科目： 293010
知能類： K1.01 [2.4/2.8]
序號： B499 (P497)

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 cool down at a high temperature rather than a low temperature
ANSWER: B

下列可能導致反應爐槽產生較高脆性破壞機率的敘述，那一種是正確的？
A. 高伽瑪通量大於高中子通量
B. 反應爐槽高機械強度材料大於高延展性材料
C. 反應爐冷卻水高含氧量大於低含氧量
D. 反應爐快速冷卻100˚F，在高溫中大於在低溫中
答案： B.

科目： 293010
知能類： K1.01 [2.4/2.8]
序號： B2499 (P2496)

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

低碳鋼的脆性破壞在溫度____於零延性溫度(nil ductility temperature)時比較容易發生，而且即使在外加應力____於鋼材的降伏(yield)應力時通常也會發生。
A. 大；大
B. 大；小
C. 小；大
D. 小；小
答案： D.

科目： 293010
知能類： K1.02 [2.2/2.7]
序號： B1299 (P1896)

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. cooldown; above
B. heatup; above
C. cooldown; below
D. heatup; below
ANSWER: C

反應爐槽脆性破壞最可能發生於反應爐冷卻水系統（RCS）的____期，當RCS溫度____於反應爐槽零延性轉換參考溫度(RT_{NDT}) 時最容易發生。
A. 冷卻；高
B. 加熱；高
C. 冷卻；低
D. 加熱；低

答案： C.

科目： 293010
知能類： K1.02 [2.2/2.7]
序號： B1500 (P697)

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

零延性轉換參考溫度(RT_{NDT})的意義是，當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. 金屬會展現出較高的延展性
C. 產生脆性破壞的機率提高
D. 在材料損壞前無法觀察到明顯的變形發生

答案： B.

科目： 293010
知能類： K1.02 [2.2/2.7]
序號： B2099 (P2096)

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

下列何者可以預防反應爐槽因脆性破壞而損壞？
A. 用低碳鋼製造反應爐槽
B. 讓反應爐槽壓力保持在低於最大設計限值
C. 運轉在高於零延性轉換的參考溫度(RT_{NDT})
D. 保持反應爐槽加熱/冷卻的循環次數在限制值內
答案： C.

科目： 293010
知能類： K1.02 [2.2/2.7]
序號： B2199 (P2295)

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

反應爐槽脆性破壞最不容易發生的時期是：反應爐____期間，且此期間反應爐槽溫度____於零延性轉換參考溫度(RT_{NDT})時。
A. 冷卻；高
B. 加熱；高
C. 冷卻；低
D. 加熱；低
答案： B.

科目： 293010
知能類： K1.02 [2.2/2.7]
序號： B2299 (P996)

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

零延性轉換溫度(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： 293010
知能類： K1.02 [2.2/2.7]
序號： B2699 (P597)

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

反應爐槽的零延性轉換溫度(RT_{NDT})的意義是為____。
A. 高於該溫度時，當反應爐冷卻水系統（RCS）壓力降低，反應爐槽金屬將會產生彈性變形
B. 高於該溫度時，當反應爐冷卻水系統（RCS）壓力增加，反應爐槽金屬將會失去彈性變形的能力
C. 低於該溫度時，當反應爐冷卻水系統（RCS）壓力降低，反應爐槽金屬將會產生彈性變形
D. 低於該溫度時，當反應爐冷卻水系統（RCS）壓力增加，反應爐槽金屬將會失去彈性變形的能力
答案： D.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B100 (P96)

The likelihood of brittle fracture failure of the reactor vessel is reduced by...
A. reducing gamma flux exposure.
B. reducing vessel temperature.
C. reducing vessel pressure.
D. increasing vessel age.
ANSWER: C

反應爐槽因脆性破壞而損壞的可能性可以因____而降低。
A. 降低伽瑪通量曝露
B. 降低爐槽溫度
C. 降低爐槽壓力
D. 增加爐槽運轉時間
答案： C.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B300 (P1897)

Which one of the following will apply a compressive stress to the outside wall of the reactor vessel?
A. Neutron embrittlement of the reactor vessel
B. Increasing reactor coolant system (RCS) pressure
C. Performing an RCS cooldown
D. Performing an RCS heatup
ANSWER: C

下列何者會在反應爐槽外壁施予壓應力(compressive stress)？
A. 反應爐槽的中子脆化
B. 增加反應爐冷卻水系統（RCS）的壓力
C. 進行RCS冷卻
D. 進行RCS加熱
答案： C.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B398 (P397)

