科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P97 (B899)

A pressure stress applied to the reactor vessel is...

A. compressive at the inner wall, tensile at the outer wall.

B. tensile at the inner wall, compressive at the outer wall.

C. tensile across the entire wall.

D. compressive across the entire wall.

ANSWER: C.

反應爐壁上，因內壓力所產生的應力為……

A. 在內壁上為壓應力，外壁為張應力。

B. 在內壁上為張應力，外壁為壓應力。

C. 在整個槽壁上均為張應力。

D. 在整個槽壁上均為壓應力。

答案：C.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P296

Brittle fracture is the fragmentation of metal resulting from the application of _____ stress at relatively _____ temperatures.

A. compressive; high

B. compressive; low

C. tensile; high

D. tensile; low

ANSWER: D.

脆性破壞意指在相對_____溫下施加_____應力而導致金屬脆化。

A. 高；壓

B. 低；壓

C. 高；張

D. 低；張

答案：D.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P397 (B398)

Brittle fracture of the reactor coolant system pressure boundary is most likely to occur at...

A. 120°F and 2200 psig.

B. 120°F and 400 psig.

C. 400°F and 2200 psig.

D. 400°F and 400 psig.

ANSWER: A.

反應器冷卻水系統壓力邊界的脆性破壞，在_____時最有可能發生。

A. 120˚F、2200 psig

B. 120˚F、400 psig

C. 400˚F、2200 psig

D. 400˚F、400 psig

答案：A.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P497 (B499)

Which one of the following comparisons will result in a higher probability of brittle fracture of the reactor vessel?

A. A high reactor gamma flux rather than a high neutron flux.

B. A high reactor vessel material strength rather than a high material ductility.

C. A high reactor coolant oxygen content rather than a low oxygen content.

D. A rapid 100°F reactor cooldown at a high temperature rather than a low temperature.

ANSWER: B.

下列哪項比較可能導致反應爐產生較高脆性破壞機率？

A. 高伽馬通率而不是高中子通率。

B. 高反應爐材料強度而不是高材料延展性。

C. 高反應器冷卻水含氧量而不是低含氧量。

D. 反應器在高溫中快速冷卻100˚F，而不是在低溫中冷卻。

答案：B.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1200

Which one of the following reduces the probability of brittle fracture of the reactor vessel?

A. The presence of a preexisting flaw

B. The presence of a tensile stress

C. Operation at low temperatures

D. Small heatup and cooldown rates

ANSWER: D.

下列何者降低了反應爐發生脆性破壞的可能性？

A. 既有瑕疵。

B. 出現張應力。

C. 低溫運轉。

D. 加熱與冷卻率小。

答案：D.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1296

Which one of the following comparisons increases the probability of brittle fracture of a pressure vessel wall?

A. A high temperature rather than a low temperature

B. A tensile stress rather than a compressive stress

C. Performing a 100°F/hour heatup rather than a 100°F/hour cooldown

D. Using materials fabricated from stainless steel rather than carbon steel

ANSWER: B.

下列何者增加了壓力槽壁的脆性破壞可能性？

A. 高溫而非低溫。

B. 張應力而非壓應力。

C. 進行 100°F/hr 加熱而非 100°/hr 冷卻。

D. 使用不銹鋼製材料而非碳鋼製材料。

答案：B.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1396

Which one of the following statements describes the relationship between brittle fracture and nilductility temperature?

A. Operation below the nil-ductility temperature will result in brittle fracture.

B. Operation above the nil-ductility temperature will result in brittle fracture.

C. Operation below the nil-ductility temperature will increase the probability of brittle fracture.

D. Operation above the nil-ductility temperature will increase the probability of brittle fracture.

ANSWER: C.

下列哪項敘述說明了脆性破壞與無延性溫度(nil-ductility temperature)的關係？

A. 若在無延性溫度以下的溫度運轉，將導致脆性破壞。

B. 若在無延性溫度以上的溫度運轉，將導致脆性破壞。

C. 若在無延性溫度以下的溫度運轉，將增加脆性破壞機率。

D. 若在無延性溫度以上的溫度運轉，將增加脆性破壞機率。

答案：C.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1597 (B1899)

Which one of the following comparisons increases the probability of brittle fracture of a pressure vessel wall?

A. Using materials fabricated from stainless steel rather than carbon steel

B. A compressive stress rather than a tensile stress

C. A high reactor coolant temperature rather than a low reactor coolant temperature

D. Performing a 100°F/hr cooldown rather than a 100°F/hr heatup

ANSWER: D.

下列何者增加壓力槽壁的脆性破壞機率？

A. 製造時使用不銹鋼而非碳鋼的材料。

B. 壓應力而非張應力。

C. 高反應器冷卻水溫度而非低反應器冷卻水溫度。

D. 執行100˚F/hr的冷卻而非100˚F/hr的加熱。

答案：D.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1696 (B2700)

Which one of the following comparisons increases the probability of brittle fracture of a reactor pressure vessel wall?

A. Performing a 50°F/hr cooldown at 1600 psia rather than a 50°F/hr cooldown at 1200 psia.

B. A compressive stress rather than a tensile stress across the vessel wall.

C. A high reactor coolant temperature rather than a low reactor coolant temperature.

D. Changing wall design to increase toughness while maintaining the same strength.

ANSWER: A.

下列那一種敘述可能增加反應器壓力槽壁脆性破壞機率？

A. 在1600 psia時以50˚F/hr冷卻而非在1200 psia時以50˚F/hr冷卻。

B. 槽壁上為壓應力而非張應力。

C. 反應器冷卻水高溫而非低溫。

D. 維持槽體材料強度不變下，變更槽壁設計以增加材料韌性。

答案：A.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1796

Brittle fracture of the reactor coolant system pressure boundary is least likely to occur at...

A. 120°F and 2200 psig.

B. 120°F and 400 psig.

C. 400°F and 2200 psig.

D. 400°F and 400 psig.

ANSWER: D.

反應器冷卻水系統的壓力邊界，在下列哪項情況發生脆性破壞的機率最小？

A. 120°F、2200 psig

B. 120°F、400 psig

C. 400°F、2200 psig

D. 400°F、400 psig

答案：D.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P1896 (B1299)

Brittle fracture of the reactor vessel (RV) is most likely to occur during a _____ of the reactor coolant system (RCS) when RCS temperature is _____ the RV reference temperature for nil-ductility transition (RT_{NDT}).

A. heatup; above

B. heatup; below

C. cooldown; above

D. cooldown; below

ANSWER: D.

反應爐槽(RV)脆性破壞最有可能發生於反應器冷卻水系統(RCS)的_____期，即是RCS溫度_____於反應爐無延性轉換參考溫度(RT_{NDT})時最容易發生。

A. 加熱；高

B. 加熱；低

C. 冷卻；高

D. 冷卻；低

答案：D.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P2096 (B2099)

Which one of the following will prevent brittle fracture failure of a reactor vessel?

A. Manufacturing the reactor vessel from low carbon steel

B. Maintaining reactor vessel pressure below the maximum design limit

C. Operating above the reference temperature for nil-ductility transition (RT_{NDT})

D. Maintaining the number of reactor vessel heatup/cooldown cycles within limits

ANSWER: C.

