/P is constant, how will indicated D/P respond as the spring weakens?
A. Increase, because the spring will expand more
B. Decrease, because the spring will expand more
C. Increase, because the spring will compress more
D. Decrease, because the spring will compress more
ANSWER: C.

參考伸縮囊(bellow)差壓偵檢器圖示（見下圖）。此偵檢器中之彈簧（圖示於壓縮狀態）因長期使用而弱化。如果實際的差壓維持固定，當彈簧弱化時，所指示之差壓有何反應？
A. 增加，因為彈簧伸張更多
B. 減小，因為彈簧伸張更多
C. 增加，因為彈簧壓縮更多
D. 減小，因為彈簧壓縮更多
答案： C.



科目： 291002
知能類： K1.13 [2.9/3.1]
序號： B212 (P211)

A bourdon-tube pressure detector was indicating 50% of scale when it was suddenly exposed to a high-pressure transient that caused permanent strain to the bourdon tube. The detector remained intact and actual pressure was restored to its original value. During the pressure transient, the affected pressure indication initially went off-scale high. After the original pressure was restored, the indication was...
A. unpredictable.
B. less than 50% of scale.
C. 50% of scale.
D. greater than 50% of scale.
ANSWER: D.

一波登管(bourdon tube)差壓偵檢器，當突然暴露在高壓暫態，導致此波登管遭受永久應變(permanent strain)，此時指示刻度為50%。此偵檢器並未受損，而實際壓力恢復至其原始值。在此壓力暫態當中，初始時受影響的壓力指示值很高且超出量表刻度。在恢復至原始壓力之後，此指示值會是
A. 無法預測
B. 小於 50%
C. 50%
D. 高於量表刻度50%
答案： D.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B14

Which one of the following describes a characteristic of a thermocouple?
A. A junction between two dissimilar metals will exhibit a change in electrical resistance proportional to temperature.
B. A junction between two dissimilar metals will generate a voltage proportional to temperature.
C. Thermocouples are generally more accurate than resistance temperature detectors.
D. Indication will fail high offscale with an open circuit.
ANSWER: B.

下列何者描述熱電偶的特性？
A. 兩不同金屬的接合點，將會呈現出與溫度成正比的電阻變化
B. 兩不同金屬的接合點，將會產生與溫度成正比的電壓
C. 熱電偶通常較電阻式溫度偵檢器為準
D. 開路時,指示器將出現超出刻度的高值失效(high offscale)
答案： B.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B208 (P414)

If a resistance temperature detector develops an open circuit (bridge circuit remains intact), indication will fail...
A. high.
B. low.
C. as is.
D. to midscale.
ANSWER: A.

如果一電阻式溫度偵檢器產生開路（橋式電路維持完整），則其指示數值將會
A. 指向高值並失效
B. 指向低值並失效
C. 指在當時刻度並失效
D. 指向中間值並失效
答案： A.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B309 (P1510)

In contrast to a thermocouple, a resistance temperature detector...
A. is used in high temperature applications.
B. does not require an external power supply for temperature indication.
C. uses a single type of metal in the sensing element.
D. is commonly placed in direct contact with the monitored substance.
ANSWER: C.

相對於熱電偶量測，電阻式溫度偵檢器
A. 應用於高溫量測中
B. 不需要外部電源便能指示溫度
C. 在感測元件部分使用單一種金屬
D. 通常與受監測物質直接接觸
答案： C.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B310 (P312)

If shorting occurs within a resistance temperature detector being used in a typical bridge circuit, indication will fail...
A. to midscale.
B. as is.
C. high.
D. low.
ANSWER: D.

在橋式電路中若電阻式溫度偵檢器發生短路，則其指示將會
A. 指向中間值並失效
B. 指在當時刻度失效
C. 指向高值並失效
D. 指向低值並失效
答案： D.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B1112

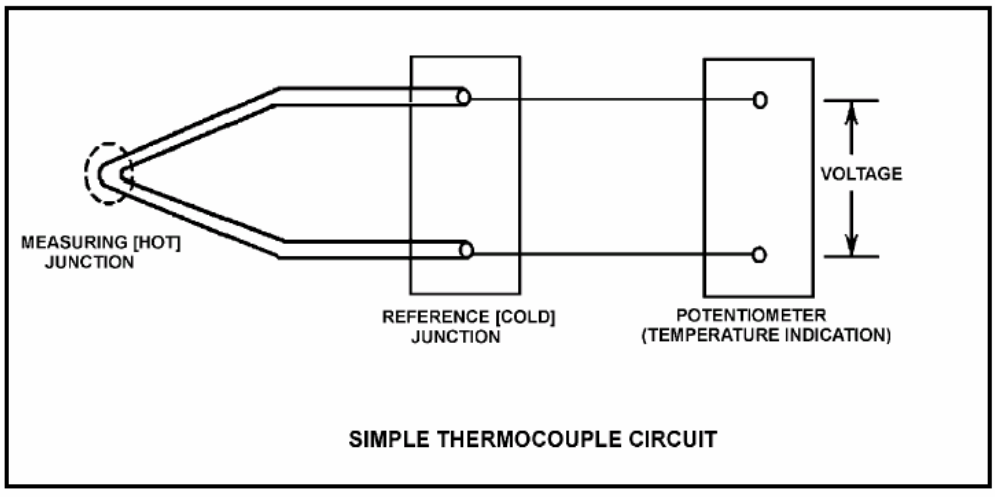
An operator suspects that a steam temperature instrument reading is not correct. A recently calibrated pressure gauge, which senses steam pressure for the same steam line, indicates 351psig.
Assuming the system is operating at saturated conditions, what is the actual steam temperature?
A. 424°F
B. 428°F
C. 432°F
D. 436°F
ANSWER: D.

一運轉員懷疑一蒸汽溫度儀表讀數不正確。而一最近經過校正之壓力計量測該蒸汽管之蒸汽壓力，指示數值為 351 psig。假設此系統在飽和狀況下運作，則實際蒸汽溫度為
A. 424°F
B. 428°F
C. 432°F
D. 436°F
答案： D.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B1314 (P1209)

Refer to the drawing of a simple thermocouple circuit (see figure below).
Circuit temperature indication is currently 350˚F. If a small steam leak occurs that raises reference (cold) junction temperature by 20˚F, the new temperature indication will be: (Assume measuring junction temperature remains constant.)
A. 310˚F.
B. 330˚F.
C. 370˚F.
D. 390˚F.
ANSWER: B.

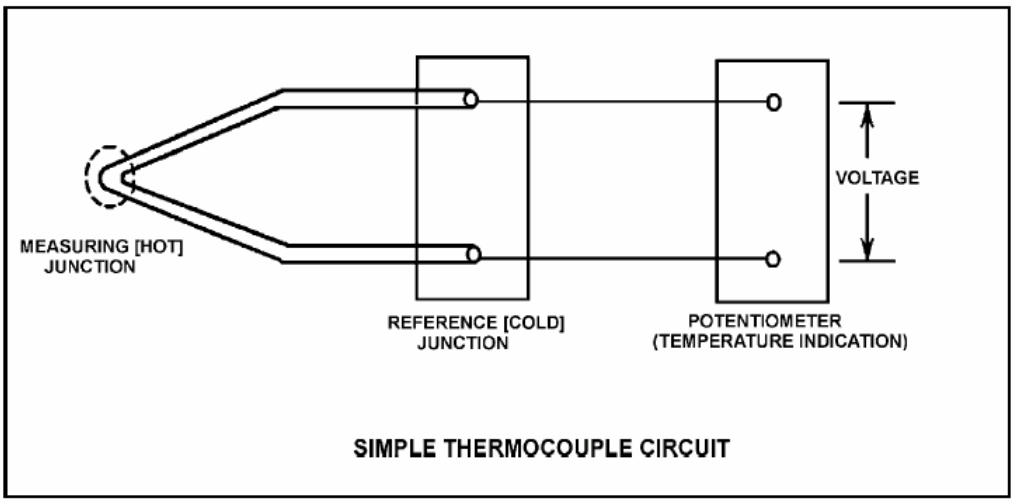
參考一簡單的熱電偶電路圖示（見下圖）。電路溫度指示目前為 350˚F.若一小量蒸汽洩漏發生，而將基準（冷）接合點(Reference Junction)溫度提高20˚F，則新的溫度指示將會是：（假設量測接合點溫度維持固定。）
A. 310˚F.
B. 330˚F.
C. 370˚F.
D. 390˚F.
答案： B.



科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B1510 (P2212)

Refer to the drawing of a simple thermocouple circuit (see figure below).
Circuit temperature indication is currently 350°F. If the reference (cold) junction temperature decreases by 10°F, the new temperature indication will be: (Assume measuring junction temperature remains constant.)
A. 340°F.
B. 350°F.
C. 360°F.
D. 370°F.
ANSWER: C.

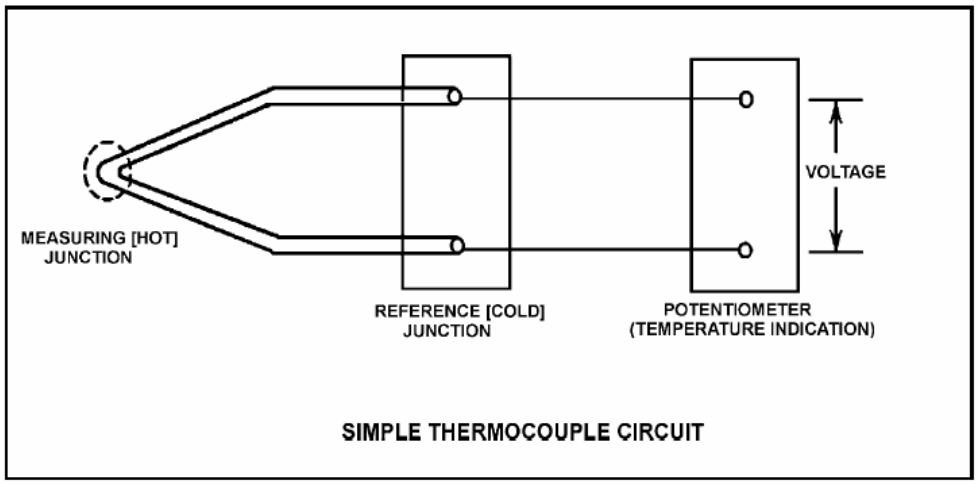
參考一簡單的熱電偶電路圖示（見下圖）。電路溫度指示目前為350°F。若基準（冷）接合點溫度降低10°F，則新的溫度指示將會是：（假設量測接合點溫度維持固定。）
A. 340°F.
B. 350°F.
C. 360°F.
D. 370°F.
答案： C.



科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B1710 (P1710)

Refer to the drawing of a simple thermocouple circuit (see figure below).
Thermocouple temperature indication is currently 150˚F. If a small steam leak occurs that raises both the measuring (hot) junction and reference (cold) junction temperatures by 20˚F, the new
temperature indication will be...
A. 130˚F.
B. 150˚F.
C. 170˚F.
D. 190˚F.
ANSWER: B.

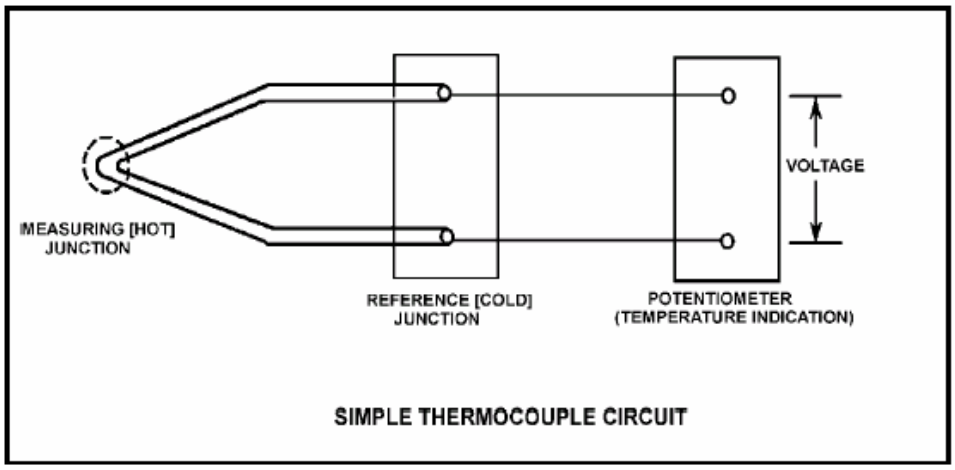
參考一簡單的熱電偶電路圖示（見下圖）。熱電偶溫度指示目前為 150˚F。若一微小蒸汽洩漏發生，而將量測（熱）與基準（冷）接合點溫度均提高20˚F，則新的溫度指示將會是：
A. 130˚F.
B. 150˚F.
C. 170˚F.
D. 190˚F.
答案： B.



科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B2009 (P2011)

Refer to the drawing of a simple thermocouple circuit (see figure below). Thermocouple temperature indication is currently 150˚F. Reference junction temperature is currently 90 ˚F. Indicator range is from 0˚F to 2000˚F.
If one of the thermocouple extension wires loosens and becomes dislodged from its terminal in the reference junction panel, which one of the following temperature indications will occur?
A. Minimum instrument reading (0˚F)
B. 60˚F
C. 90˚F
D. Maximum instrument reading (2000˚F)
ANSWER: A.

參考一簡單的熱電偶電路圖示（見下圖）。熱電偶溫度指示目前為150˚F。基準接合點(Reference Junction)溫度目前為90˚F。指示器範圍從0˚F至2000˚F。
若熱電偶的延長線之一鬆脫，同時從其基準接點連接板所在位置脫落，則下列何種溫度指示會發生？
A. 最低儀表讀數（0˚F）
B. 60˚F
C. 90˚F
D. 最高儀表讀數（2000˚F）
答案： A.



SIMPLE THERMOCOUPLE CIRCUIT

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B2412 (P2409)

What is the purpose of the reference junction panel that is provided with many thermocouple circuits?

A. Ensures that thermocouple output is amplified sufficiently for use by temperature indicationdevices.
B. Ensures that only temperature changes at the thermocouple measuring junction affect thermocouple temperature indication.
C. Ensures that electrical noise in the thermocouple extension wires does not affect thermocouple temperature indication.
D. Ensures that different lengths of thermocouple extension wires do not affect thermocouple temperature indication.

ANSWER: B.

基準接合點(Reference Junction)連接板裝置許多熱電偶電路之目的為何？

A. 確保熱電偶輸出充分放大可為溫度指示設備使用
B. 確保只有熱電偶量測接合點的溫度變化會影響熱電偶之溫度指示
C. 確保熱電偶延長線之電子雜訊不會影響到熱電偶之溫度指示
D. 確保不同長度的熱電偶延長線不會影響到熱電偶之溫度指示

答案： B.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B2712 (P2711)

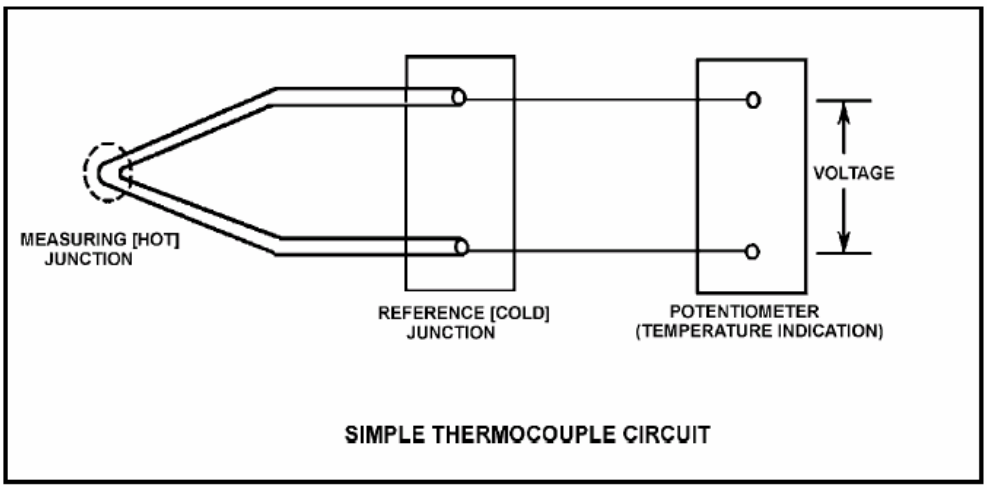
Unlike a resistance temperature detector, a typical thermocouple...
A. uses a single type of metal in the sensing element
B. requires a temperature-controlled reference junction.
C. can provide temperature input to a valve controller in a cooling water system.
D. requires an external power supply to provide indication of temperature.
ANSWER: B.

與電阻式溫度偵檢器不同，一典型的熱電偶
A. 在感測元件中使用單一種類金屬
B. 需要溫度控制的基準接合點(Reference Junction)
C. 能提供冷卻水系統中閥控制器之溫度輸入訊號
D. 需要外部電源方能提供溫度指示
答案： B.

科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B2911 (P1412)

Refer to the drawing of a simple thermocouple circuit (see figure below). Thermocouple temperature indication is currently 390˚F. If a small steam leak occurs that raises reference (cold) junction temperature by 20˚F, the new temperature indication will be... (Assume measuring junction temperature remains constant.)
A. 370˚F.
B. 390˚F.
C. 400˚F.
D. 410˚F.
ANSWER: A.