Brittle fracture of the reactor coolant pressure boundary is most likely to occur at...
A. 400˚F, 10 psig.
B. 400˚F, 400 psig.
C. 120˚F, 10 psig.
D. 120˚F, 400 psig.
ANSWER: D

反應爐冷卻水壓力邊界的脆性破壞在____時最容易發生。
A. 400˚F, 10 psig.
B. 400˚F, 400 psig.
C. 120˚F, 10 psig.
D. 120˚F, 400 psig.
答案： D.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B399 (P399)

The total stress on the reactor vessel inner wall is greater during cooldown than heatup because...
A. thermal heatup stress totally offsets pressure stress at the inner wall.
B. both pressure stress and thermal cooldown stress are tensile at the inner wall.
C. the tensile thermal cooldown stress at the inner wall is greater in magnitude than the compressive pressure stress at the same location.
D. thermal cooldown stress and thermal heatup stress are both tensile at the inner wall, but cooldown stress is greater in magnitude.
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時的熱應力，在內壁上都是張應力
C. 在內壁相同位置上，冷卻時產生的的熱張應力比內壓力產生的壓應力大
D. 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
答案： B.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B400 (P398)

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： 293010
知能類： K1.04 [2.9/3.2]
序號： B899 (P97)

Pressure stress on the reactor vessel wall is...
A. compressive across the entire wall.
B. tensile across the entire wall.
C. tensile on the inner wall, compressive on the outer wall.
D. compressive on the inner wall, tensile on the outer wall.
ANSWER: B

反應爐槽壁上，因內壓力所產生的應力為
A. 在整個槽壁上均為壓應力
B. 在整個槽壁上均為張應力
C. 在內壁上為張應力，外壁為壓應力
D. 在內壁上為壓應力，外壁為張應力
答案： B.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B1899 (P1597)

Which one of the following 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

下列何者會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. 反應爐冷卻水高溫而非反應爐冷卻水低溫
D. 執行100˚F/hr的冷卻而非100˚F/hr的加熱
答案： D.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B2300

A reactor plant heatup is in progress. The thermal 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

一反應爐加熱過程中。施加於反應爐槽之熱應力為
A. 在整個壁體均為張應力
B. 在內壁為張應力，在外壁為壓應力
C. 在整個壁體均為壓應力
D. 在內壁為壓應力，在外壁為張應力
答案： D.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B2399 (P2397)

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

反應爐冷卻水系統壓力—溫度限制曲線乃利用保守之反應爐槽參考零延性溫度(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；將在爐心中經照射的反應爐槽材料試片取出後測試
B. 大；在營運中檢測並分析反應爐槽壁
C. 小；將在爐心中經照射的反應爐槽材料試片取出後測試
D. 小；在營運中檢測並分析反應爐槽壁
答案： A.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B2500 (P2497)

Which one of the following comparisons will result in a higher probability of brittle fracture failure of the reactor vessel?
A. A feedwater pH of 8.5 rather than 9.0
B. A high feedwater oxygen content rather than a low oxygen content
C. A 50˚F/hr reactor cooldown rather than a 100˚F/hr heatup
D. A high gamma flux rather than a high neutron flux
ANSWER: C

下列可能導致反應爐槽產生較高脆性破壞機率的敘述，那一種是正確的？
A. 飼水pH值8.5而非9.0
B. 較高的飼水氧含量而非較低的氧含量
C. 反應爐以50˚F/hr冷卻而非以100˚F/hr加熱
D. 高伽瑪通量而非高中子通量
答案： C.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B2700 (P1696)

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

下列可能導致反應爐槽產生較高脆性破壞機率的敘述，那一種是正確的？

A. 在1600psia時以50˚F/hr冷卻而非在1200psia時以50˚F/hr冷卻
B. 反應爐槽壁上的壓應力而非張應力
C. 反應爐冷卻水高溫而非反應爐冷卻水低溫
D. 維持爐體材料強度不變，增加材料韌性將會增加脆性破壞機率

答案： A.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B2999 (N/A)

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

A. Maximum setpoint for main steam safety valves
B. Maximum chloride concentration in the reactor coolant
C. Maximum reactor pressure versus vessel temperature during heatup
D. Maximum differential temperature between the vessel steam dome and the bottom head

ANSWER: C

下列何種運轉限值乃設計來預防反應爐槽脆性破壞？

A. 主蒸汽安全閥最高壓力設定點
B. 反應爐冷卻水中最大氯濃度
C. 加熱時，相對於反應爐溫度的反應爐壓力上限值
D. 反應爐槽頂蓋與底蓋之間最大溫差

答案： C.