下列何者可預防反應爐因脆性破壞而損壞？

A. 用低碳鋼製造反應爐。

B. 讓反應爐壓力保持在最大設計限值之下。

C. 以高於無延性轉換參考溫度(RT_{NDT})的溫度運轉。

D. 使反應爐加熱/冷卻循環次數維持在限值內。

答案：C.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P2196

Brittle fracture of the reactor vessel (RV) is least likely to occur during a _____ of the RV when RV temperature is _____ the reference temperature for nil-ductility transition (RT_{NDT}).

A. cooldown; above

B. heatup; above

C. cooldown; below

D. heatup; below

ANSWER: B.

反應爐槽(RV)最不可能在_____期間發生脆性破壞，此時的反應爐溫度_____於無延性轉換參考溫度(RT_{NDT})。

A. 冷卻；高

B. 加熱；高

C. 冷卻；低

D. 加熱；低

答案：B.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P2496 (B2499)

Brittle fracture of a low-carbon steel is more likely to occur when the temperature of the steel is _____ the nil ductility temperature, and will normally occur when the applied stress is _____ the steel's yield strength (or yield stress).

A. greater than; greater than

B. greater than; less than

C. less than; greater than

D. less than; less than

ANSWER: D.

低碳鋼較可能在鋼的溫度_____於無延性溫度(nil ductility temperature)時發生脆性破壞，而且通常於施加應力_____於鋼材的降伏(yield)強度(或降伏應力)時發生。

A. 大；大

B. 大；小

C. 小；大

D. 小；小

答案：D.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P2497 (B2500)

Which one of the following comparisons will result in a higher probability of brittle fracture failure of the reactor vessel?

A. An RCS pH of 8.5 rather than 9.0

B. A high reactor coolant oxygen content rather than a low oxygen content

C. A 50°F/hr RCS cooldown rather than a 100°F/hr heatup

D. A high gamma flux rather than a high neutron flux

ANSWER: C.

下列那一項敘述可能導致反應爐產生較高脆性破壞機率？

A. 飼水pH值8.5而非9.0。

B. 反應器冷卻水含氧量高而非含氧量低。

C. 反應爐以50˚F/hr冷卻而非以100˚F/hr加熱。

D. 高伽馬通率而非高中子通率。

答案：C.

科目： 193010
知能類：K1.01 [2.8/3.2]
序號： P2896

Which one of the following comparisons will result in a lower probability of brittle fracture failure of the reactor vessel?

A. An RCS pH of 9.0 rather than 8.5

B. A low reactor coolant oxygen content rather than a high oxygen content

C. A 50°F/hr RCS cooldown rather than a 100°F/hr heatup

D. A high gamma flux rather than a high neutron flux

ANSWER: D.

下列何者將降低反應爐因脆性破壞而損壞的機率？

A. RCS pH 值 9.0 而非 8.5。

B. 反應器冷卻水含氧量低而非含氧量高。

C. 以 50°F/hr 冷卻而非以 100°F/hr 加熱。

D. 高伽馬通率而非高中子通率。

答案：D.

科目： 193010
知能類：K1.02 [2.4/2.5]
序號： P98

The nil-ductility temperature is that temperature...

A. below which the probability of brittle fracture significantly increases.

B. determined by fracture mechanics to be equivalent to reference transition temperature.

C. determined by Charpy V-notch test to be equivalent to reference transition temperature.

D. below which the yield stress of the metal is inversely proportional to Young's modulus of elasticity.

ANSWER: A.

無延性溫度意指……

A. 若低於此溫度，發生脆性破壞的機率將顯著增加。

B. 由破壞機制決定此溫度等於參考轉換溫度。

C. 由 V 型缺口衝擊測試(Charpy V-notch)決定此溫度等於參考轉換溫度。

D. 若低於此溫度，金屬降伏應力將與楊氏係數(Young’s modulus)成反比。

答案：A.

科目： 193010
知能類：K1.02 [2.4/2.5]
序號： P597 (B2699)

The nil-ductility transition temperature of the reactor vessel (RV) is the temperature...

A. above which the RV metal will elastically deform as RCS pressure decreases.

B. above which the RV metal loses its ability to elastically deform as RCS pressure increases.

C. below which the RV metal will elastically deform as reactor coolant system (RCS) pressure decreases.

D. below which the RV metal loses its ability to elastically deform as RCS pressure increases.

ANSWER: D.

反應爐槽(RV)的無延性轉換溫度(RT_{NDT})的意義是_____。

A. 高於該溫度時，當反應器冷卻水系統(RCS)壓力降低，反應爐金屬將產生彈性變形。

B. 高於該溫度時，當反應器冷卻水系統(RCS)壓力增加，反應爐金屬將失去彈性變形能力。

C. 低於該溫度時，當反應器冷卻水系統(RCS)壓力降低，反應爐金屬將產生彈性變形。

D. 低於該溫度時，當反應器冷卻水系統(RCS)壓力增加，反應爐金屬將失去彈性變形能力。

答案：D.

科目： 193010
知能類：K1.02 [2.4/2.5]
序號： P697 (B1500)

The reference temperature for nil-ductility transition (RT_{NDT}) is the temperature above which...

A. a large compressive stress can result in brittle fracture.

B. a metal exhibits more ductile tendencies.

C. the probability of brittle fracture increases.

D. no appreciable deformation occurs prior to failure.

ANSWER: B.

無延性轉換參考溫度(RT_{NDT})意指金屬材料溫度超過該溫度時，_____。

A. 大的壓應力會導致材料產生脆性破壞。

B. 金屬展現出較高延展性。

C. 產生脆性破壞的機率提高。

D. 材料損壞前，無法觀察到明顯的變形發生。

答案：B.

科目： 193010
知能類：K1.02 [2.4/2.5]
序號： P996 (B2299)

The nil-ductility transition temperature is that temperature...

A. below which vessel failure is imminent.

B. above which vessel failure is imminent.

C. below which the probability of brittle fracture significantly increases.

D. above which the probability of brittle fracture significantly increases.

ANSWER: C.

無延性轉換溫度(RT_{NDT})的意義是_____。

A. 低於該溫度時，爐槽將瀕臨損壞。

B. 高於該溫度時，爐槽將瀕臨損壞。

C. 低於該溫度時，產生脆性破壞的機率明顯提高。

D. 高於該溫度時，產生脆性破壞的機率明顯提高。

答案：C.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P96 (B100)

The likelihood of brittle fracture failure of the reactor vessel is reduced by...

A. increasing vessel age.

B. reducing vessel pressure.

C. reducing vessel temperature.

D. reducing gamma flux exposure.

ANSWER: B.

反應爐槽因脆性破壞而損壞的可能性，可以因_____而降低。

A. 增加爐槽壽命。

B. 降低爐槽壓力。

C. 降低爐槽溫度。

D. 減少伽馬通率暴露。

答案：B.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P142

Operating with which of the following conditions is least effective in preventing brittle fracture in the reactor coolant system (RCS)?

A. Operating within prescribed heatup and cooldown rate limitations.

B. Operating with RCS temperature greater than nil-ductility transition temperature.

C. Operating with RCS pressure low when RCS temperature is low.

D. Operating with a ramped RCS temperature as power level varies.

ANSWER: D.

下列哪項運轉條件在防止反應器冷卻水系統(RCS)發生脆性破壞上的成效最低？

A. 在指定的加熱與冷卻率限值內運轉。

B. 以高於無延性轉換溫度的 RCS 溫度運轉。

C. RCS 在低溫時以低壓運轉。

D. 功率改變時，以斜率變化式(ramped)調整的 RCS 溫度運轉。

答案：D.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P297

Why are reactor coolant system cooldown rate limitations established?