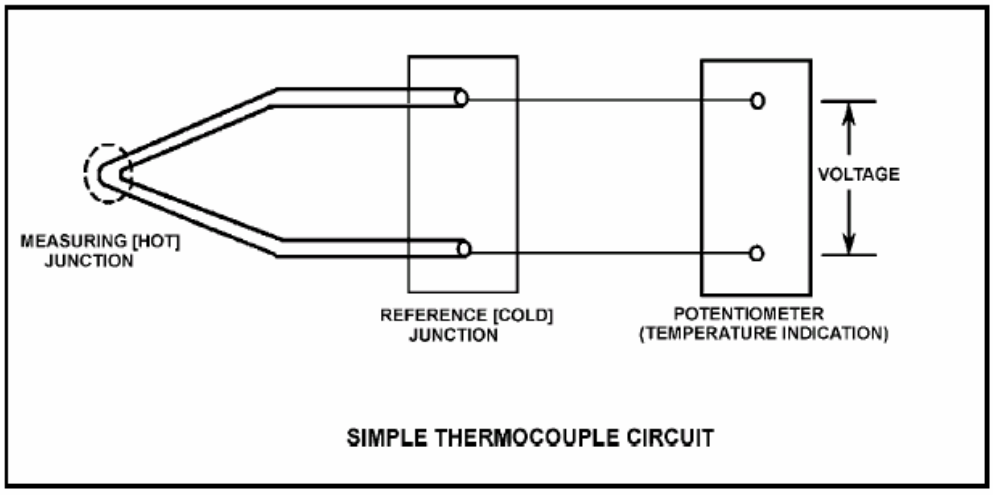
參考一簡單的熱電偶電路圖示（見下圖）。熱電偶溫度指示目前為390˚F。若一微小蒸汽洩漏發生，而將基準（冷）接合點溫度提高20˚F，則新的溫度指示將會是：（假設量測接合點溫度維持固定。）
A. 370˚F.
B. 390˚F.
C. 400˚F.
D. 410˚F.
答案： A.



科目： 291002
知能類： K1.15 [2.6/2.8]
序號： B3013 (P3011)

Refer to the drawing of a simple thermocouple circuit (see figure below). Thermocouple temperature indication is 410˚F with the reference (cold) junction at 125˚F. If an ambient temperature decrease lowers reference junction temperature to 110˚F, the new thermocouple temperature indication will be:(Assume measuring junction temperature remains constant.)
A. 380˚F.
B. 395˚F.
C. 410˚F.
D. 425˚F.
ANSWER: D.

參考一簡單的熱電偶電路圖示（見下圖）。熱電偶溫度指示目前為 410˚F，而基準（冷）接合點為125˚F。若環境溫度下降使得基準接合點(Reference Junction)溫度降低至110˚F，則新的熱電偶溫度指示將會是：（假設量測接合點溫度維持固定。）
A. 380˚F.
B. 395˚F.
C. 410˚F.
D. 425˚F.
答案： D.



科目： 291002
知能類： K1.16 [2.5/2.7]
序號： B812 (P813)

What is the most common type of sensor used to provide remote position indication of a valve that is normally either fully open or fully closed?
A. Limit switch
B. Reed switch
C. Servo transmitter
D. Linear variable differential transformer
ANSWER: A.

對於一正常狀況下為全開或全關之閥門而言,下列何者是最常用來提供遠端閥位指示的偵檢器
A. 極限開關(limit switch)
B. 磁簧開關(reed switch)
C. 伺服發射器(serve transmitter)
D. 線性差動位移計(variable differential transformer)
答案： A.

科目： 291002
知能類： K1.16 [2.5/2.7]
序號： B1712 (P1313)

Which one of the following devices is commonly used to provide remote indication of valve position on an analog meter in units of "percent of full open"?
A. Limit switch
B. Reed switch
C. Linear variable differential transformer
D. Resistance temperature detector
ANSWER: C.

下列何者為最常用來提供類比儀表上遠端閥位開度百分比指示的設備?
A. 極限開關(limit switch)
B. 磁簧開關(reed switch)
C. 線性差動位移計(variable differential transformer)
D. 電阻式溫度偵檢器(resistance temperature detector)
答案： C.

科目： 291002
知能類： K1.16 [2.5/2.7]
序號： B2611 (P2911)

Reed switches are being used in an electrical measuring circuit to monitor the position of a control rod in a reactor. The reed switches are mounted in a column above the reactor vessel such that the control rod drive shaft passes by the reed switches as the control rod is withdrawn.
Which one of the following describes the action that causes the electrical output of the measuring circuit to change as the control rod is withdrawn?

A. An ac coil on the control rod drive shaft induces a voltage into each reed switch as the drive shaft passes by.
B. A metal tab on the control rod drive shaft mechanically closes each reed switch as the drive shaft passes by.
C. The primary and secondary coils of each reed switch attain maximum magnetic coupling as the drive shaft passes by.
D. A permanent magnet on the control rod drive shaft attracts the movable contact arm of each reed switch as the drive shaft passes by.

ANSWER: D.

磁簧開關(reed switch)正用於電子量測電路以監測反應器中控制棒之位置。此磁簧開關安裝於反應器槽上方，以便當控制棒時控制棒之驅動軸會通過磁簧開關。下列當控制棒抽出時，會導致此量測電路的電力輸出發生變化？

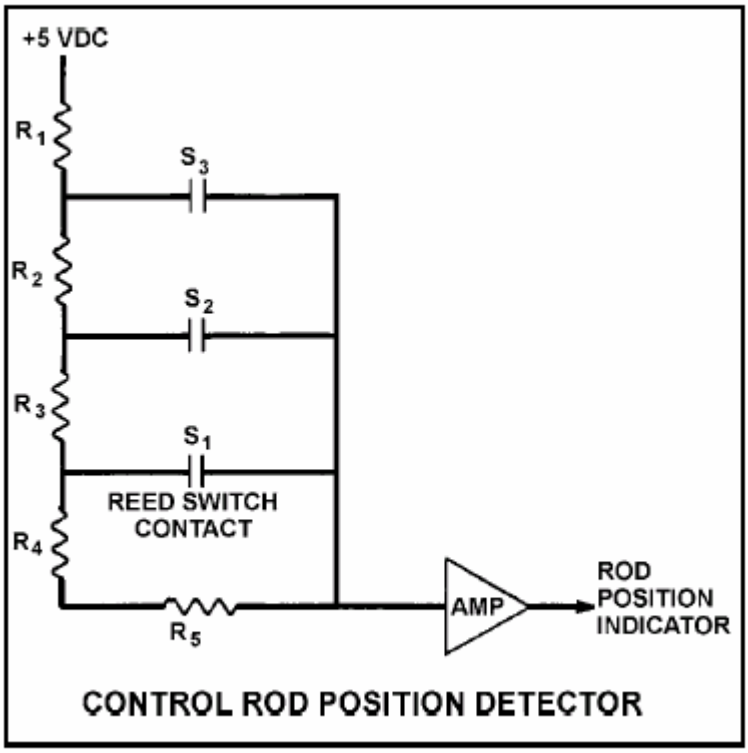
A. 在控制棒驅動軸上之交流電線圈，會在此驅動軸通過時，使得每一個磁簧開關產生一電壓
B. 在控制棒驅動軸上之一金屬垂片，會在此驅動軸通過時，機械式地關閉每一個磁簧開關
C. 每個磁簧開關上的主線圈與次線圈，會在此驅動軸通過時，獲得最大的磁耦合
D. 在控制棒樞傳動軸上之一永久磁鐵，會在此傳動軸通過時，吸引每一個磁簧開關上可移動的接觸臂

答案： D.

科目： 291002
知能類： K1.16 [2.5/2.7]
序號： B2811 (P2813)

Refer to the simplified drawing of a control rod position detector circuit (see figure below).
A magnet on the control rod extension (or drive) shaft sequentially closes individual reed switches mounted vertically adjacent to the control rod drive housing. A constant +5 dc volts is supplied to the input of the resistor network at resistor R_1.
A control rod is initially fully inserted such that all reed switch contacts are open; then the rod is withdrawn until reed switch contact S_1 is closed. Compared to the initial circuit currents, the current through resistor R_5 after the rod withdrawal will be _____, and the output current of the resistor network to the amplifier will be _____.
A. lower, higher
B. lower, lower
C. higher, higher
D. higher, lower
ANSWER: A.

參考一控制棒位置感測電路之簡示圖（見下圖）。控制棒延伸軸（或驅動軸）上之磁極依序關閉垂直安裝於鄰近控制棒驅動殼(control rod drive housing)之各個磁簧開關。R1處一固定之＋SV直流電壓供應給電阻網路作為輸入。一控制棒開始時完全插入，使得所有的磁簧開關接觸開啟；其後此控制棒退回直到振簧開關接觸點S_1 關閉。與開始時電流相比較，在控制棒抽出後，流經電阻R_5 的電流將會_____，而此電阻網路流向放大器的輸出電流將會_____。
A. 降低；升高
B. 降低；降低
C. 升高；升高
D. 升高；降低
答案： A.



CONTROL ROD POSITION DETECTOR

科目： 291002
知能類： K1.19 [3.0/3.1]
序號： B213 (P214)

Most of the electrons collected in a fission chamber are released as a result of ionizations caused directly by...
A. fission fragments.
B. fission gammas.
C. fission betas.
D. fissionable materials.
ANSWER: A.

大部分累積在分裂腔的電子是因下列何者作用所導致之離子化而釋放出來
A. 分裂產生之碎片
B. 分裂產生之伽瑪射線
C. 分裂產生之貝塔射線
D. 可分裂物質
答案： A.

科目： 291002
知能類： K1.19 [3.0/3.1]
序號： B612

Gamma radiation contributes to the output of a fission chamber by reacting with the...
A. detector gas.
B. detector leads.
C. center electrode.
D. U-235 coating on the detector walls.
答案： A.

伽瑪放射線對於一分裂腔的輸出影響在於其與何者之作用
A. 偵檢器氣體
B. 偵檢器導線
C. 中央電極
D. 偵檢器內壁之U-235塗料
答案： A.

科目： 291002
知能類： K1.19 [3.0/3.1]
序號： B1113 (P1909)

Which one of the following is the function of the positive electrode in an ion chamber?
A. Produce ions when exposed to a radiation field
B. Release electrons to combine with positive ions
C. Perform gas quenching to maximize detector sensitivity
D. Collect the electrons released during gas ionization
ANSWER: D.

下列何者是游離腔中正電極的功用？
A. 當暴露於一輻射場中時產生離子
B. 放出電子與正離子結合
C. 進行氣淬(gas quenching)以使偵檢器敏感度增至最大
D. 收集在氣體離子化中所釋放之電子
答案： D.

科目： 291002
知能類： K1.19 [3.0/3.1]
序號： B1214

A reactor scrammed due to a loss-of-coolant accident one hour ago. To verify adequate reactor vessel water level, the source range monitors (SRMs) were inserted. As the SRMs entered the core, source range count rate increased and then became relatively stable as the SRMs continued upward into the water-filled region of the core.
If the SRMs enter a voided section of the core, count rate will suddenly...
A. decrease due to increased neutron leakage.
B. decrease due to decreased fast fission.
C. increase due to increased neutron migration length.
D. increase due to decreased moderator neutron absorption.
答案： A.

一反應器因為一小時前之冷卻水流失事故而急停(scram)。為了確認適當的反應爐水位，乃將源階中子偵檢器(SRMs)插入。當SRMs進入爐心時，源階計數率增加，而其後當SRMs 繼續往上進入爐心充水區時，其計數值變為相對穩定。如果SRMs進入爐心之空泡(void)區段時，計數值會突然
A. 降低，因為中子洩漏增加
B. 降低，因為快中子分裂降低
C. 增加，因為中子遷移長度(migration length)增加
D. 增加，因為緩和劑中子吸收降低
答案： A.

科目： 291002
知能類： K1.19 [3.0/3.1]
序號： B2312

A reactor scrammed due to a loss-of-coolant accident 1 hour ago. To verify adequate reactor vessel water level, the source range monitors (SRMs) were fully inserted into the core.
If the SRMs are currently in a voided section of the core, how will the count rate change when the SRMs are withdrawn below core water level?
A. Decrease due to decreased neutron migration length.
B. Decrease due to increased moderator neutron absorption.
C. Increase due to decreased neutron leakage.
D. Increase due to increased fast fission.
ANSWER: C.

一反應器因為一小時前之冷卻水流失事故(LOCA)而急停(scram)。為了確認適當的反應爐水位，乃將源階中子偵檢器(SRMs)完全插入爐心中。如果目前 SRMs 位於爐心之空泡區，則當 SRMs 被抽出至低於反應爐水位時，其計數值會有何變化？
A. 降低，因為中子遷移長度降低
B. 降低，因為緩和劑中子吸收增加
C. 增加，因為中子洩漏減少
D. 增加，因為快中子分裂增加
答案： C.

科目： 291002
知能類： K1.19 [3.0/3.1]
序號： B3112

Fission chamber detectors are used to monitor reactor power/neutron level in a shutdown reactor as well as a reactor operating at full power (and all power levels in between). At what power levels and why is it necessary to compensate the output of the detectors for gamma interactions with the fission chambers?

A. At all power levels, because gamma interactions produce larger detector pulses than neutron interactions.
B. At all power levels, because gamma interactions produce smaller detector pulses than neutron interactions.
C. Only when shutdown or at low power levels, because gamma flux is not proportional to reactor power at low power levels.
D. Only when operating at high power levels, because gamma flux is not proportional to reactor power at high power levels.

ANSWER: C.

分裂腔偵檢器係用以監測反應爐停機及滿載(以及其他功率)運轉時，反應器之功率／中子位階。於何功率水平，以及為何必需要為與分裂腔發生伽瑪作用而產生之偵檢器的輸出進行補償？

A. 在所有的功率水平，因為伽瑪作用比中子作用產生較大的偵檢器脈衝
B. 在所有的功率水平，因為伽瑪作用比中子作用產生較小的偵檢器脈衝
C. 只有在停機或是低功率水平，因為伽瑪通量在低功率水平時與反應器功率不成正比
D. 只有在高功率運轉水平，因為伽瑪通量在高功率水平時與反應器功率不成正比

答案： C.

科目： 291002
知能類： K1.21 [2.8/2.9]
序號： B513

A fission chamber used for reactor neutron monitoring is operating in the ionization region. If the voltage supplied to the fission chamber is continuously increased, which one of the following operating regions will the detector enter next?
A. Proportional
B. Recombination
C. Geiger-Mueller
D. Limited proportional
ANSWER: A.

一直用於反應器中子監測之分裂腔於游離(ionization)區運作。如果提供給此分裂腔的電壓持續增加，則偵檢器將進入的下一操作區域為何？
A. 比例區(Proportional)
B. 再結合區(Recombination)
C. 蓋革—牟勒區(Geiger-Mueller)
D. 限制比例區(Limited proportional)
答案： A.

科目： 291002
知能類： K1.21 [2.8/2.9]
序號： B713

A fission chamber neutron monitoring instrument is operating in the proportional region of the gas ionization curve. If the voltage supplied to the fission chamber is continuously decreased, which one of the following operating regions will the detector enter next?
A. Geiger-Mueller
B. Recombination
C. Limited proportional
D. Ionization
ANSWER: D.

一分裂腔中子監測設備於氣體游離曲線之比例區(Proportional Region)中運作。如果提供給此分裂腔的電壓持續減小，則此偵檢器將進入的下一運作區域為何？
A. 蓋革—牟勒區 (Geiger-Mueller)
B. 再結合區 (Recombination)
C. 限制比例區 (Limited proportional)
D. 游離化區 (Ionization)
答案： D.

科目： 291002
知能類： K1.21 [2.8/2.9]
序號： B814 (P1812)

A gas-filled radiation detector operating in the proportional region is exposed to a constant gamma radiation field. If the applied voltage is increased but maintained within the proportional region, the rate of ion collection will...

A. increase because more secondary ionizations are occurring in the detector.
B. increase because fewer primary ions are recombining in the detector prior to reaching the electrodes.
C. stay approximately the same because the ion chamber is operating at saturated conditions.
D. stay approximately the same because all of the primary ions were already being collected at the lower voltage.

ANSWER: A.

一充氣式輻射偵檢器在比例區中運作，暴露在一穩定伽瑪輻射場中。若所施加之電壓增加，但是仍維持在比例區中，則離子收集速率將會

A. 增加，因為在偵檢器中會發生更多的二次離子
B. 增加，因為在到達電極之前，較少的一次離子在偵檢器中進行再結合
C. 維持大約相同，因為離子腔在飽和情況下運作
D. 維持大約相同，因為一次離子已經在低電壓時被收集

答案： A.

科目： 291002
知能類： K1.21 [2.8/2.9]
序號： B2413 (P2014)

What is the effect on a proportional neutron detector if it is operated at a voltage near the high end of the proportional (true proportional) region on the gas-filled detector characteristic curve?

A. Neutron-induced pulses will become so large that gamma pulse discrimination is no longer needed, yielding a more accurate neutron count rate.
B. The positive space charge effect will increase and prevent collection of both gamma- and neutron-induced pulses, yielding a less accurate neutron count rate.
C. A high rate of incident gamma radiation will result in multiple small gamma-induced pulses that combine to form larger pulses. The larger combined pulses will be counted as neutroninduced pulses, yielding a less accurate neutron count rate.
D. Detection of any single ionizing event will result in ionizing nearly the entire detector gas volume. The resulting large pulses will prevent the detector from differentiating between radiation types, yielding a less accurate neutron count rate.