科目： 293010
知能類： K1.04 [2.9/3.2]
序號： B3700 (P3698)

A 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

反應爐停機，從500˚F開始以不控制反應爐冷卻速率降溫，最後將反應爐冷卻水溫度降至240˚F。而後若反應爐冷卻水溫度持續維持在240˚F，下列何者正確描述反應爐槽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會接近零延性轉換溫度
D. 增加，因為反應爐槽內壁溫度將會接近零延性轉換溫度

答案： A.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B299 (P1997)

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 ductility
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. 增加延展性
D. 增加零延性轉換參考溫度
答案： D.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B500 (P499)

Which one of the following types of radiation most significantly reduces the ductility of the metal of a reactor pressure vessel?
A. Beta
B. Thermal neutrons
C. Gamma
D. Fast neutrons
ANSWER: D

下列何種形式的放射線降低反應爐壓力槽金屬的延展性最顯著？
A. 貝他
B. 熱中子
C. 伽瑪
D. 快中子
答案： D.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B599 (P298)

Prolonged exposure of a reactor vessel to a fast neutron flux will cause the reference temperature for nil-ductility transition (RT_{NDT}) to...
A. decrease due to the propagation of existing flaws.
B. increase due to the propagation of existing flaws.
C. decrease due to changes in the material properties of the vessel wall.
D. increase due to changes in the material properties of the vessel wall.
ANSWER: D

反應爐槽長期暴露於快中子通量下，將會導致零延展轉換參考溫度
A. 降低，因為存在瑕疵的成長
B. 升高，因為存在瑕疵的成長
C. 降低，因為槽壁材料特性的改變
D. 升高，因為槽壁材料特性的改變
答案： D.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B1100 (P1100)

Two identical 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

兩相同之反應爐在過去10年間運轉。反應爐A平均容量因數為50%，共經歷了40次加熱/冷卻週期；反應爐B平均容量因數為60%，共經歷了30次加熱/冷卻週期。那一反應爐具有最低的反應爐槽零延性轉換溫度？
A. 反應爐A，因為平均容量因數較低
B. 反應爐A，因為加熱/冷卻週期次數較多
C. 反應爐B，因為平均容量因數較高
D. 反應爐B，因為加熱/冷卻週期次數較少
答案： A.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B1200 (P1898)

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

下列何者是反應爐槽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. 高能伽瑪射線
D. 高能中子射線
答案： D.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B1800 (P1699)

Two identical reactors have been in operation for the last 10 years. Reactor A has experienced 30 heatup/cooldown cycles with an average power capacity of 60%. Reactor B has experienced 40 heatup/cooldown cycles with an average power capacity of 50%. Which reactor will have the lowest reactor vessel nil-ductility transition temperature?
A. Reactor A due to the higher average power capacity
B. Reactor A due to the fewer number of heatup/cooldown cycles
C. Reactor B due to the lower average power capacity
D. Reactor B due to the greater number of heatup/cooldown cycles
ANSWER: C

兩相同之反應爐在過去10年間運轉。反應爐A平均容量因數為60%，共經歷了30次加熱/冷卻週期；反應爐B平均容量因數為50%，共經歷了40次加熱/冷卻週期。那一反應爐具有最低的反應爐槽零延性轉換溫度？
A. 反應爐A，因為平均容量因數較高
B. 反應爐A，因為加熱/冷卻週期次數較少
C. 反應爐B，因為平均容量因數較低
D. 反應爐B，因為加熱/冷卻週期次數較多
答案： C.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B1900 (P899)

After several years of operation the maximum allowable stress to the reactor pressure 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

在經過多年的運轉後，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： 293010
知能類： K1.05 [2.5/2.8]
序號： B1999 (P998)

Prolonged exposure to _____ will cause nil-ductility transition temperature of the reactor vessel to _____.
A. neutron radiation; increase
B. neutron radiation; decrease
C. normal operating pressure; increase
D. normal operating pressure; decrease
ANSWER: A

長期暴露在____下會導致反應槽的零延性轉換溫度____。
A. 中子射線；增加
B. 中子射線；減小
C. 正常運轉壓力；增加
D. 正常運轉壓力；減小
答案： A.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B2100 (P2098)