A. Prevent excessive reactivity additions.

B. Prevent brittle fracture of the reactor vessel.

C. Prevent excessive reactor coolant system subcooling.

D. Prevent impurities from precipitating out of solution in the reactor vessel.

ANSWER: B.

為什麼要建立反應器冷卻水系統的冷卻率限值？

A. 防止加入過量反應度。

B. 防止反應爐發生脆性破壞。

C. 防止反應器冷卻水系統過度次冷。

D. 防止雜質在反應爐溶液中沈澱。

答案：B.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P300

The thermal stress experienced by the reactor vessel during a reactor coolant system heatup is...

A. compressive at the inner wall and tensile at the outer wall of the vessel.

B. tensile at the inner wall and compressive at the outer wall of the vessel.

C. tensile across the entire vessel wall.

D. compressive across the entire vessel wall.

ANSWER: A.

反應爐槽於其冷卻水系統加熱時承受的熱應力為……

A. 內壁為壓應力，外壁為張應力。

B. 內部為張應力，外壁為壓應力。

C. 整個爐壁均為張應力。

D. 整個爐壁均為壓應力。

答案：A.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P398 (B400)

The probability of reactor vessel brittle fracture is decreased by minimizing...

A. oxygen content in the reactor coolant.

B. operation at high temperatures.

C. the time taken to cool down the reactor coolant system.

D. the amount of copper manufactured into the reactor vessel.

ANSWER: D.

反應爐槽產生脆性破壞的機率，可藉由將下列何者降至最低而減少？

A. 反應器冷卻水的含氧量。

B. 在高溫下運轉。

C. 冷卻反應器冷卻水系統所需之時間。

D. 反應爐槽製造材料的含銅量。

答案：D.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P399 (B399)

The total stress on the reactor vessel inner wall is greater during cooldown than heatup because...

A. heatup stress totally offsets pressure stress at the inner wall.

B. both pressure stress and cooldown stress are tensile at the inner wall.

C. cooldown stress and heatup stress are both tensile at the inner wall, but cooldown stress is greater in magnitude.

D. the tensile cooldown stress at the inner wall is greater in magnitude than the compressive pressure stress at the same location.

ANSWER: B.

反應爐槽內壁總應力在冷卻時比加熱時大，此乃因為.....

A. 在內壁上，加熱的熱應力彌補了內壓力產生的應力。

B. 內壓力產生的應力與冷卻應力，在內壁上都是張應力。

C. 冷卻與加熱時在內壁上產生的應力都是張應力，但是冷卻時產生的應力較大。

D. 冷卻時在內壁產生的張應力，比同一位置的內壓力產生壓應力大。

答案：B.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P898

The likelihood of brittle fracture failure of the reactor vessel is reduced by...

A. increasing vessel age.

B. reducing reactor vessel pressure.

C. reducing reactor vessel temperature.

D. increasing gamma flux exposure.

ANSWER: B.

下列何者將降低反應爐因脆性破壞而損壞的機率？

A. 增加爐槽壽命。

B. 降低反應爐壓力。

C. 降低反應爐溫度。

D. 增加伽馬通率暴露。

答案：B.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P1098

Which one of the following will increase the compressive stress on the outside surface of the reactor vessel wall?

A. Neutron irradiation

B. Gamma irradiation

C. Reactor coolant system cooldown

D. Reactor coolant system heatup

ANSWER: C.

下列何者將增加反應爐壁外表面的壓應力？

A. 中子照射

B. 伽馬照射

C. 冷卻反應器冷卻水系統

D. 加熱反應器冷卻水系統

答案：C.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P1298

Which one of the following applies a compressive stress to the inner wall of the reactor pressure vessel during a reactor coolant system heatup?

A. Embrittlement stress

B. Yield stress

C. Pressure stress

D. Thermal stress

ANSWER: D.

下列何者在反應器冷卻水加熱期間，於反應器壓力槽內壁施加壓應力？

A. 脆化應力

B. 降伏應力

C. 內壓力產生的應力(pressure stress)

D. 熱應力

答案：D.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P1397

Which one of the following is the most limiting component for establishing reactor coolant system heatup/cooldown rate limits?

A. Pressurizer

B. Reactor vessel

C. Fuel rod

D. Steam generator

ANSWER: B.

下列何者在建立反應器冷卻水系統加熱/冷卻率限值上是最受限制的組件？

A. 調壓槽

B. 反應爐槽

C. 燃料棒

D. 蒸汽產生器

答案：B.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P1598

Which one of the following stresses is compressive on the outer wall of the reactor pressure vessel during a reactor coolant system cooldown?

A. Yield stress

B. Thermal stress

C. Pressure stress

D. Embrittlement stress

ANSWER: B.

反應器冷卻水冷卻期間，下列哪項在反應器壓力槽外壁上的應力為壓應力？

A. 降伏應力

B. 熱應力

C. 內壓力產生的應力(pressure stress)

D. 脆化應力

答案：B.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P1897 (B300)

Which one of the following will apply a compressive stress to the outside wall of the reactor vessel?

A. Decreasing reactor coolant system (RCS) pressure

B. Increasing RCS pressure

C. Performing an RCS cooldown

D. Performing an RCS heatup

ANSWER: C.

下列何者會在反應爐外壁施予壓應力(compressive stress)？

A. 降低反應器冷卻水系統(RCS)壓力。

B. 增加RCS壓力。

C. 進行RCS冷卻。

D. 進行RCS加熱。

答案：C.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P2397 (B2399)

Reactor coolant system pressure-temperature limit curves are derived by using a conservative value for the reactor vessel reference temperature for nil ductility transition (RT_{NDT}).

Early in core life, the assumed value of RT_{NDT} is _____ than actual RT_{NDT}; and actual RT_{NDT} is verified periodically over core life by _____.

A. higher; removing and testing irradiated specimens of reactor vessel material

B. higher; inservice inspection and analysis of the reactor vessel wall

C. lower; removing and testing irradiated specimens of reactor vessel material

D. lower; inservice inspection and analysis of the reactor vessel wall

ANSWER: A.

反應器冷卻水系統壓力-溫度限制曲線，乃是利用保守之反應爐參考無延性溫度(RT_{NDT})而得。

在爐心壽命初期，此假設之RT_{NDT}_____於實際RT_{NDT}；而實際RT_{NDT}值在整個爐心壽命中，乃週期性地藉由_____而加以驗證。

A. 大；取出在爐心中經照射的反應爐材料試片後測試

B. 大；在營運中檢測並分析反應爐壁

C. 小；取出爐心中經照射的反應爐材料試片後測試

D. 小；在營運中檢測並分析反應爐壁

答案：A.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P2998 (N/A)

Which one of the following operating limitations is designed to prevent brittle fracture of the reactor vessel?

A. Maximum setpoint for the pressurizer safety valves

B. Maximum differential pressure between the RCS and the steam generators

C. Maximum RCS pressure vs. RCS temperature for a given RCS heatup rate

D. Maximum differential temperature between the RCS and the pressurizer

ANSWER: C.

下列哪項運轉限制設計，旨在防止反應爐槽發生脆性破壞？

A. 制訂調壓槽安全閥的最高設定值。

B. RCS 與蒸汽產生器之間的最高差壓。

C. 既定加熱率時 RCS 最高壓力和 RCS 溫度的限制。

D. RCS 與調壓槽之間的最高差壓。

答案：C.