ANSWER: C.

比例中子偵檢器若於充氣偵檢器特徵曲線中在接近比例（真比例）區高限電壓附近操作，則其影響為何？

A. 中子所生之脈衝將變得非常大，以致於不需要伽瑪脈衝區分，產生較正確的中子計數值
B. 正空間充電效應會增加，並且預防伽瑪以及中子所生之脈衝，產生較不正確的中子計數值
C. 伽瑪放射發生率高，導致多個小型伽瑪所生脈衝結合而為較大脈衝。較大的結合脈衝將會被算成是中子所生脈衝，產生較不正確的中子記數值
D. 任何單一離子化事件之感測，將會導致幾乎整個偵檢器氣體的離子化。所產生的大型脈衝，將會預防偵檢器在放射種類中發生區別，產生較不正確的中子記數值

答案： C.

科目： 291002
知能類： K1.21 [2.8/2.9]
序號： B2613 (P2313)

A gas-filled radiation detector operating in the proportional region is exposed to a constant gamma radiation field. If the applied voltage is decreased but maintained within the proportional region, the rate of ion collection will...

A. stay approximately the same because all primary ions are collected as long as detector voltage remains in the proportional region.
B. stay approximately the same because the detector is still operating at saturated conditions.
C. decrease because a decreased space charge around the positive electrode reduces gas amplification.
D. decrease because fewer secondary ionizations are occurring in the detector.

ANSWER: D.

一充氣式輻射偵檢器在比例區使用，並暴露於一固定之伽瑪輻射場。若操作電壓降低，但是仍維持在比例區中，則離子收集速率將會

A. 維持大約相同，因為只要偵檢器電壓維持在比例區，一次離子便可被收集
B. 維持大約相同，因為偵檢器仍然在飽和區操作
C. 減小，因為在正極附近的空間電荷減小而降低了氣體放大效應(gas amplification)
D. 減小，因為在偵檢器中發生較少的二次游離

答案： D.

科目： 291002
知能類： K1.22 [3.0/3.1]
序號： B511 (P1514)

A fission chamber reactor neutron monitoring instrument is operating in the proportional region.
If a complete loss of fission chamber gas pressure occurs, the instrument indication will fail...
A. upscale.
B. downscale.
C. as is.
D. to midscale.
ANSWER: B.

反應器中子偵測儀器分裂腔在比例區中使用。若分裂腔氣體壓力完全喪失，則此設備指示將會失效，並指向
A. 高值
B. 低值
C. 現值
D. 中間值
答案： B.

科目： 291002
知能類： K1.22 [3.0/3.1]
序號： B613

Which one of the following will cause an upscale failure of a fission chamber neutron detector?

A. The detector electrode high voltage power supply output has decreased by 5% due to setpoint drift.
B. The detector chamber has become flooded with water due to leakage around the electrodes.
C. A power supply fuse in the amplifier circuit for the neutron monitoring instrument drawer has opened.
D. The uranium-235 in the detector coating has been transformed to uranium-236 by neutron absorption.

ANSWER: B

下列何者會導致分裂腔中子偵檢器高值失效？

A. 此偵檢器電極之高壓電源供應輸出因為設定點偏移而減少5%
B. 此偵檢腔因為電極附近發生洩漏而灌滿水
C. 中子監測儀櫃(drawer)中放大線路的電源供應器保險絲已熔毀(成開路)
D. 偵檢器塗料中之鈾-235因為吸收中子而轉變成鈾-236

答案： B.

科目： 291002
知能類： K1.22 [3.0/3.1]
序號： B3414

Two identical fission chamber neutron detectors (operating in the proportional region) are being used to monitor the neutron flux during a reactor startup. Detector A has developed a tiny leak and the argon fill gas pressure has decreased to approximately 25% of the gas pressure in detector B. When the reactor reaches criticality, the neutron level indicated by detector A will be _____ than the neutron level indicated by detector B, primarily because the incident neutrons result in _____ .
A. larger; more fissions in detector A
B. smaller; fewer fissions in detector A
C. larger; more ionizations in the detector A gas
D. smaller; fewer ionizations in the detector A gas
ANSWER: D

兩相同之分裂腔中子偵檢器（在比例區中運作）用以偵測反應器啟動時之中子通量。偵檢器A發生一微小洩漏，使得其中氬填充氣壓力下降至大約是偵檢器B的25%。當反應器達到臨界時，偵檢器A之中子水平指示將會_____偵檢器B之中子水平指示，主要原因為入射中子導致_____。
A. 大於；在偵檢器A之分裂較多
B. 小於；在偵檢器A之分裂較少
C. 大於；在偵檢器A之氣體游離較多
D. 小於；在偵檢器A之氣體游離較少
答案： D

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B313 (P2013)

An ion chamber radiation detector is exposed to a constant gamma radiation field. If the applied voltage is increased but maintained within the ion chamber region, the rate of ion collection will...

A. increase because more secondary ionizations are occurring in the detector.
B. stay approximately the same because all of the primary ions were already being collected at the lower voltage.
C. increase because less primary ions are recombining in the detector prior to reaching the electrodes.
D. stay approximately the same because the ion chamber is operating at saturated conditions.

ANSWER: B.

離子腔輻射偵檢器暴露於一固定之伽瑪輻射場中。若所施加之電壓增加，但仍維持在離子腔區，則離子之累積速率將會

A. 增加，因為在偵檢器內發生更多的二次游離
B. 維持大約相同，因為所有的一次離子在低電壓時便已經被收集
C. 增加，因為在到達電極之前，偵檢器內所發生的一次離子再結合較少
D. 維持大約相同，因為離子腔在飽和情況下運作

答案： B.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B314 (P13)

Scintillation detectors convert radiation energy into light by a process known as...
A. gas amplification.
B. space charge effect.
C. luminescence.
D. photoionization.
ANSWER: C.

閃爍偵檢器將輻射能轉換成光，此程序稱為
A. 氣體放大(gas amplification)
B. 空間充電效應(space charge effect)
C. 冷光(luminescence)
D. 光游離(photoionization)
答案： C.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B414

Refer to the drawing of a gas-filled detector characteristic curve (see figure below). Which one of the following statements describes how a gas-filled radiation detector, operating in the "proportional" region, functions?

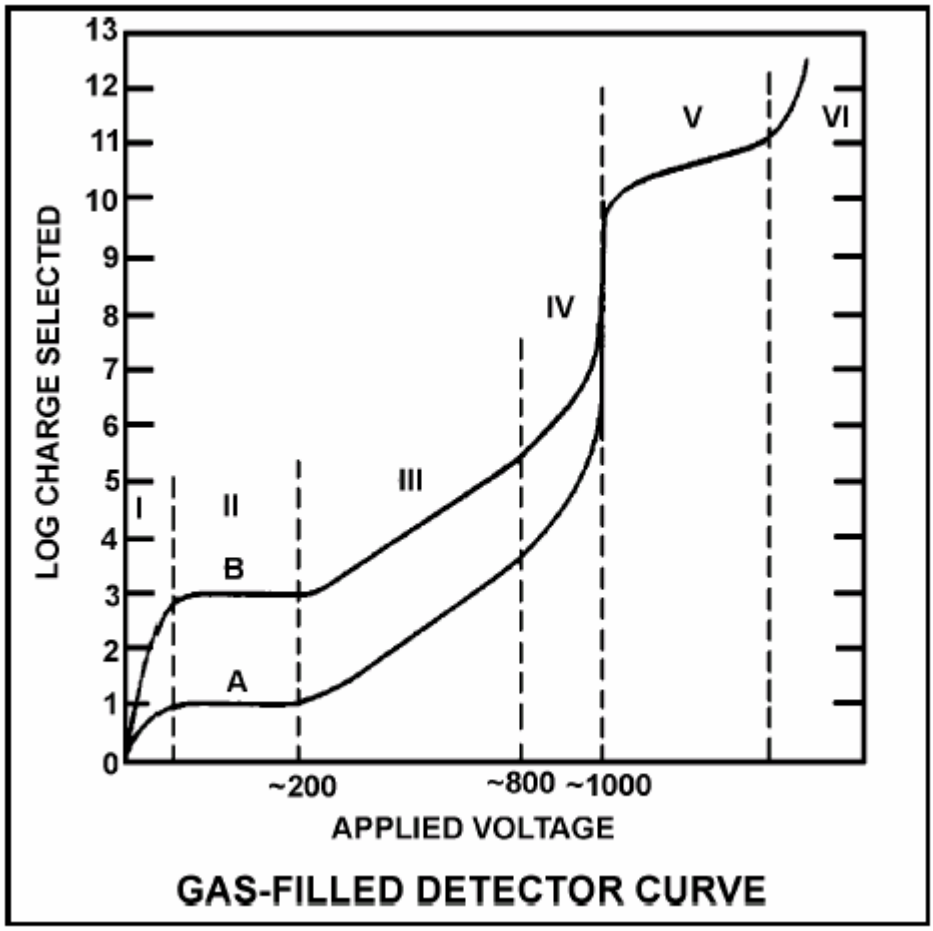
A. Essentially all of the ions from primary ionizations are collected; ions collected from secondary ionizations are independent of applied voltage.
B. Essentially none of the ions from primary ionizations are collected; ions collected from secondary ionizations vary directly with applied voltage.
C. Essentially all of the ions from primary ionizations are collected; ions collected from secondary ionizations vary directly with applied voltage.
D. Essentially none of the ions from primary ionizations are collected; ions collected from secondary ionizations are independent of applied voltage.

ANSWER: C.

參考一充氣式檢測器特徵曲線圖示（見下圖）。下列何敘述描述了一充氣式輻射偵檢器在「比例區」的運作方式？

A. 基本上所有一次游離之離子均被收集；因二次游離而收集離子則與所施電壓無關
B. 基本上所有一次游離之離子均未被收集；因二次游離而收集的離子則隨著所施電壓而變
C. 基本上所有一次游離之離子均被收集；因二次游離而收集的離子則隨著所施電壓而變
D. 基本上所有一次游離之離子均未被收集；因二次游離而收集的離子則與所施電壓無關

答案： C.


LOG CHARGE SELECTED
13
12
11
10
9
8
7
6
5
4
3
2
1
0
I
II
III
IV
V
VI
B
A
~200
~800
~1000
APPLIED VOLTAGE
GAS-FILLED DETECTOR CURVE

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B714 (P714)

Which one of the following types of radiation is the major contributor to the dose indication on a self-reading pocket dosimeter (SRPD)? (Also called SRD, PIC, and direct reading dosimeter)
A. Alpha
B. Beta
C. Gamma
D. Neutron
ANSWER: C.

下列何種放射線是易讀式袖珍劑量計讀數的主要來源？
A. 阿伐(α)
B. 貝他(β)
C. 伽瑪(γ)
D. 中子
答案： C.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B913 (P1613)

Which one of the following describes a characteristic of a Geiger-Mueller radiation detector?
A. Radiation types can be identified by pulse height and duration.
B. Specific radionuclides can be identified with the use of gamma spectrometry.
C. Small variations in applied voltage will result in large changes in detector output.
D. Any type of radiation that ionizes the detector gas will produce the same magnitude detectoroutput pulse.
ANSWER: D.

下列何者是蓋革-牟勒輻射偵檢器的特徵描述？
A. 輻射線類型可以經由脈衝之高度與時間而加以辨識
B. 特定的放射核種可以利用伽瑪能譜分析而辨識
C. 在施加電壓上的微小變化，將會導致偵檢器輸出的巨大變化
D. 任何將偵檢器氣體游離的輻射線，都會產生同樣大小的偵檢器輸出脈衝
答案： D.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B1114 (P2613)

Which one of the following describes the reason for the high sensitivity of a gas-filled ion chamber operating in the Geiger- Mueller region?
A. Any radiation-induced ionization results in a large detector output pulse.
B. Geiger-Mueller detectors are longer than other types of radiation detectors, resulting in greater detector surface area.
C. The detector output is inversely proportional to the applied voltage within the Geiger-Mueller region.
D. High detector voltage allows differentiation between the various radiation types.
ANSWER: A.

下列何者描述了一在蓋革-牟勒區運作的充氣式離子腔高靈敏度原因？
A. 任何輻射線所產生之離子化均會導致巨大的偵檢器輸出脈衝
B. 因蓋革-牟勒偵檢器較其他輻射線偵檢器為長，因而導致較大的偵檢器表面積
C. 偵檢器輸出與蓋革-牟勒區內所施電壓成反比
D. 偵檢器高電壓可區分不同類型輻射線
答案： A.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B1514 (P1513)

Which one of the following lists the two types of gas-filled radiation detectors whose outputs will be least affected by a small variation (+ 10 volts) in the voltage applied to the detectors? (Assume voltage remains within normal range.)
A. Limited proportional and Geiger Mueller
B. Ion chamber and proportional
C. Proportional and limited proportional
D. Geiger Mueller and ion chamber
ANSWER: D.

下列哪兩種充氣式輻偵檢器，其輸出最不會受到施加於偵檢器的微小電壓變化（+10伏特）的影響？（假設電壓維持在正常範圍內。）
A. 限制比例與蓋革-牟勒
B. 離子腔與比例
C. 比例與限制比例
D. 蓋革-牟勒與離子腔
答案： D.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B1714 (P1713)

A Geiger-Mueller radiation detector is located in a radiation field consisting of beta, gamma, and fast neutron radiation. Assuming each type of radiation enters the detector gas chamber and ionizes the detector gas, which one of the following describes the resulting detector pulse sizes?

A. Beta radiation will produce a larger pulse size than either gamma or fast neutron radiation.
B. Gamma radiation will produce a larger pulse size than either beta or fast neutron radiation.
C. Fast neutron radiation will produce a larger pulse size than either beta or gamma radiation.
D. Beta, gamma, and fast neutron radiation will produce pulse sizes that are equal in magnitude.

ANSWER: D.

一蓋革-牟勒放射線偵檢器位於包含貝他、伽瑪以及快中子福射線之輻射場中。假設每一種輻射線均進入偵檢氣體腔，同時將偵檢器氣體游離，下列何者描述了所產生之偵檢器脈衝大小？

A. 與伽瑪或快中子相比，貝他放射線將會產生較大的脈衝大小。
B. 與貝他或快中子相比，伽瑪放射線將會產生較大的脈衝大小。
C. 與貝他或伽瑪相比，快中子放射線將會產生較大的脈衝大小。
D. 貝他、伽瑪與快中子所產生的脈衝大小相等。

答案： D.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B2414 (P2413)

A gas-filled radiation detector operating in the ionization chamber region is exposed to a constant gamma radiation field. If the applied voltage is decreased but maintained within the region, the rate of ion collection will...

A. stay approximately the same because all of the primary ions continue to be collected and essentially no secondary ionizations are occurring.
B. stay approximately the same because detector operation in the ionization chamber region is characterized by complete ionization of the detector gas.
C. decrease because fewer primary ionizations are occurring in the detector as detector voltage decreases.
D. decrease because fewer secondary ionizations are occurring in the detector as detector voltage decreases.

ANSWER: A.

一充氣式輻射偵檢器在離子腔區運作，並暴露於一固定之伽瑪輻射場中。若所施加電壓減小，但是仍維持在該區中，則離子收集速率將會

A. 維持大約相同，因為所有的一次離子繼續被收集，而基本上沒有二次游離發生
B. 維持大約相同，因為偵檢器在離子腔區運作之特徵為偵檢器氣體的完全離子化
C. 減小，因為當偵檢器電壓下降時，在偵檢器中所發生的一次游離較少
D. 減小，因為當偵檢器電壓下降時，在偵檢器中所發生的二次游離較少

答案： A.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B3714 (P3714)

During reactor power operation, a reactor coolant sample is taken and analyzed. Which one of the following lists three radionuclides that are all indicative of a fuel cladding failure if detected in elevated concentrations in the reactor coolant sample?
A. Lithium-6, cobalt-60, and argon-41
B. Iodine-131, cesium-138, and strontium-89
C. Nitrogen-16, xenon-135, and manganese-56
D. Hydrogen-2 (deuterium), hydrogen-3 (tritium), and oxygen-18
ANSWER: B.

在反應器運轉中，一反應器冷卻水樣本經過採樣及分析。若反應器冷卻水樣本中檢驗出某些核種濃度升高，則下列那三種放射核種均會指示燃料護套失效？
A. 鋰-6， 鈷-138，氬-41
B. 碘-131, 銫-135, 鍶-89
C. 氮-16, 氙-135, 錳-56
D. 氫-2, 氫-3, 氧-18
答案： B.

科目： 291002
知能類： K1.23 [2.8/2.9]
序號： B3907 (P3906)

A beta particle and an alpha particle enter and cause ionization in a gas-filled radiation detector operating in the Geiger-Mueller region. Which one of the following accurately compares the amplitude of the detector pulses caused by each type of radiation?
A. The beta particle pulse will be larger in amplitude.
B. The alpha particle pulse will be larger in amplitude.
C. The pulses will be identical for both types of radiation.
D. Cannot be determined without particle kinetic energy information.
ANSWER: C.