Two identical 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

兩相同之反應爐在過去10年間運轉。反應爐A平均容量因數為60%，共經歷了30次加熱/冷卻週期；反應爐B平均容量因數為50%，共經歷了40次加熱/冷卻週期。那一反應爐具有最高的反應爐槽零延性轉換溫度？
A. 反應爐A，因為加熱/冷卻週期次數較少
B. 反應爐A，因為平均容量因數較高
C. 反應爐B，因為加熱/冷卻週期次數較多
D. 反應爐B，因為平均容量因數較低
答案： B.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B2600 (P2599)

Two identical 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

兩相同反應爐目前停機進行更換燃料。反應爐A運轉15年平均容量因數為60%；反應爐B運轉12年平均容量因數為75%。那一反應爐具有最低的反應槽零延性轉換溫度？
A. 反應爐A，因為平均容量因數較低
B. 反應爐B，因為平均容量因數較高
C. 兩反應爐有大約相同之零延性轉換溫度，因為兩個爐心發生的核分裂次數大約相同
D. 兩反應爐有大約相同之零延性轉換溫度，因為停機時爐心快中子照射效應並不顯著
答案： C.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B2800 (P2799)

Two identical 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 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: C

兩相同之反應爐在過去10年間運轉。反應爐A平均容量因數為60％，共經歷了30次加熱/冷卻週期；反應爐B平均容量因數為80％，共經歷了20次加熱/冷卻週期。那一反應爐具有最高的反應爐槽零延性轉換溫度？理由為何？
A. 反應爐A，因為平均容量因數較低
B. 反應爐A，因為加熱/冷卻週期次數較多
C. 反應爐B，因為平均容量因數較高
D. 反應爐B，因為加熱/冷卻週期次數較少
答案： C.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B2900 (P2298)

Two identical 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

兩相同之反應爐在過去10年間運轉。反應爐A平均容量因數為50%，共經歷了40次加熱/冷卻週期；反應爐B平均容量因數為60%，共經歷了30次加熱/冷卻週期。那一反應爐具有最高的反應爐槽零延性轉換溫度
A. 反應爐A，因為加熱/冷卻週期次數較多
B. 反應爐A，因為平均容量因數較低
C. 反應爐B，因為加熱/冷卻週期次數較少
D. 反應爐B，因為平均容量因數較高
答案： D.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B3000 (P2698)

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

兩相同反應爐目前停機進行更換燃料。反應爐A運轉15年平均容量因數為60%。反應爐B運轉12年平均容量因數為60%。那一反應爐具有最低的反應爐槽零延性轉換溫度？
A. 反應爐A，因為其發生的核分裂次數較多
B. 反應爐B，因為其發生的核分裂次數較少
C. 兩反應爐之零延性轉換溫度大約相同，因為兩者平均容量因數相同
D. 兩反應爐之零延性轉換溫度大約相同，因為停機時爐心中核分裂速率並不顯著
答案： B.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B3200 (P3197)

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

一反應爐在平均功率85%下運轉18個月後停機更換燃料。在停機過程當中，反應爐槽監測金屬試片從反應爐中取出以進行測試。測試結果確定自從上次燃料更換後，材料的零延性轉換溫度（NDT）已經從44˚F降低至42˚F，。則下列何種結論較正確？

A. 測試結果可信，比起上次更換燃料，此反應爐槽目前比較可能發生脆性破壞
B. 測試結果可信，比起上次更換燃料，此反應爐槽目前比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： 293010
知能類： K1.05 [2.5/2.8]
序號： B3600 (P3598)

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

一反應爐在平均功率85%下運轉18個月後停機更換燃料。在停機過程當中，反應爐槽監測金屬試片從反應爐中取出以進行測試。測試結果確定自從上次燃料更換後，材料的零延性轉換溫度（NDT）已經從44˚F降低至32˚F。則下列何種結論較正確？

A. 測試結果可信，比起上次更換燃料，此反應爐槽目前比較可能發生脆性破壞
B. 測試結果可信，比起上次更換燃料，此反應爐槽目前比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，因為試片實際NDT溫度在上述18個月的運轉期間，下降溫度應遠小於測試結果所得之數值

答案： C.

科目： 293010
知能類： K1.05 [2.5/2.8]
序號： B3900 (P3898)

Two identical 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

兩相同反應爐目前均停機進行更換燃料。反應爐A運轉10年，平均容量因數為90％；反應爐B運轉15年，平均容量因數為80％。那一反應爐具有較高的反應爐槽零延性轉換溫度？原因為何？
A. 反應爐A，因為其具有較高的平均壽命容量因數
B. 反應爐B，因為其具有較低的平均壽命容量因數
C. 反應爐A，因為其發生的核分裂次數明顯較少
D. 反應爐B，因為其發生的核分裂次數明顯較多
答案： D.