科目： 193010
知能類：K1.04 [3.3/3.7]
序號： P3698 (B3700)

A nuclear reactor is shutdown with the shutdown cooling system maintaining reactor coolant temperature at 240°F immediately following an uncontrolled cooldown from 500°F. If reactor coolant temperature is held constant at 240°F, which one of the following describes the change in tensile stress on the inner wall of the reactor vessel (RV) over the next few hours?

A. Decreases, because the temperature gradient across the RV wall will decrease.

B. Increases, because the temperature gradient across the RV wall will decrease.

C. Decreases, because the inner RV wall temperature will approach the nil-ductility transition temperature.

D. Increases, because the inner RV wall temperature will approach the nil-ductility transition temperature.

ANSWER: A.

一部核子反應器停機，從500˚F開始以不控制反應器冷卻速率降溫，最後將反應器冷卻水溫度降至240˚F。而後若反應器冷卻水溫度持續維持在240˚F，下列何者正確描述反應爐槽(RV)內壁在接下來的數小時內張應力的變化？

A. 降低，因為反應爐槽壁上的溫度梯度會降低。

B. 增加，因為反應爐槽壁上的溫度梯度會降低。

C. 降低，因為反應爐槽內壁溫度將接近無延性轉換溫度。

D. 增加，因為反應爐槽內壁溫度將接近無延性轉換溫度。

答案：A.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P95

Fast neutron irradiation of the reactor vessel results in _____ stresses within the vessel metal, thereby _____ the nil-ductility transition temperature.

A. decreased; increasing

B. decreased; decreasing

C. increased; increasing

D. increased; decreasing

ANSWER: C.

反應爐的快中子照射使爐槽金屬的應力_____，進而使無延性轉換溫度_____。

A. 降低；增加

B. 降低；降低

C. 增加；增加

D. 增加；降低

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P143

Fast neutron irradiation adversely affects the reactor pressure vessel primarily by causing...

A. metal embrittlement.

B. brittle fracture.

C. flaw initiation.

D. flaw propagation.

ANSWER: A.

快中子照射之所以對反應器壓力槽造成不利影響，在於造成……

A. 金屬脆化

B. 脆性破壞

C. 瑕疵出現(flaw initiation)

D. 瑕疵擴大(flaw propagation)

答案：A.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P298 (B599)

Prolonged exposure of the reactor vessel to a fast neutron flux will cause the reference temperature for nil-ductility transition (RT_{NDT}) to...

A. increase due to the propagation of existing flaws.

B. decrease due to the propagation of existing flaws.

C. increase due to changes in the material properties of the vessel wall.

D. decrease due to changes in the material properties of the vessel wall.

ANSWER: C.

反應爐長期暴露於快中子通率下，將會導致無延展轉換參考溫度(RT_{NDT})……

A. 升高，因為既有瑕疵擴大。

B. 降低，因為既有瑕疵擴大。

C. 升高，因為槽壁材料特性改變。

D. 降低，因為槽壁材料特性改變。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P499 (B500)

Which one of the following types of radiation significantly reduces the ductility of the metal of a reactor pressure vessel?

A. Beta

B. Thermal neutrons

C. Gamma

D. Fast neutrons

ANSWER: D.

下列何種形式的輻射，顯著降低了反應爐壓力槽的金屬延展性？

A. 貝他

B. 熱中子

C. 伽馬

D. 快中子

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P899 (B1900)

After several years of operation, the maximum allowable stress to the reactor vessel is more limited by the inner wall than the outer wall because...

A. there is a temperature gradient across the reactor pressure vessel wall.

B. the inner wall has a smaller surface area than the outer wall.

C. the inner wall experiences more neutron-induced embrittlement than the outer wall.

D. the inner wall experiences more tensile stress than the outer wall.

ANSWER: C.

經過幾年運轉後，反應爐壓力槽的最大容許應力，在內壁的限制較外壁大，其原因為.....

A. 在反應爐壓力槽壁上有溫度梯度。

B. 內壁的表面積比外壁小。

C. 內壁承受中子照射引發之材料脆化比外壁嚴重。

D. 內壁承受的張應力比外壁大。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P998 (B1999)

Prolonged exposure to _____ will cause nil-ductility transition temperature of the reactor vessel to _____.

A. neutron radiation; increase

B. neutron radiation; decrease

C. boric acid; increase

D. boric acid; decrease

ANSWER: A.

長期暴露在_____下，將導致反應爐的無延性轉換溫度_____。

A. 中子射線；增加

B. 中子射線；減小

C. 硼酸；增加

D. 硼酸；減小

答案：A.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P1100 (B1100)

Two identical nuclear reactors have been in operation for the last 10 years. Reactor A has experienced 40 heatup/cooldown cycles with an average power capacity of 50%. Reactor B has experienced 30 heatup/cooldown cycles with an average power capacity of 60%.

Which reactor will have the lowest reactor vessel nil-ductility transition temperature?

A. Reactor A due to the lower average power capacity.

B. Reactor A due to the greater number of heatup/cooldown cycles.

C. Reactor B due to the higher average power capacity.

D. Reactor B due to the fewer number of heatup/cooldown cycles.

ANSWER: A.

兩部相同的核子反應器於過去十年間持續運轉。反應器A平均功率容量因數為50%，共經歷了40次加熱/冷卻週期；反應器B平均功率容量因數為60%，共經歷了30次加熱/冷卻週期。

哪部反應器具有最低的反應爐無延性轉換溫度？

A. 反應器A，因為平均功率容量因數較低。

B. 反應器A，因為加熱/冷卻週期次數較多。

C. 反應器B，因為平均功率容量因數較高。

D. 反應器B，因為加熱/冷卻週期次數較少。

答案：A.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P1498

The two factors that have the greatest effect on the reference temperature for nil-ductility transition (RT_{NDT}) of the reactor vessel over its life are...

A. thermal neutron flux and vessel copper content.

B. thermal neutron flux and vessel carbon content.

C. fast neutron flux and vessel copper content.

D. fast neutron flux and vessel carbon content.

ANSWER: C.

在反應爐使用壽命期間，對反應爐的無延性轉換參考溫度(RT_{NDT})影響最大的兩項因素，分別為……

A. 熱中子通率與爐槽含銅量。

B. 熱中子通率與爐槽含碳量。

C. 快中子通率與爐槽含銅量。

D. 快中子通率與爐槽含碳量。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P1699 (B1800)

Two identical nuclear reactors have been in operation for the last 10 years. Reactor A has experienced 30 heatup/cooldown cycles and has an average power capacity of 60%. Reactor B has experienced 40 heatup/cooldown cycles and has an average power capacity of 50%.

Which reactor will have the lowest reactor vessel nil-ductility transition temperature?

A. Reactor A due to the fewer number of heatup/cooldown cycles

B. Reactor A due to the higher average power capacity

C. Reactor B due to the greater number of heatup/cooldown cycles

D. Reactor B due to the lower average power capacity

ANSWER: D.