一貝他粒子與一阿伐粒子進入一於蓋革-牟勒區運作之充氣式輻射偵檢器，並導致游離。下列何者正確比較了由每一種放射線所導致的偵檢器脈衝的大小？
A. 貝他粒子脈衝振幅較大
B. 阿伐粒子脈衝振幅較大
C. 兩種放射線所導致的脈衝大小相同
D. 欠缺動能資料因此無法決定
答案： C.

科目： 291002
知能類： K1.24 [3.1/3.2]
序號： B214 (P216)

Which one of the following describes a characteristic of a self-reading pocket dosimeter (SRPD)?
A. The output of an SRPD is a dose rate in mr/hr.
B. SRPDs can be used to record beta and gamma radiation.
C. SRPD readings must be considered inaccurate when they are dropped.
D. SRPDs hold their charge indefinitely when removed from a radiation field.
ANSWER: C.

下列何者描述了易讀袖珍劑量計(SRPD)的特徵？
A. SRPD輸出之劑量單位為 mr/hr
B. SRPD能用以記錄貝他與伽瑪放射線
C. 當摔落時，SRPD讀數應被視為不正確
D. 當從一輻射場中取出時，SRPD會永久保留其電荷
答案： C.

科目/題號：291002/1 (2016 新增)
知能類：K1.01 [2.4/2.5]
序號：B4804 (P4804)

A cooling water system uses a horizontal venturi with a differential pressure flow detector to provide flow rate indication. Water enters and leaves the venturi at 70°F, 100 psig, and 24 ft/sec. Water velocity at the throat of the venturi is 50 ft/sec. Assume water is incompressible and the venture experiences no unrecoverable head loss. What is the approximate pressure of the water at the throat of the venturi?
A. 98 psig
B. 94 psig
C. 87 psig
D. 74 psig
ANSWER: C.

一冷卻水系統使用水平文氏管及差壓流量偵檢器以提供流量率指示。水以 70°F、100 psig、24 ft/sec 進入與離開文氏管，文氏管喉部水流速為 50 ft/sec。假設水是不可壓縮，而流經文氏管無不可回復的水頭損失。文氏管喉部的水壓大約為何？
A. 98 psig
B. 94 psig
C. 87 psig
D. 74 psig

答案： C

科目/題號：291002/2 (2016 新增)
知能類：K1.01 [2.4/2.5]
序號：B6104 (P6103)

For water flowing through a venturi, there is a proportional relationship between flow rate and differential pressure. For steam flowing through a venturi, the relationship must be modified to account for changes in _____ as the steam flows through the venturi.
A. velocity
B. enthalpy
C. internal energy
D. specific volume
ANSWER: D.

水流經一文氏管，其流量率與差壓為正比關係。如為蒸汽流經此文氏管，則其流量率與差壓的關係必須作修正，以計入_____的改變。
A.速度
B.熱焓
C.內能
D.比容

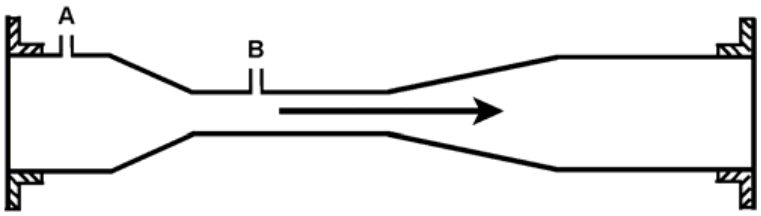
答案： D

科目/題號：291002/3 (2016 新增)
知能類：K1.01 [2.4/2.5]
序號：B6804 (P6803)

Refer to the drawing of a frictionless venturi flow element (see figure below).
Subcooled water is flowing through the venturi with the following initial conditions:
Flow rate = 500 gpm
Tap A pressure = 40 psia
Tap B pressure = 36 psia
Flow rate increases to 1,000 gpm, which results in a tap A pressure of 68 psia. What is the new pressure at tap B?
A. 60 psia
B. 52 psia
C. 44 psia
D. 32 psia
ANSWER: B.

參考無磨擦力文氏管流量元件圖(見下圖)。次冷水流經文氏管，其初始狀態如下：
流量率=500 gpm
接頭A壓力= 40 psia
接頭B壓力= 36 psia
當流量率增加到1,000 gpm時，接頭A壓力為68 psia。接頭B的新壓力為多少？
A. 60 psia
B. 52 psia
C. 44 psia
D. 32 psia

答案： B

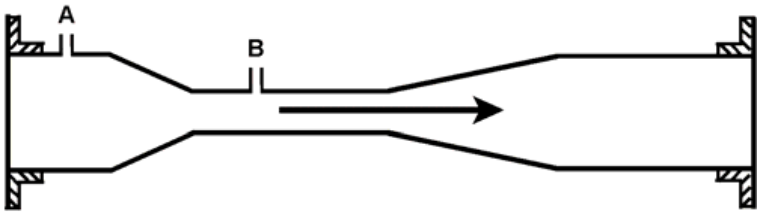


科目/題號：291002/4 (2016 新增)
知能類：K1.01 [2.4/2.5]
序號：B7632 (P7632)

Refer to the drawing of a frictionless venturi flow element (see figure below).
Subcooled water is flowing through the venturi with the following initial conditions:
Flow rate = 500 gpm
Tap A pressure = 40 psia
Tap B pressure = 36 psia
When flow rate is increased to 750 gpm, the pressure at tap A increases to 68 psia.
What is the new pressure at tap B?
A. 66 psia
B. 62 psia
C. 59 psia
D. 52 psia
ANSWER:C

參考無磨擦力文氏管流量元件圖(見下圖)。次冷水流經文氏管，其初始狀態如下：
流量率=500 gpm
接頭A壓力= 40 psia
接頭B壓力= 36 psia
當流量率增加到750 gpm時，接頭A壓力增加到68 psia。接頭B的新壓力為多少？
A. 66 psia
B. 62 psia
C. 59 psia
D. 52 psia

答案： C

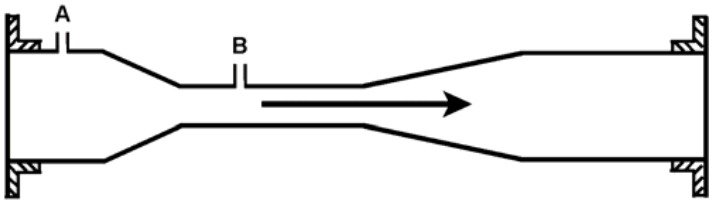


科目/題號：291002/5 (2016 新增)
知能類：K1.01 [2.4/2.5]
序號：B7681 (P7681)

Refer to the drawing of a frictionless venturi flow element (see figure below).
Subcooled water is flowing through the venturi with the following initial conditions:
Flow rate = 500 gpm
Tap A pressure = 48 psia
Tap B pressure = 44 psia
When flow rate is increased to 900 gpm, the pressure at tap A increases to 62 psia.
What is the new pressure at tap B?
A. 46 psia
B. 49 psia
C. 55 psia
D. 60 psia
ANSWER: B.

參考無磨擦力文氏管流量元件圖(見下圖)。次冷水流經文氏管，其初始狀態如下：
流量率=500 gpm
接頭A壓力= 48 psia
接頭B壓力= 44 psia
當流量率增加到 900 gpm時，接頭A壓力增加到 62 psia。接頭B的新壓力為多少？
A. 46 psia
B. 49 psia
C. 55 psia
D. 60 psia

答案： B



科目/題號：291002/6 (2016 新增)
知能類：K1.02 [2.4/2.5]
序號：B4604 (P4603)

A main steam flow rate differential pressure detector was properly calibrated to produce a main steam flow rate indication of 500,000 lbm/hr with the following initial input conditions:
Detector high pressure input = 1,000 psia
Detector low pressure input = 950 psia
The current detector input conditions are as follows:
Detector high pressure input = 985 psia
Detector low pressure input = 935 psia
Assume that the detector and associated circuitry do not have steam density compensation. Also assume that the main steam quality and volumetric flow rate do not change.
The current main steam flow rate indication is _____ 500,000 lbm/hr; and the current main steam flow rate is _____ 500,000 lbm/hr.
A. equal to; greater than
B. less than; greater than
C. equal to; less than
D. greater than; less than
ANSWER: C.

一經適當校正之主蒸汽流量差壓偵檢器，在下列初始輸入狀態下產生 500,000 lbm/hr 主蒸汽流量率指示：
偵檢器高壓端輸入=1,000 psia
偵檢器低壓端輸入=950 psia
目前偵檢器輸入狀態如下：
偵檢器高壓端輸入=985 psia
偵檢器低壓端輸入=935 psia
假設偵檢器及其相關電路沒有蒸汽密度補償，且主蒸汽乾度及體積流量率不變。則目前主蒸汽流量率指示值_____500,000 lbm/hr；又目前主蒸汽流率_____500,000 lbm/hr。
A.等於；大於
B.小於；大於
C.等於；小於
D.大於；小於

答案： C

科目/題號：291002/7 (2016 新增)
知能類：K1.02 [2.4/2.5]
序號：B4704 (P4703)

A nuclear power plant is initially operating with the following main steam parameter values:
Main steam pressure = 1,000 psia
Main steam flow rate = 500,000 lbm/hr
Main steam pressure decreases and stabilizes at 950 psia.
Assume 100 percent quality saturated steam and that main steam volumetric flow rate is the same before and after the pressure change.
Which one of the following is the approximate mass flow rate of main steam after the pressure change?
A. 528,000 lbm/hr
B. 500,000 lbm/hr
C. 472,000 lbm/hr
D. 444,000 lbm/hr
ANSWER: C.

一運轉中的核電廠其初始主蒸汽參數值如下：
主蒸汽壓力= 1,000 psia
主蒸汽流量率= 500,000 lbm/hr
主蒸汽壓力降低後穩定在 950 psia。
假設壓力改變前和改變後主蒸汽均維持 100%乾度飽和及相同體積流量率。
下列何者為壓力改變後的大約主蒸汽質量流量率？
A. 528,000 lbm/hr
B. 500,000 lbm/hr
C. 472,000 lbm/hr
D. 444,000 lbm/hr

答案： C

科目/題號：291002/8 (2016 新增)
知能類：K1.05 [3.1/3.1]
序號：B1773 (P1873)

Water is flowing through each of the following devices. Which one of the devices will produce an outlet pressure that is greater than the inlet pressure?
A. Convergent nozzle
B. Divergent nozzle
C. Orifice
D. Flow restrictor
ANSWER: B.

水流經下列各項設備時，其中那一項設備之出口壓力大於入口壓力？
A.漸縮噴嘴
B.漸散噴嘴
C.限流孔
D.流量限制器

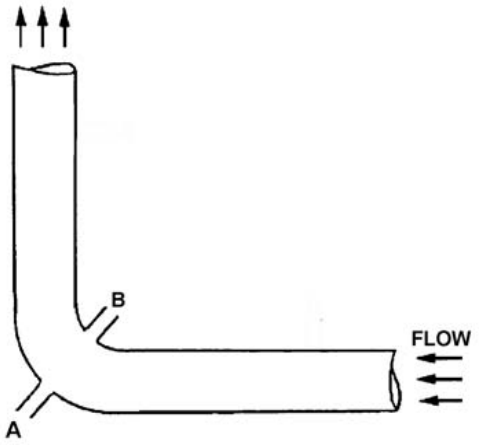
答案： B

科目/題號：291002/9 (2016 新增)
知能類：K1.05 [3.1/3.1]
序號：B1907 (P1007)

Refer to the drawing of a pipe elbow used for flow measurement in a cooling water system (see figure below).
A differential pressure (D/P) flow detector is connected to instrument lines A and B. If instrument line A develops a leak, indicated flow rate will _____ due to a _____ measured D/P.
A. increase; larger
B. increase; smaller
C. decrease; larger
D. decrease; smaller
ANSWER: D.

參考用在一冷卻水系統量測流量的肘形彎管圖(見下圖)。
差壓流量偵檢器連接到儀器管 A 與 B。如果儀器管 A 發生洩漏，則流量率指示將會_____，因為量測的差壓_____。
A.增加；較大
B.增加；較小
C.減少；較大
D.減少；較小

答案： D



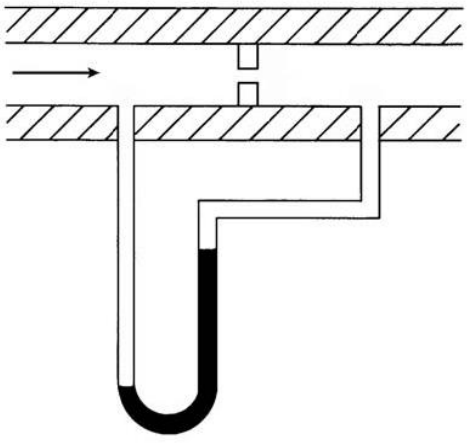
PIPE ELBOW - TOP VIEW

科目/題號：291002/10 (2016 新增)
知能類：K1.05 [3.1/3.1]
序號：B3807 (P3807)

Refer to the drawing of a differential pressure manometer (see figure below).
The manometer is filled with water and installed across an orifice in a ventilation duct to determine the rate of air flow. The manometer is currently indicating a water level difference of 16-inch at an air flow rate of 300 ft3/min.
Which one of the following will be the approximate rate of air flow when the manometer indicates a water level difference of 4-inch?
A. 75 ft3/min.
B. 125 ft3/min.
C. 150 ft3/min.
D. 175 ft3/min.
ANSWER: C.

參考差壓流量計圖(見下圖)。
此流量計充水安裝於通風管內的限流孔之兩側以量測空氣流量率。空氣流量率為 300 ft^3/min 時，流量計指示水位差為 16-inch。
當流量計指示水位差為 4-inch 時，下列何者為大約的空氣流量率？
A. 75 ft^3/min.
B. 125 ft^3/min.
C. 150 ft^3/min.
D. 175 ft^3/min.

答案： C.

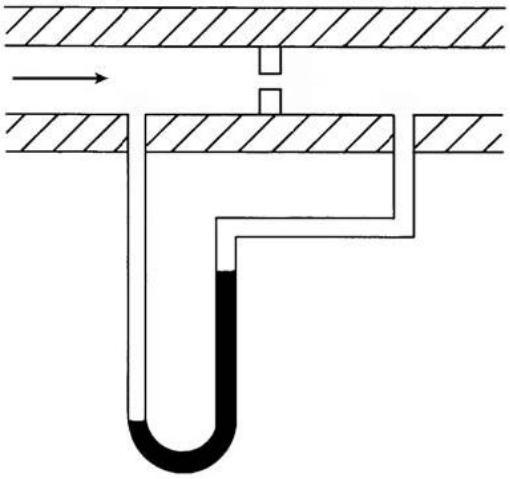


科目/題號：291002/11 (2016 新增)
知能類：K1.05 [3.1/3.1]
序號：B4605 (P4604)

Refer to the drawing of a differential pressure manometer (see figure below).
The manometer is filled with water and installed across an orifice in a ventilation duct to determine the rate of air flow. The manometer is currently indicating a water level difference of 8-inch at an air flow rate of 300 cubic feet per minute (ft3/min).
Which one of the following will be the approximate air flow rate when the manometer indicates a water level difference of 4-inch?
A. 75 ft3/min
B. 150 ft3/min
C. 188 ft3/min
D. 212 ft3/min
ANSWER: D

參考差壓流量計圖(見下圖)。
此流量計充水安裝於通風管內的限流孔兩側以量測空氣流量率。空氣流量率為 300 ft^3/min 時，流量計指示水位差為 8-inch。
當流量計指示水位差為 4-inch 時，下列何者為大約的空氣流量率？
A. 75 ft^3/min.
B. 150 ft^3/min.
C. 188 ft^3/min.
D. 212 ft^3/min.

答案： D

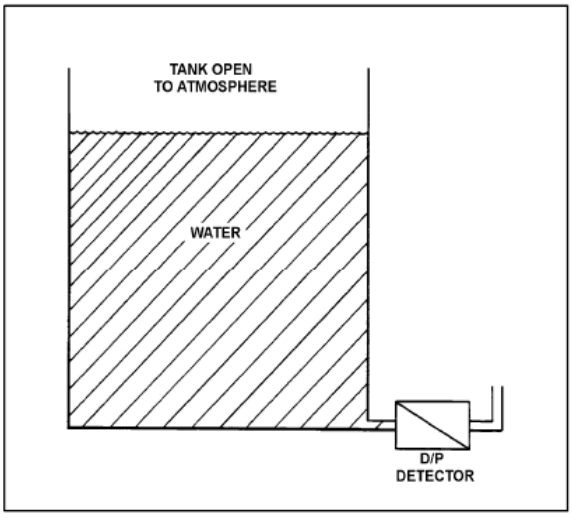


科目/題號：291002/12 (2016 新增)
知能類：K1.06 [2.8/2.9]
序號：B2210

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detector (see figure below).
The level detector is being used in a level control system that was calibrated to maintain tank level at 80 percent at the current water temperature of 70°F. If the water temperature gradually increases and stabilizes at 90°F, the level control system will cause actual tank level to...
A. remain at 80 percent.
B. increase and stabilize above 80 percent.
C. oscillate around 80 percent.
D. decrease and stabilize below 80 percent.
ANSWER: B.