科目/題號：293010/1 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B3300(P3297)

A reactor is shut down for refueling following 18 months of operation at an average power level of 85 percent. During the shutdown, a reactor vessel metal specimen was removed from the reactor vessel for testing. The testing determined that the nil-ductility transition (NDT) temperature of the specimen 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.

一反應器以平均85%功率運轉18個月後停機更換燃料。當此停機期間，反應爐槽金屬試片從爐內移出執行測試。此測試判定該試片之零延性轉換溫度(NDTT)由上次停機更換燃料的42˚F變為44˚F。
下列何項結論為正確?
A.測試結果是可信的，目前爐槽較上次更換燃料停機時對脆性斷裂更敏感
B.測試結果是可信的，目前爐槽較上次更換燃料停機時對脆性斷裂更不敏感
C.測試結果是有問題的，因為在所述的18個月運轉期間爐槽NDTT並未增加
D.測試結果是有問題的，因為在所述的18個月運轉期間爐槽NDTT至少上升10˚F

答案： A

科目/題號：293010/2 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B4250(P4250)

A reactor is shut down for refueling following 18 months of operation at an average power level of 85 percent. 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 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.

一反應器以平均85%功率運轉18個月後停機更換燃料。當此停機期間，反應爐槽金屬試片從爐內移出執行測試。此測試判定試片之零延性轉換溫度(NDTT)由上次停機更換燃料的42˚F變為72˚F。下列何者結論為正確？
A.測試結果是可信的，且爐槽較上次更換燃料停機時更可能受到脆性斷裂
B.測試結果是可信的，目前爐槽較上次更換燃料停機時更不可能受到脆性斷裂
C.測試結果是有問題的，因為在所述的18個月運轉期間爐槽NDTT並未增加
D.測試結果是有問題的，因為在所述的18個月運轉期間爐槽NDTT上升較所顯示者少

答案： D

科目/題號：293010/3 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B4450(P4450)

A reactor is shut down for refueling. During the shutdown, a reactor vessel metal specimen was removed from the reactor vessel for testing. The specimen was last tested six years ago and then returned to its original location in the reactor vessel. During the subsequent six years, the reactor has completed several 18 month fuel cycles with an average power level of 85 percent.
The tests determined 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.

一反應器為更換燃料而停機。當此停機期間，反應器槽金屬試片從爐內移出執行測試。試片上次測試是六年前，然後將其放回爐內原來位置。當其後續六年期間，反應器以平均85%功率運轉經過數個18個月燃料週期。此測試判定試片之零延性轉換溫度(NDTT)由上次停機更換燃料測試的44°F維持不變。下列何者結論為正確？

A.測試結果是可信的，然而目前爐槽較6年前對脆性斷裂更敏感
B.測試結果是可信的，然而目前爐槽較6年前對脆性斷裂更不敏感
C.測試結果是有問題的，因為試片的NDTT從上次測試後應該會增加
D.測試結果是有問題的，因為試片的NDTT從上次測試後應該會減少

答案： C

科目/題號：293010/4 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B4650(P4650)

Two identical reactors are currently shut down for refueling. Reactor A has achieved an average lifetime capacity factor of 60 percent while operating for 12 years. Reactor B has achieved an average lifetime capacity factor of 60 percent 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 less total fissions.
B. Reactor B, because it has produced more total 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 shutdown reactor is not significant.
ANSWER: A.

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12年後已達平均壽期容量因數60%，而反應器B運轉15年後已達平均壽期容量因數60%。下列何者反應器具有較低零延性轉換溫度？
A.反應器A，因其產生較少的總分裂次數
B.反應器B，因其產生較多的總分裂次數
C.兩座反應器具有大約相同的NDTT，因為其具有相同之平均壽期容量因素
D.兩座反應器具有大約相同的NDTT，因為停機中的反應器其分裂率是不重要的

答案： A

科目/題號：293010/5 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B5550(P5550)

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零延性轉換溫度？
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，因為快中子照射在停機的反應器是不重要的
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：293010/6 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B6350(P6350)

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：293010/7 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B6950(P6950)

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零延性轉換溫度，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零延性轉換溫度，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零延性轉換溫度，因為在停機的反應器快中子的照射是不重要的

答案： C

科目/題號：293010/8 (2016 新增)
知能類：k1.05〔2.5/2.8〕
序號：B7640(P7640)

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.A rapid 100°F reactor heatup at a low temperature rather than at a high temperature.
C. 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