兩部相同的核子反應器於過去十年間持續運轉。反應器A平均功率容量因數為60%，共經歷了30次加熱/冷卻週期；反應器B平均功率容量因數為50%，共經歷了40次加熱/冷卻週期。

哪部反應器具有最低的反應爐槽無延性轉換溫度？

A. 反應器A，因為加熱/冷卻週期次數較少。

B. 反應器A，因為平均功率容量因數較高。

C. 反應器B，因為加熱/冷卻週期次數較多。

D. 反應器B，因為平均功率容量因數較低。

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P1898 (B1200)

Which one of the following is the major contributor to embrittlement of the reactor vessel?

A. High-energy fission fragments

B. High operating temperature

C. High-energy gamma radiation

D. High-energy neutron radiation

ANSWER: D.

下列何者是反應爐材料脆化的主要原因？

A. 高能量核分裂產物

B. 高運轉溫度

C. 高能量伽馬射線

D. 高能量中子射線

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P1997 (B299)

Which one of the following describes the effect of fast neutron irradiation on a reactor pressure vessel?

A. Increased fatigue crack growth rate

B. Increased plastic deformation prior to failure

C. Increased metal toughness

D. Increased nil-ductility reference transition temperature

ANSWER: D.

下列何者描述了快中子照射對於反應爐壓力槽的影響？

A. 增加疲勞裂縫成長率。

B. 增加材料損壞前的塑性變形。

C. 增加金屬韌性。

D. 增加無延性轉換參考溫度。

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P2098 (B2100)

Two identical nuclear reactors have been in operation for the last 10 years. Reactor A has experienced 30 heatup/cooldown cycles and has an average power capacity of 60%. Reactor B has experienced 40 heatup/cooldown cycles and has an average power capacity of 50%.

Which reactor will have the highest reactor vessel nil-ductility transition temperature?

A. Reactor A due to the fewer number of heatup/cooldown cycles

B. Reactor A due to the higher average power capacity

C. Reactor B due to the greater number of heatup/cooldown cycles

D. Reactor B due to the lower average power capacity

ANSWER: B.

兩部相同之核子反應器於過去十年間持續運轉。反應器A平均功率容量因數為60%，共經歷了30次加熱/冷卻週期；反應器B平均功率容量因數為50%，共經歷了40次加熱/冷卻週期。

哪部反應器具有最高的反應爐無延性轉換溫度？

A. 反應器A，因為加熱/冷卻週期次數較少。

B. 反應器A，因為平均功率容量因數較高。

C. 反應器B，因為加熱/冷卻週期次數較多。

D. 反應器B，因為平均功率容量因數較低。

答案：B.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P2298

Two identical nuclear reactors have been in operation for the last 10 years. Reactor A has experienced 40 heatup/cooldown cycles and has an average power capacity of 50%. Reactor B has experienced 30 heatup/cooldown cycles and has an average power capacity of 60%.

Which reactor will have the highest reactor vessel nil-ductility transition temperature?

A. Reactor A due to the greater number of heatup/cooldown cycles

B. Reactor A due to the lower average power capacity

C. Reactor B due to the fewer number of heatup/cooldown cycles

D. Reactor B due to the higher average power capacity

ANSWER: D.

兩部相同的核子反應器於過去十年間持續運轉。反應器 A 的平均功率容量因數為 50%，共經歷 40 次加熱/冷卻週期。反應器 B 的平均功率容量因數為 60%，共經歷 30 次加熱/冷卻週期。

哪部反應器的反應爐無延性轉換溫度較高？

A. 反應器 A，因為加熱/冷卻週期次數較多。

B. 反應器 A，因為平均功率容量因數較低。

C. 反應器 B，因為加熱/冷卻週期次數較低。

D. 反應器 B，因為平均功率容量因數較高。

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P2599 (B2600)

Two identical nuclear reactors are currently shut down for refueling. Reactor A has an average lifetime power capacity of 60% and has been operating for 15 years. Reactor B has an average lifetime power capacity of 75% and has been operating for 12 years.

Which reactor, if any, will have the lowest reactor vessel nil ductility transition temperature?

A. Reactor A due to the lower average lifetime power capacity.

B. Reactor B due to the higher average lifetime power capacity.

C. Both reactors will have approximately the same nil ductility transition temperature because each core has produced approximately the same number of fissions.

D. Both reactors will have approximately the same nil ductility transition temperature because fast neutron irradiation in a shut down core is not significant.

ANSWER: C.

兩部相同的核子反應器目前停機以更換燃料。反應器A已經運轉15年，平均功率容量因數為60%；反應器B已經運轉12年，平均功率容量因數為75%。

哪部反應爐具有最低的反應爐槽無延性轉換溫度？

A. 反應器A，因為平均功率容量因數較低。

B. 反應器B，因為平均功率容量因數較高。

C. 兩部反應器有大約相同之無延性轉換溫度，因為兩個爐心發生的核分裂次數大約相同。

D. 兩部反應器有大約相同之無延性轉換溫度，因為停機時的爐心快中子照射效應並不顯著。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P2698 (B3000)

Two identical nuclear reactors are currently shut down for refueling. Reactor A has an average lifetime power capacity of 60% and has been operating for 15 years. Reactor B has an average lifetime power capacity of 60% and has been operating for 12 years.

Which reactor, if any, will have the lowest reactor vessel nil ductility transition temperature?

A. Reactor A because it has produced the greater number of fissions.

B. Reactor B because it has produced the fewer number of fissions.

C. Both reactors will have approximately the same nil ductility transition temperature because they have equal average lifetime power capacities.

D. Both reactors will have approximately the same nil ductility transition temperature because the fission rate in a shut down core is not significant.

ANSWER: B.

兩部相同的核子反應器目前停機以更換燃料。反應器A已經運轉15年，平均功率容量因數為60%。反應器B已經運轉12年，平均功率容量因數為60%。

哪部反應器具有最低的反應爐槽無延性轉換溫度？

A. 反應器A，因為其發生的核分裂次數較多。

B. 反應器B，因為其發生的核分裂次數較少。

C. 兩部反應器之無延性轉換溫度大約相同，因為兩者平均功率容量因數相同。

D. 兩部反應器之無延性轉換溫度大約相同，因為停機時的爐心中核分裂速率並不顯著。

答案：B.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P2799 (B2800)

Two identical nuclear reactors have been in operation for the last 10 years. Reactor A has experienced 30 heatup/cooldown cycles and has an average power capacity of 60%. Reactor B has experienced 20 heatup/cooldown cycles and has an average power capacity of 80%.

Which reactor will have the highest reactor vessel nil-ductility transition temperature and why?

A. Reactor A due to the greater number of heatup/cooldown cycles

B. Reactor A due to the lower average power capacity

C. Reactor B due to the fewer number of heatup/cooldown cycles

D. Reactor B due to the higher average power capacity

ANSWER: D.

兩部相同的核子反應器於過去十年間持續運轉。反應器A平均功率容量因數為60%，共經歷了30次加熱/冷卻週期；反應器B平均功率容量因數為80%，共經歷了20次加熱/冷卻週期。

哪部反應器具有最高的反應爐無延性轉換溫度？理由為何？

A. 反應器A，因為加熱/冷卻週期次數較多。

B. 反應器A，因為平均功率容量因數較低。

C. 反應器B，因為加熱/冷卻週期次數較少。

D. 反應器B，因為平均功率容量因數較高。

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P3197 (B3200)

A nuclear reactor is shut down for refueling following 18 months of operation at an average power level of 85%. During the shutdown, a reactor vessel metal specimen is removed from the reactor vessel for testing. The testing determines that the nil-ductility transition (NDT) temperature of the specimen has decreased from 44°F to 42°F since the previous refueling shutdown.