參考裝有差壓(D/P)液位偵檢器的儲水槽圖(見下圖)。
此液位偵檢器經校正用於液位控制系統，以維持目前水溫為 70°F 液位在 80%。
如果水溫慢慢升高後並穩定在 90°F，則液位控制系統將使儲水槽液位…
A.維持在 80%
B.上升並穩定在 80%以上
C.在 80%附近震盪
D.下降並穩定在 80%以下

答案： B

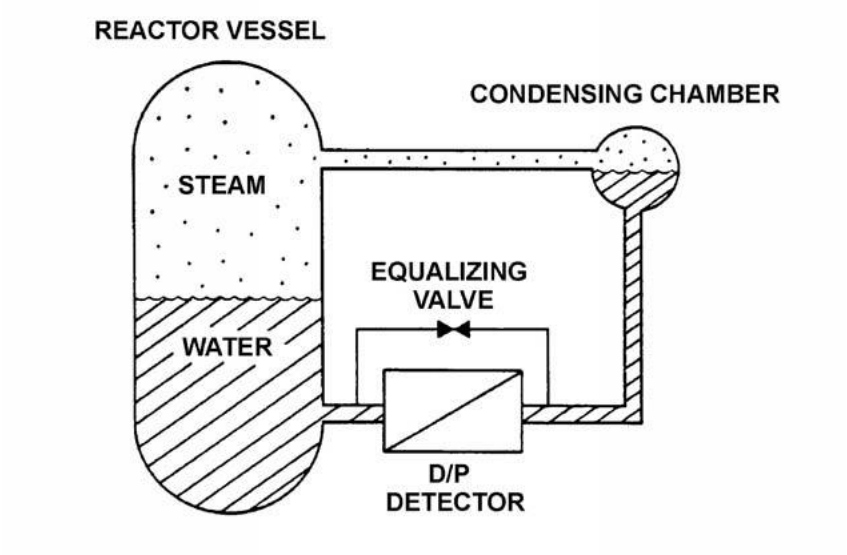


科目/題號：291002/13 (2016 新增)
知能類：K1.06 [2.8/2.9]
序號：B4104

Refer to the drawing of a reactor vessel differential pressure (D/P) level detection system that was recently calibrated at normal operating conditions (see figure below). Assume that the associated reactor vessel level instrument does not use density compensation.
With the nuclear power plant shut down at reduced reactor vessel temperature and pressure, the reactor vessel level instrument will indicate _____ than actual water level; the D/P currently sensed by the D/P detector is _____ than the D/P for the same reactor vessel water level at normal operating conditions.
A. higher; smaller
B. higher; larger
C. lower; smaller
D. lower; larger
ANSWER: A.

參考最近在正常運轉狀態下校正的反應爐槽差壓(D/P)液位偵檢系統圖(見下圖)。假設反應爐槽相關液位儀器沒有使用密度補償。
當核能電廠停機，反應爐槽溫度及壓力減低時，反應爐槽液位儀器指示將_____實際水位;而目前差壓偵檢器量到的差壓將_____在正常運轉狀態下相同反應爐槽水位差壓。
A.高於；小於
B.高於；大於
C.低於；小於
D.低於；大於

答案： A

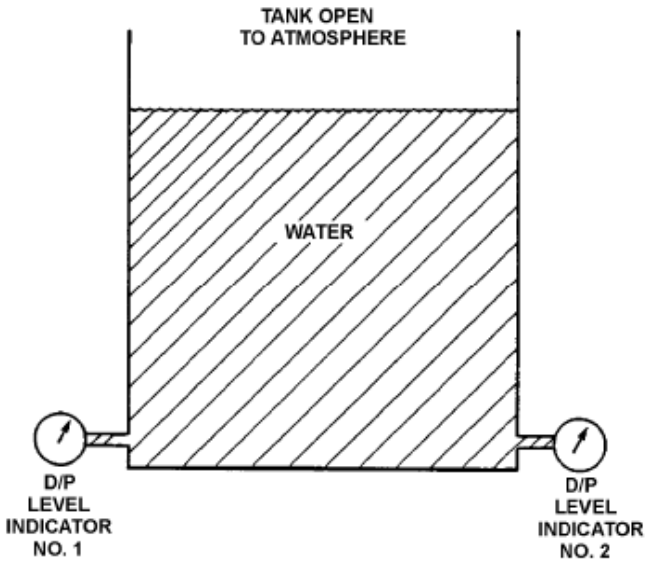


科目/題號：291002/14 (2016 新增)
知能類：K1.06 [2.8/2.9]
序號：B4205 (P1907)

Refer to the drawing of a water storage tank with two differential pressure (D/P) level indicators (see figure below).
Indicator 1 was calibrated at 120°F and indicator 2 was calibrated at 180°F. If tank water temperature is currently 150°F, then indicator...
A. 1 will read greater than indicator 2, and greater than actual level.
B. 1 will read greater than indicator 2, and less than actual level.
C. 2 will read greater than indicator 1, and greater than actual level.
D. 2 will read greater than indicator 1, and less than actual level.
ANSWER: C.

參考裝有兩只差壓(D/P)液位指示計的儲水槽圖(見下圖)。
液位計 1 校正於 120°F，而液位計 2 校正於 180°F。如果儲水槽目前水溫為 150°F，則…
A.液位計 1 讀數將高於液位計 2，且高於實際水位
B.液位計 1 讀數將高於液位計 2，且低於實際水位
C.液位計 2 讀數將高於液位計 1，且高於實際水位
D.液位計 2 讀數將高於液位計 1，且低於實際水位

答案： C

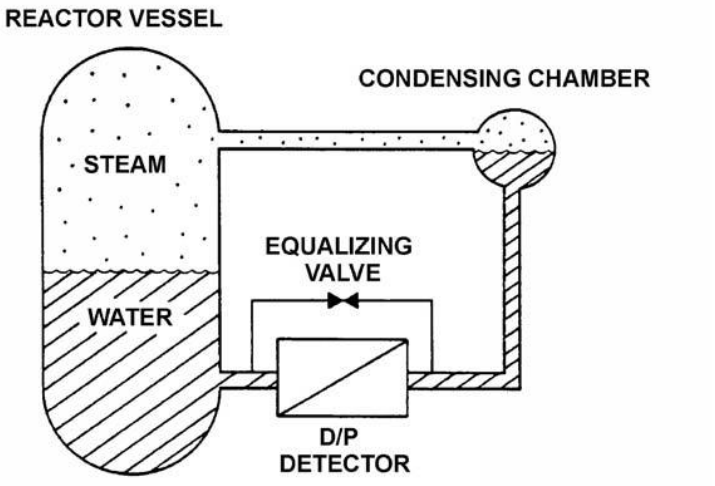


科目/題號：291002/15 (2016 新增)
知能類：K1.06 [2.8/2.9]
序號：B4504

Refer to the drawing of a differential pressure (D/P) level detection system for a reactor vessel at normal operating temperature and pressure (see figure below).
A nuclear power plant uses several differential pressure detectors like the one below to provide multiple channels of reactor vessel water level indication. A hot channel was calibrated when the reactor vessel was at normal operating temperature. A cold channel was calibrated when the reactor vessel was at 160°F.
How will the level indications on the two channels compare when the reactor vessel is at normal operating temperature?
A. The cold channel will indicate higher than the hot channel, due to the difference in reference leg water density at the two calibration temperatures.
B. The cold channel will indicate lower than the hot channel, due to the difference in reference leg water density at the two calibration temperatures.
C. The cold channel will indicate higher than the hot channel, due to the difference in reactor vessel water density at the two calibration temperatures.
D. The cold channel will indicate lower than the hot channel, due to the difference in reactor vessel water density at the two calibration temperatures.
ANSWER: D.

參考在正常運轉溫度及壓力下反應爐槽差壓(D/P)液位偵檢系統圖(見下圖)。
一核電廠使用多只圖示之差壓偵檢器以提供反應爐槽具多重控道水位指示。高溫控道於反應爐槽正常運轉溫度時校正。低溫控道於反應爐槽160°F時校正。
當反應爐槽在正常運轉溫度時兩控道水位指示值之比較結果為何？
A.低溫控道將高於高溫控道，因為在兩不同校正溫度下之參考柱密度不同
B.低溫控道將低於高溫控道，因為在兩不同校正溫度下之參考柱密度不同
C.低溫控道將高於高溫控道，因為在兩不同校正溫度下之反應爐槽水密度不同
D.低溫控道將低於高溫控道，因為在兩不同校正溫度下之反應爐槽水密度不同

答案： D



科目/題號：291002/16 (2016 新增)
知能類：K1.06 [2.8/2.9]
序號：B5105

Refer to the drawing of a differential pressure (D/P) level detection system for a reactor vessel at normal operating temperature and pressure (see figure below).
A nuclear power plant uses several differential pressure detectors like the one below to provide multiple channels of reactor vessel water level indication. A hot channel was calibrated when the reactor vessel was at normal operating temperature. A cold channel was calibrated when the reactor vessel was at 160°F.
How will the level indications on the two channels compare when the reactor vessel is at 160°F?

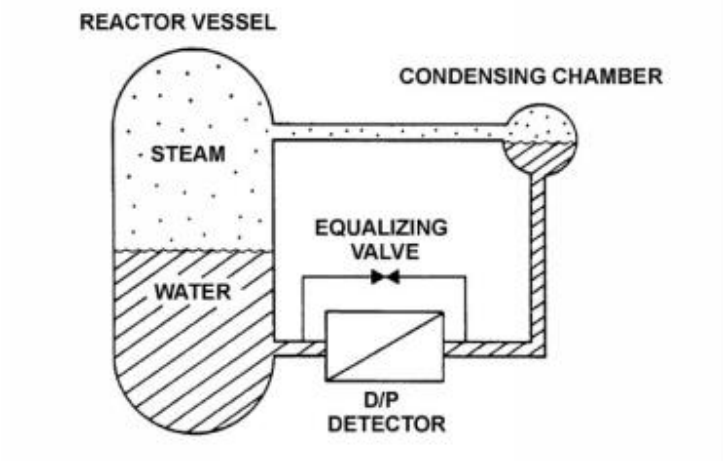
A. The cold channel will indicate higher than the hot channel, due to the difference in reference leg water density at the two calibration temperatures.
B. The cold channel will indicate lower than the hot channel, due to the difference in reference leg water density at the two calibration temperatures.
C. The cold channel will indicate higher than the hot channel, due to the difference in reactor vessel water density at the two calibration temperatures.
D. The cold channel will indicate lower than the hot channel, due to the difference in reactor vessel water density at the two calibration temperatures.

ANSWER: D.

參考在正常運轉溫度及壓力下反應爐槽差壓(D/P)液位偵檢系統圖(見下圖)。
一核電廠使用多只如下圖所示之差壓偵檢器以提供反應爐槽具多重控道水位指示。高溫控道於反應爐槽正常運轉溫度時校正。低溫控道於反應爐槽160°F時校正。
當反應爐槽在160°F時兩組水位指示值之比較結果為何？

A.低溫控道將高於高溫控道，因為在兩不同校正溫度下之參考柱密度不同
B.低溫控道將低於高溫控道，因為在兩不同校正溫度下之參考柱密度不同
C.低溫控道將高於高溫控道，因為在兩不同校正溫度下之反應爐槽水密度不同
D.低溫控道將低於高溫控道，因為在兩不同校正溫度下之反應爐槽水密度不同

答案： D

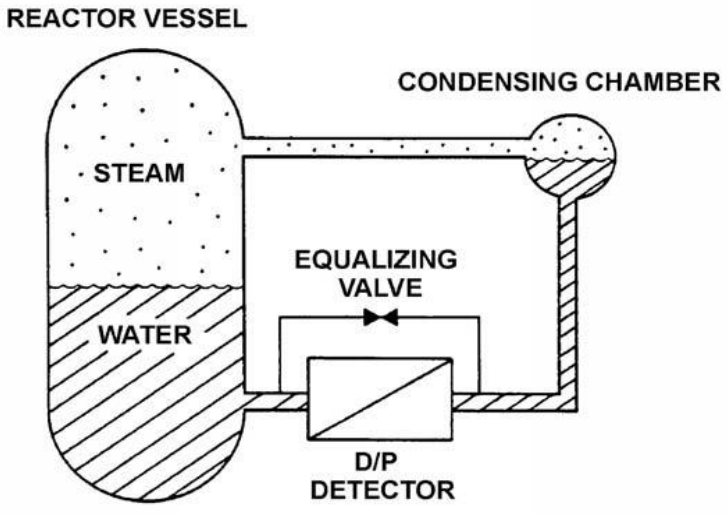


科目/題號：291002/17 (2016 新增)
知能類：K1.06 [2.8/2.9]
序號：B6204

Refer to the drawing of a reactor vessel differential pressure (D/P) level detection system (see figure below).
With the reactor containing saturated water at 536°F, reactor vessel level indication is 40 feet. Assume that reference leg level and temperature do not change. Also, ignore the effect of steam density changes on level indication.
With no change in actual reactor vessel level, what will level indication be at 300°F (saturated)?
A. 32.7 feet
B. 35.8 feet
C. 45.2 feet
D. 48.9 feet
ANSWER: D.

參考反應爐槽差壓(D/P)液位偵檢系統圖(見下圖)。
當反應爐裝載536°F飽和水時，反應爐槽水位指示為40 feet。假設參考柱水位與溫度沒有改變，且忽略蒸汽密度改變對水位指示的影響。
在反應爐槽實際水位沒有改變下，300°F飽和狀態的水位指示值為何？
A. 32.7 feet
B. 35.8 feet
C. 45.2 feet
D. 48.9 feet

答案： D



科目/題號：291002/18 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B155

Many reactor vessel water level instruments are designed with a condensing chamber in the reference leg. The purpose of the condensing chamber is to...
A. provide a source of makeup water to the reference leg during normal operations.
B. provide reference leg compensation for the reactor pressure exerted on the variable leg.
C. prevent reference leg flashing during a rapid depressurization of the reactor vessel.
D. ensure the reference leg temperature remains near the temperature of the water in the reactor vessel.
ANSWER: A.

許多反應器水位儀器參考柱在設計上均有冷凝腔(condensing chamber)。冷凝腔的目的是…
A.在正常運轉狀況下提供參考柱補給水來源
B.提供施加於可變柱的反應器壓力的補償
C.預防反應器在快速減壓過程中參考柱發生閃化
D.確保參考柱溫度維持接近於反應器的水溫

答案： A

科目/題號：291002/19 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B5004

The downcomer region of a reactor vessel contains 40 feet of saturated water at 536°F. A reactor vessel water level detector has a pressure tap located at the bottom of the downcomer region. Approximately how much of the total pressure at the pressure tap is caused by the downcomer water?
A. 0.6 psi
B. 13.0 psi
C. 27.7 psi
D. 156.0 psi
ANSWER: B.

反應器降流區有 40 feet、536°F 的飽和水。在降流區底部有一反應器水位感測器壓力接頭。此壓力中，源自降流區的壓力大約為多少？
A. 0.6 psi
B. 13.0 psi
C. 27.7 psi
D. 156.0 psi

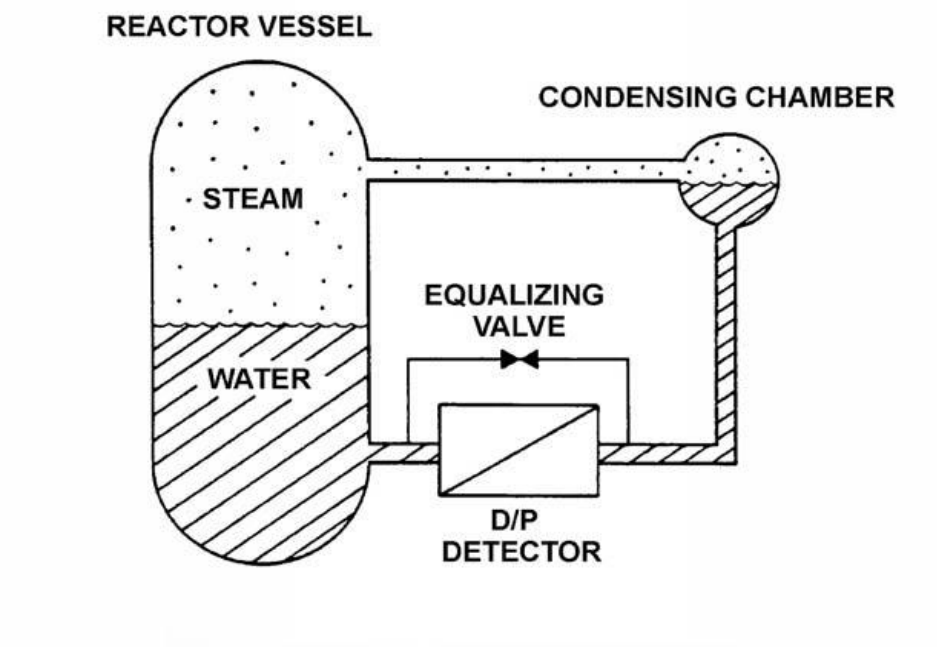
答案： B

科目/題號：291002/20 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B5204

Refer to the drawing of a differential pressure (D/P) level detection system (see figure below) for a reactor vessel at normal operating temperature and pressure. The level detector has just been calibrated.
The high pressure side of the detector is connected to the _____; and if the equalizing valve is opened, the indicated reactor vessel level will be _____ than the actual level.
A. condensing chamber; lower
B. condensing chamber; higher
C. reactor vessel; lower
D. reactor vessel; higher
ANSWER: B.

參考在正常溫度及壓力運轉的反應器差壓(D/P)液位偵檢系統圖(見下圖)。該水位偵檢器剛校正完成。偵檢器高壓側是接到_____；又如果平衡閥是開著的，反應器水位指示值將_____實際水位。
A.冷凝腔(condensing chamber)；低於
B.冷凝腔(condensing chamber)；高於
C.反應爐；低於
D.反應爐；高於

答案： B

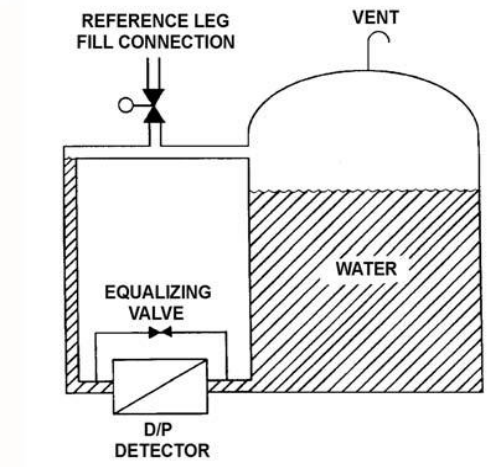


科目/題號：291002/21 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B6105 (P6104)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below).
The D/P level detector was just calibrated and returned to operation with the following conditions:
●The reference leg contains 20 feet of water at 70°F.
●The tank contains 18 feet of water at 70°F.
●Tank level indication is 18 feet.
Assume the actual tank water level and the temperature of the water in the tank and reference leg do not change. Which one of the following will be the new tank level indication if the reference leg water level decreases to 18 feet?
A. 22 feet
B. 20 feet
C. 18 feet
D. 2 feet
ANSWER: B.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。
差壓(D/P)液位偵檢器剛校正後在下列狀況下恢復運轉：
●參考柱含有20 feet高、溫度70°F的水
●儲水槽含有18 feet高、溫度70°F的水
●儲水槽液位指示為18 feet
假設在貯水槽實際水位不變，儲水槽與參考水柱水溫也不變。如果參考柱的水位降低到18 feet，下列何者為儲水槽的新液位指示值？
A. 22 feet
B. 20 feet
C. 18 feet
D. 2 feet

答案： B

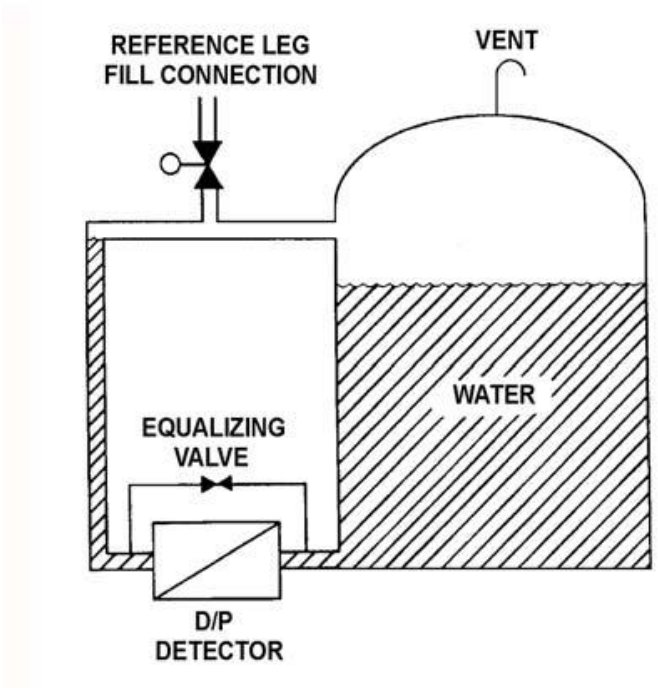


科目/題號：291002/22 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B6606 (P6604)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below).
The water storage tank is 40 feet tall. The level detection system is calibrated to provide a level indication of 30 feet when the tank and reference leg levels are equal.
If the tank is completely filled with water, the tank level will indicate...
A. less than 30 feet.
B. 30 feet.
C. greater than 30 feet, but less than 40 feet.
D. 40 feet.
ANSWER: B.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。
儲水槽為40 feet高。當液位偵檢系統在儲水槽與參考柱水位一樣時，作校正顯示儲水槽之水位為30 feet。如果儲水槽充滿水，則儲水槽水位指示值將為…
A.小於30 feet
B. 30 feet
C.大於30 feet但小於40 feet
D. 40 feet

答案： B

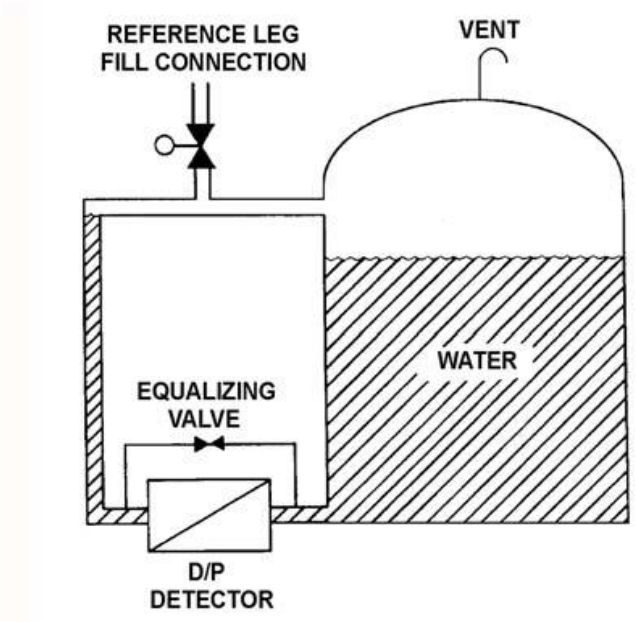


科目/題號：291002/23 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B6705 (P6704)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below).
Assume that the initial temperature of the reference leg and the water in the tank is 100°F, and that reference leg temperature does not change.
If the temperature of the water in the tank increases by 20°F, the D/P sensed by the detector will _____ if the _____ of the water in the tank is constant.
A. decrease; level
B. decrease; mass
C. remain the same; level
D. remain the same; mass
ANSWER: D.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。
假設參考柱及儲水槽初始水溫為100°F，又參考柱水溫不變。
如果儲水槽水溫增加20°F，則偵檢器量到的差壓將 _____假設儲水槽水的_____是固定不變。
A.減小；水位
B.減小；質量
C.維持不變；水位
D.維持不變；質量

答案： D

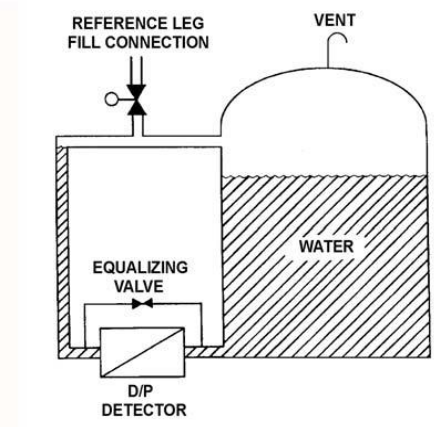


科目/題號：291002/24 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B7404 (P7404)

Refer to the drawing of a vented water storage tank with a differential pressure (D/P) level detection system (see figure below). The water in the tank and reference leg is at the same temperature.
The tank level indicator was just calibrated to indicate 0 percent when the tank is empty and 100 percent when the water level reaches the upper tap. The indicator's display range is 0 percent to 120 percent. The initial water level is as indicated in the figure.
If the tank water level slowly increases and stabilizes just below the top of the tank, the level indication will increase until…
A. the water level stabilizes, at which time the level indication will stabilize at 100 percent.
B. the water level stabilizes, at which time the level indication will stabilize at a value greater than 100 percent.
C. the water level reaches the upper tap, at which time the level indication will remain at 100 percent as the water level continues to increase.
D. the water level reaches the upper tap, at which time the level indication will continue to increase as the water level continues to increase.
ANSWER: C.

參考裝有差壓(D/P)液位偵檢系統的通氣儲水槽圖(見下圖)。儲水槽的水與參考柱的水溫度相同。剛校正過的儲水槽水位指示器，在空水槽時水位指示值為0%，在水位達到上接頭時水位指示值為100%。水位指示器的指示範圍為0%到120%。起始水位如圖所示。如果儲水槽水位慢慢上升，並在槽頂正下方達到穩定，則水位指示值將上升直到…
A.水位達到穩定時，水位指示值將穩定在100%
B.水位達到穩定時，水位指示值將穩定在100%以上
C.水位達到上接頭時，水位指示值將停在100%，而水位則繼續上升
D.水位達到上接頭時，水位指示值將跟著水位上升繼續上升

答案： C

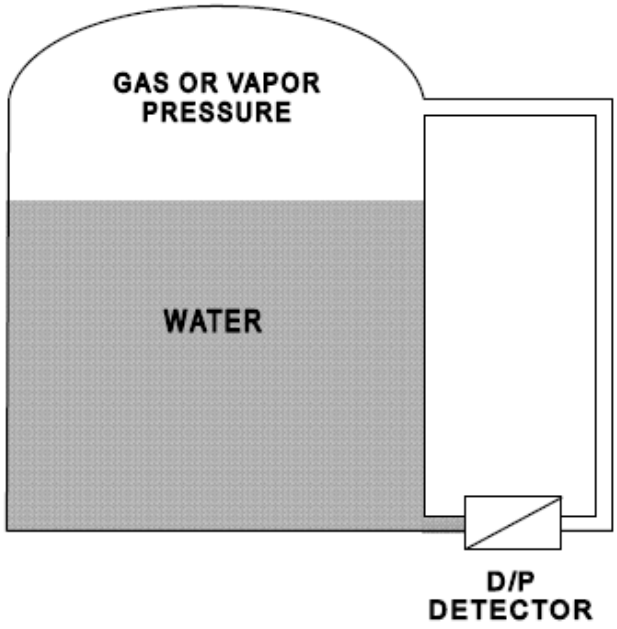


科目/題號：291002/25 (2016 新增)
知能類：K1.07 [3.2/3.2]
序號：B7602 (B7602)

Refer to the drawing of a water storage tank with a differential pressure (D/P) level detection system (see figure below). The level detector has just been calibrated. How will the indicated level be affected if condensation partially fills the normally dry reference leg?
A. Indicated level will not be affected.
B. Indicated level will be lower than actual level.
C. Indicated level will be higher than actual level.
D. Indicated level may be higher or lower than actual level depending on the pressure in the upper volume of the tank.
ANSWER: B.

參考裝有差壓(D/P)液位偵檢系統的儲水槽圖(見下圖)。該水位偵檢器剛校正完成。假如正常時乾燥的參考柱現在有部分凝結水，則水位指示值將會受到什麼影響？
A.水位指示值不會受到影響
B.水位指示值將低於實際水位
C.水位指示值將高於實際水位
D.水位指示值將高於或低於實際水位視儲水槽上部空間之壓力而定

答案： B



科目/題號：291002/26 (2016 新增)
知能類：K1.11 [2.3/2.5]
序號：B7504 (P7503)

A cooling water system pressure detector uses a bourdon tube as the sensing element. Which one of the following explains how the indicated system pressure will be affected if a local steam leak raises the temperature of the bourdon tube by 50°F? (Assume the cooling water system pressure does not change.)
A. Indicated pressure will decrease because the bourdon tube will become more flexible.
B. Indicated pressure will increase because the bourdon tube will become more flexible.
C. Indicated pressure will decrease because the bourdon tube internal pressure will increase.
D. Indicated pressure will increase because the bourdon tube internal pressure will increase.
ANSWER: B.

一冷卻水系統壓力偵檢器使用巴登管(bourdon tube)當感測元件。當有局部蒸汽洩漏使得巴登管溫度提高50°F，下列何者可以說明系統壓力指示值將受到如何的影響？(假設冷卻水系統壓力不變)
A.系統壓力指示值將降低，因為巴登管將變得較可撓
B.系統壓力指示值將增加，因為巴登管將變得較可撓
C.系統壓力指示值將降低，因為巴登管內部壓力將增加
D.系統壓力指示值將增加，因為巴登管內部壓力將增加

答案： B

科目/題號：291002/27 (2016 新增)
知能類：K1.11 [2.3/2.5]
序號：B7642 (P7642)

A cooling water system pressure detector uses a bourdon tube as the sensing element. Which one of the following explains how the indicated system pressure will be affected if the temperature of the bourdon tube decreases by 30°F? (Assume the cooling water system pressure does not change.)
A. Indicated pressure will decrease because the bourdon tube will become less flexible.
B. Indicated pressure will increase because the bourdon tube will become less flexible.
C. Indicated pressure will decrease because the bourdon tube internal pressure will decrease.
D. Indicated pressure will increase because the bourdon tube internal pressure will decrease.
ANSWER: A.

一冷卻水系統壓力偵檢器使用巴登管(bourdon tube)當感測元件。如果巴登管溫度降低30°F，下列何者可以說明系統壓力指示值將受到如何的影響？(假設冷卻水系統壓力不變)
A.系統壓力指示值將降低，因為巴登管將變得較不可撓
B.系統壓力指示值將增加，因為巴登管將變得較不可撓
C.系統壓力指示值將降低，因為巴登管內部壓力將減少
D.系統壓力指示值將增加，因為巴登管內部壓力將減少

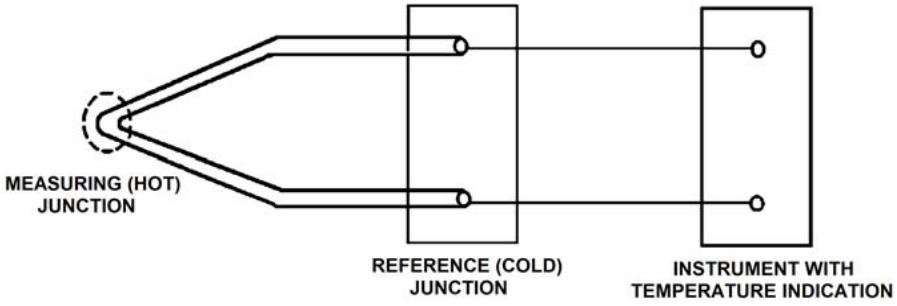
答案： A

科目/題號：291002/28 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B4206 (P4206)

Refer to the drawing of a simple thermocouple circuit (see figure below).
Given that the temperatures at the measuring and reference junctions remain constant, if a ventilation system malfunction causes the temperature of the temperature indication panel to increase by 10°F, indicated temperature will...
A. not be affected.
B. increase by 10°F.
C. decrease by 10°F.
D. change in an unpredictable manner.
ANSWER: A.

參考一熱電偶電路簡圖(見下圖)。
已知參考接合點及量測接合點之溫度固定不變，如果因通風系統故障導致溫度指示儀板之溫度上升10°F，溫度指示值將…
A.不受影響
B.上升10°F
C.下降10°F
D.無法預測如何變化

答案： A

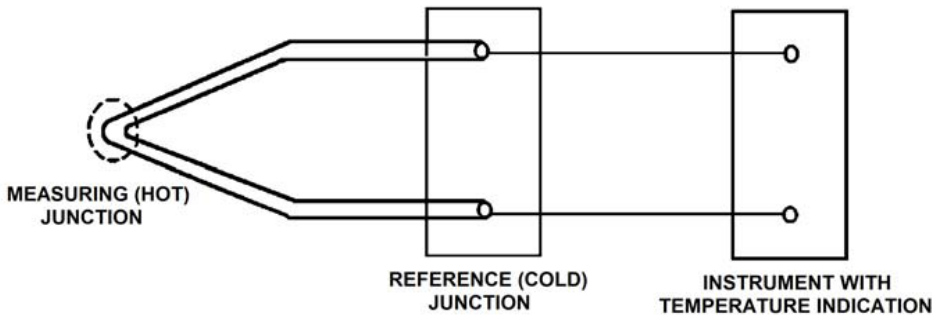


科目/題號：291002/29 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B5305 (P5305)

Refer to the drawing of a simple thermocouple circuit (see figure below).
The measuring and reference junctions are located inside the reactor containment building while the instrument is located in a remote location outside the containment building. Thermocouple temperature indication is initially 500°F.
An ambient temperature decrease outside the containment building lowers the temperature of the instrument by 10°F, while the measuring and reference junction temperatures remain constant. Thermocouple temperature indication at the lower ambient temperature will be...
A. 490°F.
B. 500°F.
C. 510°F.
D. unpredictable.
ANSWER: B.