Which one of the following conclusions is warranted?

A. The test results are credible and the reactor vessel is more likely to experience brittle fracture now than after the previous refueling shutdown.

B. The test results are credible and the reactor vessel is less likely to experience brittle fracture now than after the previous refueling shutdown.

C. The test results are questionable because the specimen NDT temperature would not decrease during the described 18-month period of operation.

D. The test results are questionable because the specimen NDT temperature would decrease by more than 2°F during the described 18-month period of operation.

ANSWER: C.

一部核子反應器以平均功率85%運轉18個月後停機更換燃料。在大修期間，從反應爐取出監測金屬試片以進行測試。測試結果判定從上次停機更換燃料後，材料的無延性轉換(NDT)溫度已經從44˚F降低至42˚F。

下列結論何者為真？

A. 測試結果可信，比起上次停機更換燃料，此反應爐目前較可能發生脆性破壞。

B. 測試結果可信，比起上次停機更換燃料，此反應爐目前較不可能發生脆性破壞。

C. 測試結果有問題，因為樣本NDT溫度不會在上述18個月的運轉期間下降。

D. 測試結果有問題，因為樣本NDT溫度在上述18個月的運轉期間中，下降溫度應該大於2˚F。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P3297 (B3300)

A nuclear reactor is shut down for refueling following 18 months of operation at an average power level of 85%. During the shutdown, a reactor vessel metal specimen is removed from the reactor vessel for testing. The testing determines that the nil-ductility transition (NDT) temperature of the specimen has increased from 42°F to 44°F since the previous refueling shutdown.

Which one of the following conclusions is warranted?

A. The test results are credible and the reactor vessel is more susceptible to brittle fracture now than after the previous refueling shutdown.

B. The test results are credible and the reactor vessel is less susceptible to brittle fracture now than after the previous refueling shutdown.

C. The test results are questionable because the vessel NDT temperature would not increase during the described 18-month period of operation.

D. The test results are questionable because the vessel NDT temperature would increase by at least 10°F during the described 18-month period of operation.

ANSWER: A.

一部核子反應器以平均功率 85%運轉 18 個月後停機更換燃料。在大修期間，從反應爐取出金屬試片以進行測試。測試結果判定試片的無延性轉換(NDT)溫度，自上次停機更換燃料起，從 42°F 升高至 44°F。

下列結論何者為真？

A. 測試結果可信，相較於上次停機更換燃料，目前的反應爐更有可能發生脆性破壞。

B. 測試結果可信，相較於上次停機更換燃料，目前的反應爐較不可能發生脆性破壞。

C. 測試結果有問題，因為在上述 18 個月的運轉期間，反應爐的 NDT 溫度不會增加。

D. 測試結果有問題，因為在上述 18 個月的運轉期間，反應爐的 NDT 溫度至少增加 10°F。

答案：A.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P3598 (B3600)

A nuclear reactor is shut down for refueling following 18 months of operation at an average power level of 85%. During the shutdown, a reactor vessel metal specimen is removed from the reactor vessel for testing. The testing indicates that the nil-ductility transition (NDT) temperature of the specimen has decreased from 44°F to 32°F since the previous refueling shutdown.

Which one of the following conclusions is warranted?

A. The test results are credible and the reactor vessel is more likely to experience brittle fracture now than after the previous refueling shutdown.

B. The test results are credible and the reactor vessel is less likely to experience brittle fracture now than after the previous refueling shutdown.

C. The test results are questionable because the actual specimen NDT temperature would not decrease during the described 18-month period of operation.

D. The test results are questionable because the actual specimen NDT temperature would decrease by much less than indicated by the test results.

ANSWER: C.

一部核子反應器以平均功率85%運轉18個月後停機更換燃料。在大修期間，從反應爐取出監測金屬試片以進行測試。測試結果指出自從上次停機更換燃料後，材料的無延性轉換溫度(NDT)已經從44˚F降至32˚F。

下列結論何者為真？

A. 測試結果可信，比起上次更換燃料，此反應爐目前較可能發生脆性破壞。

B. 測試結果可信，比起上次更換燃料，此反應爐目前較不可能發生脆性破壞。

C. 測試結果有問題，因為試片NDT溫度不會在上述18個月的運轉期間下降。

D. 測試結果有問題，因為在上述18個月的運轉期間，試片的實際NDT溫度下降數值，應遠小於測試結果所得之數值。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P3898 (B3900)

Two identical nuclear reactors are currently shut down for refueling. Reactor A has an average lifetime power capacity of 90% and has been operating for 10 years. Reactor B has an average lifetime power capacity of 80% and has been operating for 15 years.

Which reactor will have the higher reactor vessel nil ductility transition temperature and why?

A. Reactor A because it has the higher average lifetime power capacity.

B. Reactor B because it has the lower average lifetime power capacity.

C. Reactor A because it has produced significantly less fissions.

D. Reactor B because it has produced significantly more fissions.

ANSWER: D.

兩部相同的核子反應器目前停機以更換燃料。反應器A已經運轉10年，平均功率容量因數為90%；反應器B已經運轉15年，平均功率容量因數為80%。

哪部反應器具有較高的反應爐無延性轉換溫度？原因為何？

A. 反應器A，因為其具有較高的平均功率容量因數。

B. 反應器B，因為其具有較低的平均功率容量因數。

C. 反應器A，因為其發生的核分裂次數明顯較少。

D. 反應器B，因為其發生的核分裂次數明顯較多。

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P4250 (B4250)

A nuclear reactor is shut down for refueling following 18 months of operation at an average power level of 85%. During the shutdown, a reactor vessel metal specimen was removed from the reactor vessel for testing. The tests determined that the nil-ductility transition (NDT) temperature of the specimen has increased from 42°F to 72°F since the previous refueling shutdown.

Which one of the following conclusions is warranted?

A. The test results are credible and the reactor vessel is more likely to experience brittle fracture now than after the previous refueling shutdown.

B. The test results are credible and the reactor vessel is less likely to experience brittle fracture now than after the previous refueling shutdown.

C. The test results are questionable because the specimen NDT temperature would not increase during the described 18-month period of operation.

D. The test results are questionable because the specimen NDT temperature would increase by less than indicated during the described 18-month period of operation.

ANSWER: D.

一部核子反應器以平均功率 85%運轉 18 個月後停機更換燃料。在大修期間，從反應爐取出金屬試片以進行測試。測試結果判定試片的無延性轉換(NDT)溫度，自上次停機更換燃料以來，從 42°F 升高至 72°F。

下列結論何者為真？

A. 測試結果可信，相較於上次停機更換燃料，目前的反應爐較有可能發生脆性破壞。

B. 測試結果可信，相較於上次停機更換燃料，目前的反應爐較不可能發生脆性破壞。

C. 測試結果有問題，因為在上述 18 個月的運轉期間，反應爐的 NDT 溫度不會增加。

D. 測試結果有問題，因為在上述 18 個月的運轉期間，反應爐增加的 NDT 溫度應少於所示增溫。

答案：D.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P4450 (B4450)

A nuclear reactor is shut down for refueling. During the shutdown, a reactor vessel metal specimen is removed from the reactor vessel for testing. The specimen was last tested six years ago. During the subsequent six years, the reactor has completed several 18-month fuel cycles with an average power level of 85%.