參考一熱電偶電路簡圖(見下圖)。
量測接合點及參考接合點位於圍阻體內，儀器則位於圍阻體外遠端處。熱電偶之最初溫度指示值為500°F。圍阻體外環境溫度下降使得儀器溫度下降10°F，量測接合點及參考接合點溫度則維持不變。在較低的環境溫度下熱電偶溫度指示值將是…
A.490°F
B.500°F
C.510°F
D.無法預測

答案： B

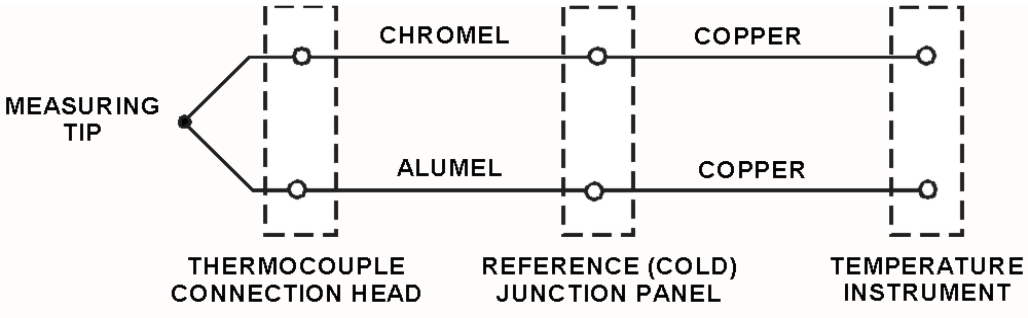


科目/題號：291002/30 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B5507 (P5505)

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).
What is the effect on the thermocouple reference junctions if the chromel and alumel extension wires from the thermocouple connection head to the reference junction panel are replaced with copper wires?
A. There will no longer be any reference junctions.
B. The reference junctions will be located in the temperature instrument.
C. The reference junctions will still be located in the reference junction panel.
D. The reference junctions will be located in the thermocouple connection head.
ANSWER: D.

參考一鉻鎳-鋁鎳熱電偶電路簡圖(見下圖)。
如果將熱電偶接出端點到參考接合點連接板的鉻鎳及鋁鎳延伸線換成銅線則其對參考接合點的影響為何？
A.將不再有任何參考接合點
B.參考接合點位置將在溫度儀器
C.參考接合點位置仍將在參考接合點連接板
D.參考接合點位置將在熱電偶接出端點

答案： D



科目/題號：291002/31 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B5805 (P5805)

Which one of the following is a characteristic of a resistance temperature detector but not a thermocouple?
A. Sensing element is made from a single metal or alloy.
B. Requires a reference junction for accurate temperature measurement.
C. Extension leads made from relatively expensive metals or alloys are required for accurate temperature measurement.
E. Temperature measurement relies on a sensor material property that varies directly with the change in the measured temperature.
ANSWER: A.

下列何者是電阻式溫度偵檢器(RTD)的特徵但不是熱電偶的特徵？
A.感測元件由單一金屬或合金製成
B.為量取精確溫度需要參考接合點
C.為量取精確溫度需要較昂貴的金屬或合金製成的延伸線
D.溫度量測依據感測器的材質特性而定，而實際量測到的溫度直接隨著量測溫度改變而變更

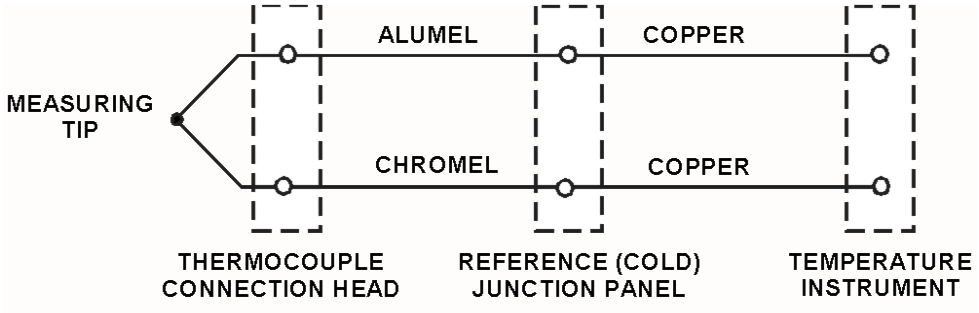
答案： A

科目/題號：291002/32 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B6005 (P6004)

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).
What is the effect on the thermocouple reference junctions if the copper extension wires from the reference junction panel to the temperature instrument are replaced with alumel (top) and chromel (bottom) extension wires?
A. The reference junctions will be located in the thermocouple connection head.
B. The reference junctions will still be located in the reference junction panel.
C. The reference junctions will be located in the temperature instrument.
D. There will no longer be any reference junctions.
ANSWER: C.

參考一鉻鎳-鋁鎳熱電偶電路簡圖(見下圖)。
如果將參考接合點連接板到溫度儀器的銅延伸線換成鋁鎳(上)及鉻鎳(下)延伸線，則其對參考接合點的影響為何？
A.參考接合點位置將在熱電偶連接端點
B.參考接合點位置仍將在參考接合點連接板
C.參考接合點位置將在溫度儀器
D.將不再有任何參考接合點

答案： C

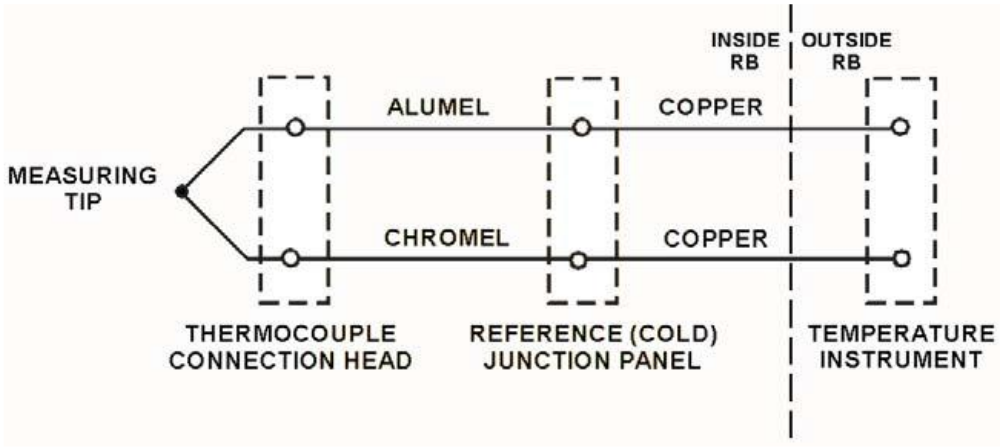


科目/題號：291002/33 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B6306 (P6305)

Refer to the drawing of a simple chromel-alumel thermocouple circuit (see figure below).
The thermocouple, thermocouple connection head, and reference junction panel are located inside a reactor building (RB) while the temperature instrument is located outside the RB. Thermocouple temperature indication is initially 440°F.
A steam leak inside the RB increases the temperatures of the thermocouple connection head and reference junction panel by 40°F, while the temperature at the measuring tip is unchanged. What is the resulting temperature indication?
A. 400°F
B. 440°F
C. 480°F
D. 520°F
ANSWER: A.

參考一鉻鎳-鋁鎳熱電偶電路簡圖(見下圖)。
熱電偶、熱電偶接出端點及參考接合點連接板位於反應器廠房內而溫度儀器則位於反應器廠房外。熱電偶溫度指示最初為440°F。
反應器廠房內蒸汽洩漏使得熱電偶接出端點及參考接合點連接板溫度上升40°F。當量測端點的溫度不變，則溫度指示將變為多少？
A. 400°F
B. 440°F
C. 480°F
D. 520°F

答案： A



科目/題號：291002/34 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B6506 (P6504)

Because of a thermocouple temperature display failure, the millivolt output of a thermocouple circuit is being converted to a temperature value using conversion tables. The tables are based on a thermocouple reference junction temperature of 32°F. The actual reference junction is located in a panel that is maintained at 120°F. Room temperature surrounding the panel is 80°F.
What adjustment must be made to the temperature value taken from the conversion tables to calculate the actual temperature at the measuring tip of the thermocouple?
A. Add 48°F.
B. Subtract 48°F.
C. Add 88°F.
D. Subtract 88°F.
ANSWER: C.

由於熱電偶溫度指示失效，熱電偶電路的毫伏特(mV)輸出用轉換表轉換為溫度值。轉換表係以參考接合點32°F為基準。實際參考接合點位在連接板，該連接板溫度維持在120°F。連接板周遭室溫為80°F。
要計算量測端點的實際溫度，從轉換表取得的溫度值必須做何種調整？
A.加48°F
B.減48°F
C.加88°F
D.減88°F

答案： C

科目/題號：291002/35 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B6905 (P6905)

A simple two-wire resistance temperature detector (RTD) is being used to measure the temperature of a water system. Copper extension wires run from the RTD to a temperature instrument 40 feet away.
If the temperature of the extension wires decreases, the electrical resistance of the extension wires will _____; and the temperature indication will _____ unless temperature compensation is provided.
A. increase; increase
B. increase; decrease
C. decrease; increase
D. decrease; decrease
ANSWER: D.

用一簡單的雙線電阻式溫度偵檢器(RTD)量測一水系統溫度。電阻式溫度偵檢器以銅延伸線連接到40呎外的溫度儀器。
如果延伸線的溫度降低，延伸線的電阻將_____；若未提供溫度補償，則溫度指示將_____。
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：291002/36 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B7106 (P7103)

A resistance temperature detector (RTD) and a thermocouple (TC) are commonly used sensors for temperature measurement. If a temperature display fails, which of the sensors, if any, has a property that can be measured manually and converted to a temperature value with the aid of conversion tables.
A. TC only.
B. RTD only.
C. Both TC and RTD.
D. Neither TC nor RTD.
ANSWER: C.

電阻式溫度偵檢器(RTD)及熱電偶(TC)係常用的溫度量測元件。若其溫度指示失效，有那種元件具有可先以人工量測後，再藉轉換表轉換為溫度值的特性？
A.只有熱電偶可以
B.只有電阻式溫度偵檢器可以
C.熱電偶及電阻式溫度偵檢器都可以
D.熱電偶及電阻式溫度偵檢器都不可以

答案： C

科目/題號：291002/37 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B7206 (P7205)

Because of a thermocouple temperature display failure, the millivolt output of a thermocouple circuit is being converted to a temperature value using conversion tables. The tables are based on a thermocouple reference junction temperature of 32°F. The actual reference junction is located in a panel that is currently at 80°F. The temperature value taken from the conversion tables is 120°F.
What adjustment must be made to the temperature value taken from the conversion tables to calculate the actual temperature at the measuring tip of the thermocouple?
A. Add 48°F.
B. Subtract 48°F.
C. Add 88°F.
D. Subtract 88°F.
ANSWER: A.

由於熱電偶溫度指示失效，熱電偶電路的毫伏特(mV)輸出，用轉換表轉換為溫度值。轉換表係以參考接合點32°F為基準。實際參考接合點位在連接板，該連接板目前溫度為80°F。從轉換表取得的溫度值為120°F。
要計算量測端點的實際溫度，從轉換表取得的溫度值必須做何種的調整？
A.加48°F
B.減48°F
C.加88°F
D.減88°F

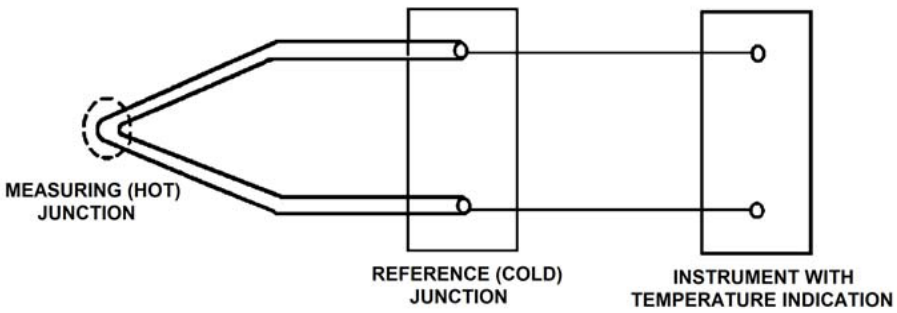
答案： A

科目/題號：291002/38 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B7405 (P7405)

Refer to the drawing of a simple thermocouple circuit (see figure below).
The measuring junction temperature is currently 300°F while the reference junction temperature is being held constant at 120°F. The thermocouple circuit is capable of indicating 32°F to 600°F and has just been calibrated at the current conditions.
If the measuring junction temperature decreases and stabilizes at 90°F, what temperature will be indicated?
A. 32°F
B. 60°F
C. 90°F
D. 120°F
ANSWER: C.

參考熱電偶電路簡圖(見下圖)。
量測接合點目前溫度為300°F，而參考接合點溫度維持固定於120°F。熱電偶電路可以顯示32°F至600°F，且在目前狀況下剛完成校正，若量測接合點之溫度下降並穩定在90°F，溫度指示將為多少？
A. 32°F
B. 60°F
C. 90°F
D. 120°F

答案： C



科目/題號：291002/39 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B7612 (P7612)

For proper operation of a thermocouple circuit, the reference junction temperature…
A. must be less than the measuring junction temperature.
B. must be greater than the measuring junction temperature.
C. may be less than, greater than, or equal to the measuring junction temperature.
D. may be less than or greater than, but not equal to, the measuring junction temperature.
ANSWER: C.

為使熱電偶電路正常運作，參考接合點溫度…
A.必須低於量測接合點溫度
B.必須高於量測接合點溫度
C.可以低於、高於或等於量測接合點溫度
D.可以低於或高於，但不能等於量測接合點溫度

答案： C

科目/題號：291002/40 (2016 新增)
知能類：K1.15 [2.6/2.8]
序號：B7652 (P7652)

Because of a thermocouple temperature display failure, the millivolt output of a thermocouple circuit is being converted to a temperature value using conversion tables. The tables are based on a thermocouple reference junction temperature of 32˚F. The actual reference junction is located in a panel that is maintained at 96˚F. Room temperature surrounding the panel is 72˚F.
What adjustment must be made to the temperature value taken from the conversion tables to calculate the actual temperature at the measuring tip of the thermocouple?
A. Add 64˚F.
B. Subtract 64˚F.
C. Add 40˚F.
D. Subtract 40˚F.
ANSWER: A.

由於熱電偶溫度指示失效，熱電偶電路的毫伏特(mV)輸出用轉換表轉換為溫度值。轉換表係以參考接合點32°F為基準。實際參考接合點位在連接板，該連接板目前溫度為96°F。連接板周遭室溫為72°F。
要計算量測端點的實際溫度，從轉換表取得的溫度值必須做什麼樣的調整？
A.加64˚F
B.減64˚F
C.加40˚F
D.減40˚F

答案： A

科目/題號：291002/41 (2016 新增)
知能類：K1.19 [3.0/3.1]
序號：B7506

A loss-of-coolant accident resulted in a reactor scram. The source range monitors (SRMs) were fully inserted and are currently located in a voided section of the core. If the SRMs are subsequently positioned below the core water level, the SRM count rate will…
A. decrease due to decreased neutron migration length.
B. decrease due to decreased thermal neutron flux.
C. increase due to increased neutron migration length.
D. increase due to increased thermal neutron flux.
ANSWER: D.

冷卻水流失事故造成反應器急停。源階偵測系統(SRMs)全部插入後目前位在爐心空泡區。若接下來將源階偵檢器擺在爐心水位下方，源階偵測系統計數率將…
A.減少，因中子遷移長度減少
B.減少，因熱中子通量減少
C.增加，因中子遷移長度增加
D.增加，因熱中子通量增加

答案： D

科目/題號：291002/42 (2016 新增)
知能類：K1.21 [2.8/2.9]
序號：B5607 (P5606)

A proportional detector with pulse height discrimination circuitry is being used in a constant field of neutron and gamma radiation to provide source range neutron count rate indication. Assume that the pulse height discrimination setpoint does not change. If the detector voltage is increased but maintained within the proportional region, count rate indication will increase because...

A. a single neutron- or gamma-induced ionizing event will result in multiple pulses inside the detector.
B. the ratio of the number of neutron-induced pulses to gamma-induced pulses inside the detector will increase.
C. the positive space charge effect will increase and promote the collection of both gamma- and neutron-induced pulses.
D. all detector pulses will increase in amplitude and previously uncounted gamma pulses will be added to the total count rate.

ANSWER: D.

具有脈高鑑別電路的比例偵檢器用在一穩定中子及加馬輻射場以提供源階中子計數率指示。假設脈高鑑別設定點不變。若偵檢器的電壓增加但維持在比例區，則計數率指示值將增加因為…

A.單一中子或加馬誘發的游離效應將在偵測系統內部產生多個脈衝
B.偵測系統內部中子誘發與加馬誘發的脈衝數比例將增加
C.正空間電荷效應將增加並促進中子誘發脈衝與加馬誘發的脈衝的收集
D.所有偵測系統的脈衝振幅將增加，且先前未計入的加馬脈衝將加計到總計數率

答案： D

科目/題號：291002/43 (2016 新增)
知能類：K1.22 [3.0/3.1]
序號：B7007

Two identical fission chamber neutron detectors, operating in the proportional region, are being used to monitor core neutron flux during a reactor startup. Detector A has developed a small leak that caused its argon fill gas pressure to decrease to approximately 25 percent of the gas pressure in detector B. When the reactor reaches criticality, the neutron flux indication produced by detector B will be _____ than the neutron flux indication produced by detector A, primarily because the higher gas pressure in detector B results in _____.
A. greater; more neutron-induced fissions in detector B
B. smaller; fewer neutron-induced fissions in detector B
C. greater; more ionizations in the detector B fill gas
D. smaller; fewer ionizations in the detector B fill gas
ANSWER: C.

兩相同之分裂腔中子偵檢器，在比例區運作，用以偵測反應器起動時之爐心中子通量。偵檢器A發生一微小洩漏使得其氬充填氣壓下降至大約是偵檢器B的25%。當反應器達到臨界時，偵檢器B產生的中子通量值將_____ 偵檢器A產生的中子通量值，主要是因為偵檢器B較高的氣壓造成_____。
A.大於；偵檢器B有較多的中子誘發分裂
B.小於；偵檢器B有較少的中子誘發分裂
C.大於；偵檢器B充填氣體有較多的游離
D.小於；偵檢器B充填氣體有較少的游離

答案： C

科目/題號：291002/44 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B4507 (P4506)

A nuclear power plant has been shut down for one month. A portable gas-filled radiation detector is needed to monitor shutdown reactor core neutron level from a location outside the reactor vessel. The detector must be able to distinguish between ionizations caused by gamma and neutron radiation.
Which region(s) of the gas-filled detector characteristic curve is/are acceptable for operation of the detector?
A. Geiger-Mueller, Ion Chamber, and Proportional regions are all acceptable.
B. Proportional region is acceptable, and Ion Chamber region also may be usable.
C. Ion Chamber region is acceptable, and Geiger-Mueller region also may be usable.
D. Geiger-Mueller region is acceptable, and Proportional region also may be usable.
ANSWER: B.

一核電廠已停機一個月。為了從反應爐外偵測爐心中子位階，需要有一攜帶型充氣式輻射偵檢器。此偵檢器必須能分辨加馬及中子所產生的游離。
此充氣式偵檢器可運作於特性曲線的那些區是可接受的？
A.蓋革區、游離腔區及比例區均可接受
B.比例區可接受，且游離腔區或許也可用
C.游離腔區可接受，且蓋革區或許也可用
D.蓋革區可接受，且比例區或許也可用

答案： B

科目/題號：291002/45 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B4807 (P4806)

Quench gases are added to gas-filled radiation detectors that operate in the _____ region; the quench gases prevent a single ionization event from causing _____ in the detector gas volume.
A. ion chamber; multiple discharges
B. ion chamber; secondary ionizations
C. Geiger-Mueller; multiple discharges
D. Geiger-Mueller; secondary ionizations
ANSWER: C.

淬熄氣體加到運作於_____區的充氣式輻射偵檢器;淬熄氣體可預防偵檢器氣體容積內之單一游離事件引起_____。
A.游離腔；多重放電
B.游離腔；二次游離
C.蓋革；多重放電
D.蓋革；二次游離

答案： C

科目/題號：291002/46 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B4907 (P4906)

Which one of the following contains the pair of radiation detector types that are the most sensitive to low-energy beta and/or gamma radiation?
A. Geiger-Mueller and scintillation
B. Geiger-Mueller and ion chamber
C. Ion chamber and scintillation
D. Ion chamber and proportional
ANSWER: A.

下列何者含有對低能量貝他及/或加馬輻射線最敏感的兩種輻射偵檢器？
A.蓋革及閃爍偵檢器
B.蓋革及游離腔
C游離腔及閃爍偵檢器
D.游離腔及比例

答案： A

科目/題號：291002/47 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B5207 (P5206)

A beta particle and an alpha particle with equal kinetic energies cause ionization in a gas-filled radiation detector. The detector is operating in the ion chamber region of the gas ionization curve.
Which one of the following describes the amplitudes of the detector pulses caused by each type of radiation?
A. The beta particle pulse will be larger in amplitude.
B. The alpha particle pulse will be larger in amplitude.
C. The amplitudes of both pulses will be approximately equal for all detector voltages in the ion chamber region.
D. The amplitudes of both pulses will be approximately equal for all detector voltages in the ion chamber regio n, as well as all detector voltages outside the ion chamber region.
ANSWER: B.

具有相同動能的阿伐粒子及貝他粒子在充氣式輻射偵檢器造成游離。偵檢器在氣體游離曲線的游離腔區運作。
下列何者描述各種輻射線所造成的偵檢器脈衝振幅？
A.貝他粒子脈衝振幅較大
B.阿伐粒子脈衝振幅較大
C.所有偵檢器之工作電壓在游離腔區，兩者脈衝振幅大約相等
D.所有偵檢器之工作電壓在游離腔區和在游離腔區外，兩者脈衝振幅大約相等

答案： B

科目/題號：291002/48 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B5307 (P5306)

Which one of the following types of radiation detectors is generally not used for measuring a high-intensity beta and gamma radiation field because of a relatively long detector recovery time, or dead time, following each ionization event.
A. Geiger-Mueller
B. Ion chamber
C. Proportional
D. Scintillation
ANSWER: A.

因為在每次游離事件後偵檢器之回復時間或無感時間相對較長，下列何種輻射偵檢器一般不用於量測高強度貝他及加馬輻射場？
A.蓋革偵檢器
B.游離腔偵檢器
C.比例偵檢器
D.閃爍偵檢器

答案： A

科目/題號：291002/49 (2016新增)
知能類：K1.23 [2.8/2.9]
序號：B6007 (P6006)

Which one of the following types of radiation detectors uses a gas volume for radiation detection and will typically produce the weakest output signal if all of the detectors are placed in the same gamma radiation field?
A. Geiger-Mueller
B. Ion chamber
C. Proportional counter
D. Scintillation
ANSWER: B.

如果將下列各型輻射偵檢器都放在同樣的加馬輻射場，何者是使用氣體容積做輻射偵檢，且通常產生最弱的輸出訊號？
A.蓋革
B.游離腔
C.比例計數器
D.閃爍

答案： B

科目/題號：291002/50 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B6206 (P6206)

Which one of the following types of radiation detectors is typically the least accurate in determining the dose rate to a human body from an unspecified source of radiation?
A. Geiger-Mueller
B. Ion chamber
C. Proportional counter
D. Scintillation
ANSWER: A.

對人體受到未界定輻射源的劑量率判定，下列輻射偵檢器中，何者準確度通常是最低的？
A.蓋革
B.游離腔
C.比例計數器
D.閃爍

答案： A

科目/題號：291002/51 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B6407 (P6405)

A fission chamber neutron detector is located in a constant neutron radiation field and is initially operating in the proportional region. If the voltage applied to the detector is changed such that the detector operates in the ion chamber region, the rate of neutron interactions in the detector will _____; and the amplitude of each neutron-induced detector pulse will _____.
A. increase; increase
B. decrease; decrease
C. remain the same; increase
D. remain the same; decrease
ANSWER: D.

一分裂腔中子偵檢器置於一穩定的中子輻射場中，最初在比例區運作。如果施加於偵檢器的電壓改變導致偵檢器運作於游離腔區，則其偵檢器內的中子交互作用率將_____；而中子誘發的偵檢器脈衝振幅將_____。
A.增加；增加
B.減少；減小
C.維持不變；增加
D.維持不變；減小

答案： D

科目/題號：291002/52 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B6507 (P6505)

Which one of the following describes the positive space charge effect associated with a gas-filled radiation detector?
A. Multiple detector pulses result from a single ionization event because positive ions form a cloud around the negative electrode, which increases the electric field strength, thereby initiating secondary ionizations.
B. Multiple detector pulses result from a single ionization event because positive ions form a cloud around the positive electrode, which increases the electric field strength, thereby initiating secondary ionizations.
C. The pulse amplitude resulting from an ionization event is reduced because positive ions form a cloud around the negative electrode, which reduces the electric field strength, thereby limiting secondary ionizations.
D. The pulse amplitude resulting from an ionization event is reduced because positive ions form a cloud around the positive electrode, which reduces the electric field strength, thereby limiting secondary ionizations.
ANSWER: D.

下列何者描述與充氣式輻射偵檢器相關的正空間電荷效應？
A. 單一游離事件可產生多個偵檢器脈衝，因為正離子雲集在負電極，使電場強度增加，因而引發二次游離。
B. 單一游離事件可產生多個偵檢器脈衝，因為正離子雲集在正電極，使電場強度增加，因而引發二次游離。
C. 游離事件產生的脈衝振幅減小，因為正離子雲集在負電極，使電場強度減小，因而限制二次游離。
D. 游離事件產生的脈衝振幅減小，因為正離子雲集在正電極，使電場強度減小，因而限制二次游離。

答案： D

科目/題號：291002/53 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B6906 (P6906)

In which usable region(s) of the gas-filled detector ionization curve is the pulse height resulting from the detection of a 1 MeV beta particle the same as a 5 MeV alpha particle?
A. Geiger-Mueller only.
B. Geiger-Mueller and Ionization Chamber.
C. Proportional only.
D. Proportional and Ionization Chamber.
ANSWER: A.

在各充氣式偵檢器游離曲線可用區中，何者所偵檢1 MeV貝他粒子的脈高與5 MeV阿伐粒子的脈高相同？
A.只有蓋革區
B.蓋革區及游離腔區
C.只有比例區
D.比例區及游離腔區

答案： A

科目/題號：291002/54 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B7207 (P7206)

Which one of the following personal radiation monitoring devices can be charged with DC voltage to “zero” the device prior to use?
A. Film badge
B. Alarming dosimeter
C. Thermoluminescent dosimeter
D. Self-reading pocket dosimeter
ANSWER: D.

下列個人輻射監測裝置中，何者在使用前可用直流電充電使之歸零？
A.膠片配章
B.警報劑量計
C.熱發光劑量計
D.自讀式袖珍劑量計

答案： D

科目/題號：291002/55 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B7507 (P7505)

A Geiger-Mueller detector with a Apancake@ probe (often called a frisker) is being used to monitor personnel leaving a radiologically controlled area. The probe is equipped with a mica window.
Two individuals have radioactive skin contamination—one individual with only alpha emitters, and the other with only beta emitters. Both types of radiation are being emitted at the same rate. The same percentage of each type of radiation enters the probe's detection chamber and causes ionization.
Which one of the following describes the detector=s count rate response to the alpha and beta radiation?
A. The count rate will be higher for the alpha radiation.
B. The count rate will be higher for the beta radiation.
C. The count rate will be the same for both types of radiation.
D. Cannot be determined without knowing the energy levels of the radiation.
ANSWER: C.

一配置薄煎餅型探頭(常稱為frisker搜身者)的蓋革偵檢器，被用來監測離開輻射管制區人員。探頭配有雲母窗。
有兩個人其皮膚受到輻射污染；其中一人只受到阿伐射源污染，另一人只受到貝他射源污染。兩種輻射線的放射率相同。每一種輻射線有相同百分比進入探頭的偵檢腔並引發游離。
下列何者描述偵檢器對阿伐及貝他輻射線的計數率反應？
A.阿伐的計數率將較高
B.貝他的計數率將較高
C.兩種輻射線的計數率將相同
D.不知輻射線的能量大小無法確定

答案： C

科目/題號：291002/56 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B7613 (P7613)

A proportional detector with pulse height discrimination circuitry is being used in a constant field of neutron and gamma radiation to provide source range neutron count rate indication. Assume the pulse height discrimination value does not change.
If the detector voltage is decreased significantly, but maintained within the proportional region, the detector count rate indication will _____; and the detector will become _____ susceptible to the positive space charge effect.
A. decrease; less
B. decrease; more
C. remain the same; less
D. remain the same: more
ANSWER: A.

一具有脈高鑑別電路的比例偵檢器，用於一穩定的中子及加馬輻射場，以提供源階中子計數率指示。假設脈高鑑別值不變。
如果偵檢器電壓大幅降低，但維持在比例區內，偵檢器的計數率指示將_____；而偵檢器對正空間電荷效應將變得_____敏感。
A.減少；較不
B.減少；較
C.維持相同；較不
D.維持相同；較

答案： A

科目/題號：291002/57 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B7662 (P7662)

A gas-filled radiation detector that operates in the Geiger-Mueller region of the gas ionization curve is being used in a constant radiation field. If the detector=s operating voltage is increased by 50 volts while remaining in the Geiger-Mueller region, the detector's count rate indication will _____; and the ability of the detector to detect gamma radiation will _____.
A. increase; improve
B. increase; remain the same
C. remain the same; improve
D. remain the same; remain the same
ANSWER: D.

在氣體游離曲線蓋革區運作的充氣式偵檢器使用於一穩定輻射場。如果偵檢器運轉電壓增加50伏特，而仍維持在蓋革區內，偵檢器的計數率指示將_____；又偵檢器偵檢加馬輻射線的能力將_____。
A.增加；改善
B.增加；維持一樣
C.維持一樣；改善
D.維持一樣；維持一樣;

答案： D

科目/題號：291002/58 (2016 新增)
知能類：K1.23 [2.8/2.9]
序號：B7672 (P7672)

A proportional detector with pulse height discrimination circuitry is being used in a constant field of neutron and gamma radiation to provide source range neutron count rate indication. Assume the pulse height discrimination value does not change.
If the detector voltage is increased significantly, but maintained within the proportional region, the detector count rate indication will _____; and the detector will become _____ susceptible to the positive space charge effect.
A. increase; less
B. increase; more
C. remain the same; less
D. remain the same: more
ANSWER: B.

一具有脈高鑑別電路的比例偵檢器，使用於一穩定的中子及加馬輻射場，以提供源階中子計數率指示。假設脈高鑑別值不變。
如果偵檢器電壓大幅增加，但維持在比例區內，偵檢器的計數率指示將_____；而偵檢器對正空間電荷效應將變得_____敏感。
A.增加；較不
B.增加；較
C.維持相同；較不
D.維持相同；較

答案： B

科目/題號：291002/59 (2016 新增)
知能類：K1.24 [3.1/3.2]
序號：B5707 (P5706)

Which one of the following describes a characteristic of a self-reading pocket dosimeter?
A. Provides dose rate indication in mR/hr.
B. More sensitive to gamma radiation than beta radiation.
C. Contains crystals that luminesce when exposed to ionizing radiation.
D. Can be stored as an accurate record of lifetime radiation exposure.
ANSWER: B.

下列何者描述自讀式袖珍劑量計的特性？
A.可提供mR/hr劑量率指示
B.對加馬輻射比對貝他輻射更敏感
C.含有曝露於游離輻射時會發光的晶體
D.可用以存為終生輻射曝露之正確紀錄

答案： B

科目/題號：291002/60 (2016 新增)
知能類：K1.24 [3.1/3.2]
序號：B6807 (P6806)

A nuclear plant worker normally wears a thermoluminescent dosimeter (TLD) or similar device for measuring radiation exposure. When a self-reading pocket dosimeter (SRPD) is also required, where will the SRPD be worn and why?
A. Below the waist near the TLD to measure radiation from the same source(s).
B. Below the waist away from the TLD to measure radiation from different sources.
C. Above the waist near the TLD to measure radiation from the same source(s).
D. Above the waist away from the TLD to measure radiation from different sources.
ANSWER: C.

核電廠工作人員平常配帶熱發光劑量計(TLD)或類似裝置以量測輻射曝露。當也有需要自讀式袖珍劑量計(SRPD)時，SRPD應配帶在何處?為什麼？
A.在腰部下方靠近TLD，以量測相同來源的輻射線
B.在腰部下方遠離TLD，以量測不同來源的輻射線.
C.在腰部上方靠近TLD，以量測相同來源的輻射線
D.在腰部上方遠離TLD，以量測不同來源的輻射線

答案： C

科目/題號：291002/61 (2016 新增)
知能類：K1.24 [3.1/3.2]
序號：B7633 (P7633)

A Geiger-Mueller detector with a “pancake” probe (often called a frisker) is being used to monitor workers leaving a radiologically controlled area for contamination. The probe is equipped with a mica window. The background detector count rate is 20 cpm.
As one individual’s shoe is scanned, the detector reading increases to 200 cpm. When a sheet of paper is placed between the probe and the shoe, the detector reading decreases to 60 cpm. Which one of the following is indicated by the decrease in the detector reading?
A. The contamination contains beta particles.
B. The contamination contains alpha particles.
C. The contamination does not contain beta particles.
D. The contamination does not contain alpha particles.
ANSWER: B.

一配置薄煎餅型探頭(常稱為frisker搜身者)的蓋革偵檢器，被用來監測離開輻射管制區人員有無污染。探頭配有雲母窗。偵檢器背景計數率為20 cpm。
當有一個人的鞋子被掃瞄時，偵檢器讀數增加到200 cpm。當有一張紙被放在探頭和鞋子之間時，偵檢器讀數降到60 cpm。下列何者敘述顯示偵檢器讀數的減少？
A.污染含有貝他粒子
B.污染含有阿伐粒子
C.污染不含貝他粒子
D.污染不含阿伐粒子

答案： B

科目/題號：291002/62 (2016 新增)
知能類：K1.24 [3.1/3.2]
序號：B7653 (P7653)

A Geiger Mueller detector with a “pancake” probe (sometimes called a frisker) is being used to monitor for skin contamination. During frisking, the probe is more likely to detect contamination if the probe is held _____ than one-half inch from the skin; and is moved _____ than two inches per second.
A. farther; faster
B. farther; slower
C. closer; faster
D. closer; slower
ANSWER: D.

一配置薄煎餅型探頭(常稱為frisker搜身者)的蓋革偵檢器用來監測皮膚污染。當量測時，假如探頭距皮膚比半inch _____，以及比每秒2- inch _____速度移動，探頭將更可能檢測到污染。
A.更遠；更快
B.更遠；更慢
C.更接近；更快
D.更接近；更慢

答案： D