The test determines that the nil-ductility transition (NDT) temperature of the specimen has remained unchanged at 44°F since it was last tested. Which one of the following conclusions is warranted?

A. The test results are credible, however, the reactor vessel is more susceptible to brittle fracture now than six years ago.

B. The test results are credible, however, the reactor vessel is less susceptible to brittle fracture now than six years ago.

C. The test results are questionable because the specimen NDT temperature should have increased since it was last tested.

D. The test results are questionable because the specimen NDT temperature should have decreased since it was last tested.

ANSWER: C.

一部核子反應器停機以更換燃料。在大修期間，從反應爐取出金屬試片以進行測試。最後測試試片的時間為六年前。反應器於往後六年間，以 85%平均功率完成數次為期 18 個月的燃料週期。

測試結果判定試片的無延性轉換(NDT)溫度，自上次停機更換燃料以來均未改變，仍然維持 44°F。則下列哪項結論為真？

A. 測試結果可信，然而相較於六年前，目前的反應爐較有可能發生脆性破壞。

B. 測試結果可信，然而相較於六年前，目前的反應爐較不可能發生脆性破壞。

C. 測試結果有問題，因為從上次測試以來，反應爐的 NDT 溫度應該增加。

D. 測試結果有問題，因為從上次測試以來，反應爐的 NDT 溫度應該降低。

答案：C.

科目： 193010
知能類：K1.05 [2.9/3.0]
序號： P4650 (B4650)

Two identical nuclear reactors are currently shut down for refueling. Reactor A has achieved an average lifetime power capacity of 60% while operating for 12 years. Reactor B has achieved an average lifetime power capacity of 60% while operating for 15 years.

Which reactor, if any, will have the lower reactor vessel nil ductility transition temperature?

A. Reactor A because it has produced the fewer total number of fissions.

B. Reactor B because it has produced the greater total number of fissions.

C. Both reactors will have approximately the same nil ductility transition temperature because they have equal average lifetime power capacities.

D. Both reactors will have approximately the same nil ductility transition temperature because the fission rate in a shut down core is not significant.

ANSWER: A.

兩部相同的核子反應器目前停機以更換燃料。反應器 A 已經運轉 12 年，平均功率容量因數達到 60%。反應器 B 已經運轉 15 年，平均功率容量因數達到 60%。

哪部反應器的反應爐無延性轉換溫度較低？

A. 反應器 A，因為其產生的核分裂總次數較少。

B. 反應器 B，因為其產生的核分裂次數較多。

C. 兩部反應器的無延性轉換溫度約略相同，因為其平均功率容量因數相等。

D. 兩部反應器的無延性轉換溫度約略相同，因為停機爐心的分裂率並不顯著。

答案：A.

科目： 193010
知能類：K1.06 [3.6/3.8]
序號： P99

A nuclear power plant is shut down with the reactor coolant system at 1,200 psia and 350°F. Which one of the following would be most likely to cause pressurized thermal shock of the reactor vessel?

A. A rapid depressurization followed by a rapid heatup

B. A rapid depressurization followed by a rapid cooldown

C. A rapid cooldown followed by a rapid pressurization

D. A rapid heatup followed by a rapid pressurization

ANSWER: C.

核能電廠目前停機，此時的反應器冷卻水系統為 1,200 psia 與 350°F。下列何者最有可能造成反應爐產生壓力熱震 (Pressurized thermal shock)？

A. 迅速加熱伴隨著迅速減壓。

B. 迅速冷卻伴隨著迅速減壓。

C. 迅速加壓伴隨著迅速冷卻。

D. 迅速加壓伴隨著迅速加熱。

答案：C.

科目： 193010
知能類：K1.06 [3.6/3.8]
序號： P299

Pressurized thermal shock is a condition that can occur following a rapid _____ of the reactor coolant system (RCS) if RCS pressure is rapidly _____.

A. cooldown; decreased

B. cooldown; increased

C. heatup; decreased

D. heatup; increased

ANSWER: B.

壓力熱震(Pressurized thermal shock)是反應器冷卻水系統(RCS)壓力迅速_____時，RCS快速_____後可能發生的狀況。

A. 降低；冷卻

B. 增加；冷卻

C. 降低；加熱

D. 增加；加熱

答案：B.

科目： 193010
知能類：K1.06 [3.6/3.8]
序號： P2800 (N/A)

Which one of the following would be most likely to cause pressurized thermal shock of a reactor vessel?

A. Starting a reactor coolant pump in an idle loop with the associated steam generator temperature less than RCS loop temperature.

B. Starting a reactor coolant pump in an idle loop with the associated steam generator temperature greater than RCS loop temperature.

C. Continuous emergency coolant injection to the RCS during and after a complete and unisolable rupture of a steam generator steam outlet nozzle.

D. Continuous emergency coolant injection to the RCS during and after a complete and unisolable rupture of a reactor vessel coolant outlet nozzle.

ANSWER: C.

下列何者造成反應爐出現壓力熱震(Pressurized thermal shock)的機率最大？

A. 啟動未運轉迴路的反應器冷卻水泵，此時相關的蒸汽產生器溫度低於 RCS 迴路溫度。

B. 啟動未運轉迴路的反應器冷卻水泵，此時相關的蒸汽產生器溫度高於 RCS 迴路溫度。

C. 在蒸汽產生器蒸汽出口噴嘴出現完全且無法隔離(unisonlable)的斷裂當時及之後，持續注入緊急冷卻水至 RCS。

D. 在反應爐槽冷卻水出口噴嘴出現完全且無法隔離(unisonlable)的斷裂當時及之後，持續注入緊急冷卻水至 RCS。

答案：C.

科目： 193010
知能類：K1.07 [3.8/4.1]
序號： P100

During a severe overcooling transient, a major concern to the operator is...

A. accelerated zirconium hydriding.

B. loss of reactor vessel water level.

C. loss of reactor coolant pump net positive suction head.

D. brittle fracture of the reactor vessel.

ANSWER: D.

運轉員在發生嚴重的過冷暫態時，首重下列哪項問題？

A. 鋯氫反應加速。

B. 反應爐水位下降。

C. 反應器冷卻水泵喪失淨正吸水頭。

D. 反應爐槽脆性破壞。

答案：D.

科目： 193010
知能類：K1.07 [3.8/4.1]
序號： P1000

An uncontrolled cooldown is a brittle fracture concern because it creates a large _____ stress at the _____ wall of the reactor vessel.

A. tensile; inner

B. tensile; outer

C. compressive; inner

D. compressive; outer

ANSWER: A.

防範脆性破壞時，首重無法控制的冷卻現象，因為此現象在反應爐的_____壁造成龐大的_____應力。

A. 內；張

B. 外；張

C. 內；壓

D. 外；壓

答案：A.

科目： 193010
知能類：K1.07 [3.8/4.1]
序號： P1099

During an uncontrolled cooldown of a reactor coolant system, the component most susceptible to pressurized thermal shock is the...

A. reactor vessel.

B. steam generator tube sheet.

C. cold leg accumulator penetration.

D. loop resistance temperature detector penetration.

ANSWER: A.

反應器冷卻水系統發生無法控制的冷卻現象時，最有可能承受壓力熱震(Pressurized thermal shock)的組件為……

A. 反應爐槽

B. 蒸汽產生器管板(tube sheet)

C. 冷端蓄壓槽穿越管

D. 反應器冷卻水迴路的電阻式溫度感測器穿越管

答案：A.

科目： 193010
知能類：K1.07 [3.8/4.1]
序號： P1199

Which one of the following describes the thermal stress placed on the reactor vessel during a cooldown of the reactor coolant system?

A. Compressive at the inner wall, tensile at the outer wall

B. Tensile at the inner wall, compressive at the outer wall

C. Compressive across the entire wall

D. Tensile across the entire wall

ANSWER: B.

下列何者描述了在反應器冷卻水系統冷卻期間，施加於反應爐槽的熱應力？

A. 內壁為壓應力、外壁為張應力。

B. 內壁為張應力、外壁為壓應力。

C. 整個爐壁為壓應力。

D. 整個爐壁為張應力。

答案：B.

科目： 193010
知能類：K1.07 [3.8/4.1]
序號： P1500

The thermal stress experienced by the reactor vessel during a reactor coolant system cooldown is...

A. tensile across the entire vessel wall.

B. tensile at the inner wall, compressive at the outer wall of the vessel.

C. compressive across the entire vessel wall.

D. compressive at the inner wall, tensile at the outer wall of the vessel.

ANSWER: B.

反應爐槽於冷卻水系統冷卻期間經歷的熱應力為……

A. 整個爐壁為張應力。

B. 反應爐內壁為張應力、外壁為壓應力。

C. 整個爐壁為壓應力。

D. 反應爐內壁為壓應力、外壁為張應力。

答案：B.

科目： 193010
知能類：K1.07 [3.8/4.1]
序號： P2797

A nuclear power plant heatup is in progress using reactor coolant pumps. The heatup stress applied to the reactor vessel is...

A. tensile across the entire wall.

B. tensile at the inner wall and compressive at the outer wall.

C. compressive across the entire wall.

D. compressive at the inner wall and tensile at the outer wall.

ANSWER: D.

核能電廠正使用反應器冷卻水泵進行加熱。關於施加在反應爐槽的加熱應力……

A. 整個爐壁為張應力。

B. 內壁為張應力、外壁為壓應力。

C. 整個爐壁為壓應力。

D. 內壁為壓應力、外壁為張應力。

答案：D.

科目/題號：193010/1 (2016新增)
知能類：K1.05 [2.9/3.0]
序號：P398 (B400)

The likelihood of reactor vessel brittle fracture is decreased by minimizing...
A. the oxygen content in the reactor coolant.
B. operation at high reactor coolant temperatures.
C. the time taken to cool down the reactor.
D. the amount of copper contained in the metal used for the reactor vessel.
ANSWER: D.

反應爐槽產生脆性破壞的機率可藉由減少下列何者而降低？
A.反應爐冷卻水中之氧含量
B.在高溫下運轉
C.冷卻反應爐冷卻水系統所需之時間
D.反應爐槽製造時材料含銅的總量

答案： D

科目/題號：193010/2 (2016新增)
知能類： K1.05 [2.9/3.0]
序號： P5550 (B5550)

Two identical reactors are currently shut down for refueling. Reactor A has an average lifetime capacity factor of 90 percent and has been operating for 24 years. Reactor B has an average lifetime capacity factor of 72 percent and has been operating for 30 years.
Which reactor, if any, will have the lower reactor vessel nil-ductility transition temperature?
A. Reactor A, because it has produced more total fissions.
B. Reactor B, because it has produced less total fissions.
C. Both reactors will have approximately the same nil-ductility transition temperature because fast neutron irradiation in a shutdown reactor is not significant.
D. Both reactors will have approximately the same nil-ductility transition temperature because each reactor has produced approximately the same number of fissions.
ANSWER: D.

兩座完全相同的反應器目前均因更換燃料而停機。反應器A在運轉24年後已達平均壽期容量因數90%，而反應器B運轉30年後已達平均壽期容量因數72%。下列何者反應器具有較低無延性轉換溫度(NDTT)？
A.反應器A，因其產生較多的總分裂次數
B.反應器B，因其產生較少的總分裂次數
C.兩座反應器具有大約相同的 NDTT，因為快中子的照射在停機的反應器不重要
D.兩座反應器具有大約相同的NDTT，因為每一反應器均產生大約相同的分裂數

答案： D

科目/題號：193010/3 (2016新增)
知能類：K1.05 [2.9/3.0]
序號：P6350 (B6350)

Which one of the following comparisons yields a higher probability for brittle fracture of a reactor vessel?
A. A high fast neutron flux in the reactor rather than a high gamma flux.
B. A high material ductility of the reactor vessel rather than a high material strength.
C. A rapid 100°F reactor heatup at a high temperature rather than at a low temperature.
D. A rapid 100°F reactor cooldown at a high temperature rather than at a low temperature.
ANSWER: A.

比較下列何者在反應器槽產生脆性斷裂的機率較高？
A.反應器槽中較高的快中子通量而不是較高的加馬通量
B.反應器槽材料較高延展性而不是較高材料強度
C.反應器在高溫時快速加熱100°F而不是在低溫時
D.反應器在高溫時快速冷卻100°F而不是在低溫時

答案： A

科目/題號：193010/4 (2016新增)
知能類：K1.05 [2.9/3.0]
序號：P6950 (B6950)

Two identical reactors are currently shut down for refueling. Reactor A has an average lifetime capacity factor of 90 percent and has been operating for 16 years. Reactor B has an average lifetime capacity factor of 80 percent and has been operating for 18 years.
Which reactor, if any, will have the lower reactor vessel nil-ductility transition temperature, and why?
A. Reactor A, due to the higher average lifetime capacity factor.
B. Reactor B, due to the lower average lifetime capacity factor.
C. Both reactors will have approximately the same nil-ductility transition temperature because each reactor has produced approximately the same number of fissions.
D. Both reactors will have approximately the same nil-ductility transition temperature because fast neutron irradiation in a shutdown reactor is not significant.
ANSWER: C.

兩座完全相同的反應器目前均因更換燃料而停機。反應器A在運轉16年後已達平均壽期容量因數90%，而反應器B運轉18年後已達平均壽期容量因數80%。下列何者反應器具有較低反應器槽無延性轉換溫度，且理由為何？
A.反應器A，因其具有較高平均壽期容量因數
B.反應器B，因其具有較低平均壽期容量因數
C.兩座反應器具有大約相同的無延性轉換溫度，因為每一反應器均產生大約相同的分裂數
D.兩座反應器具有大約相同的無延性轉換溫度，因為快中子的照射在停機的反應器是不重要的

答案： C

科目/題號：193010/5 (2016新增)
知能類： K1.05 [2.9/3.0]
序號： P7640 (B7640)

Which one of the following comparisons yields a lower probability for brittle fracture of a reactor vessel?

A. A high gamma flux in the reactor rather than a high fast neutron flux.
B. A high material strength of the reactor vessel rather than a high material ductility.
C. A rapid 100°F reactor heatup at a low temperature rather than at a high temperature.
D. A rapid 100°F reactor cooldown at a low temperature rather than at a high temperature.

ANSWER: A.

比較下列何者在反應器槽產生脆性斷裂的機率較低？
A.反應器槽中較高的加馬通量而不是較高的快中子通量
B.反應器槽較高材料強度而不是較高材料延展性
C.反應器在低溫時快速加熱100°F而不是在高溫時
D.反應器在低溫時快速冷卻100°F而不是在高溫時

答案： A