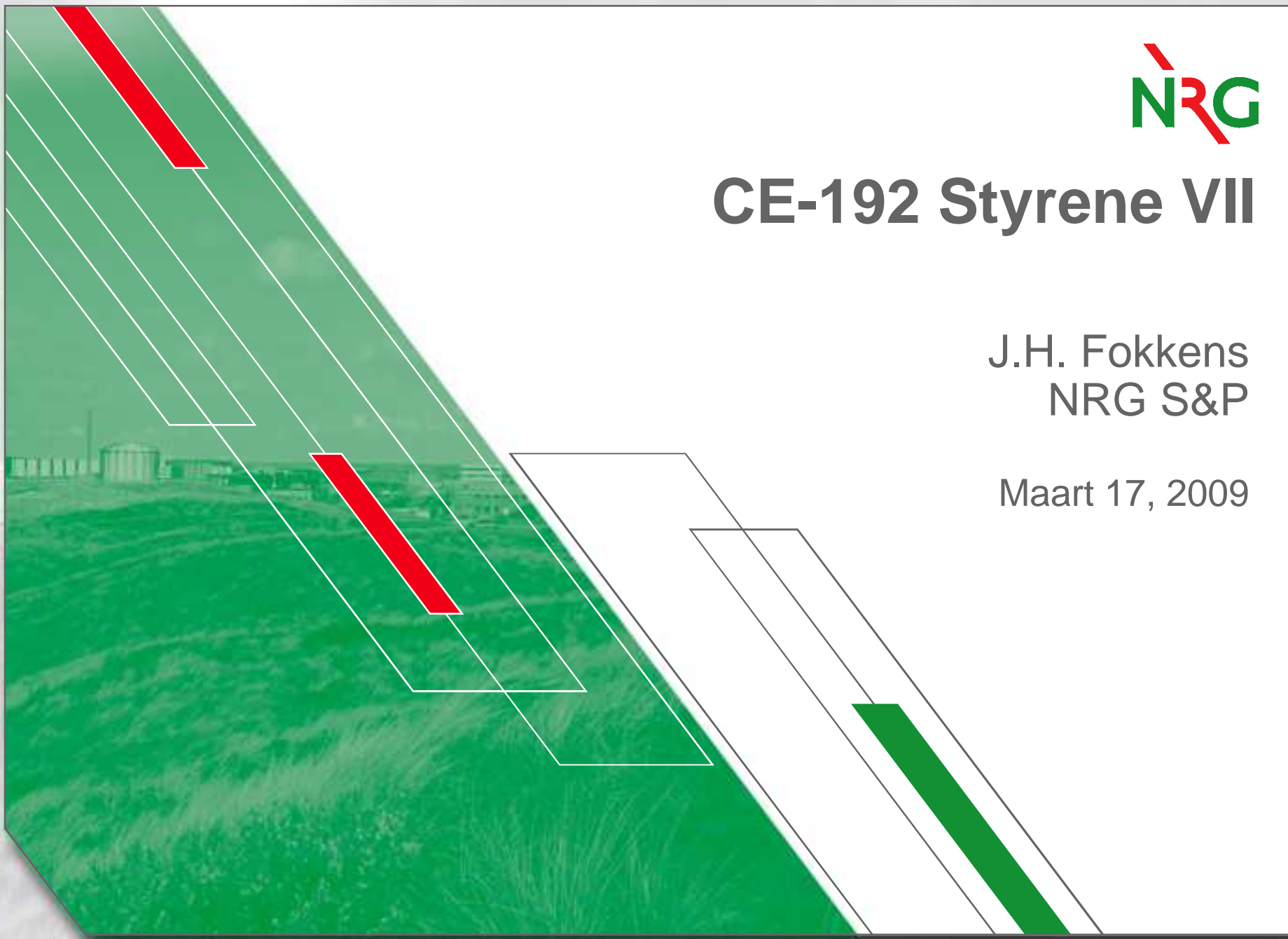




CE-192 Styrene VII

J.H. Fokkens
NRG S&P

Maart 17, 2009



Probleemstelling



SIC in lassen rond stoominlaat nozzle van Interstage Heat Exchanger

- Bepaling van de minimum wanddikte bij de lassen van de stoominlaat nozzle
- Thermo-mechanische analyses voor de In-Situ PWHT van de Interstage Heat Exchanger

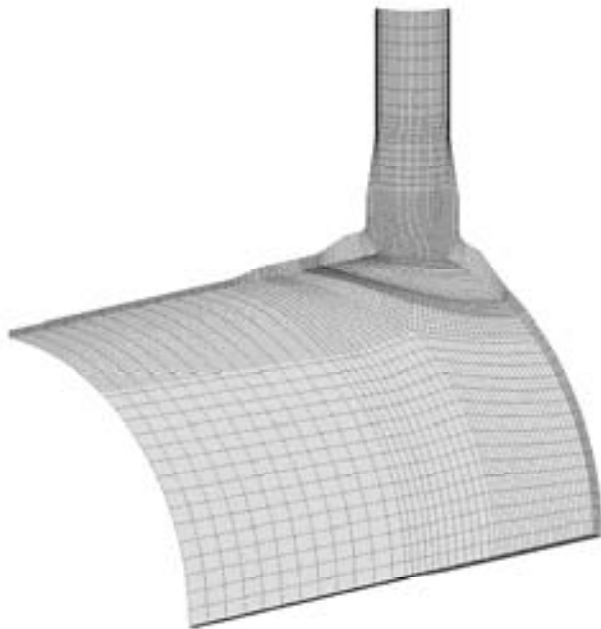
Doelstelling



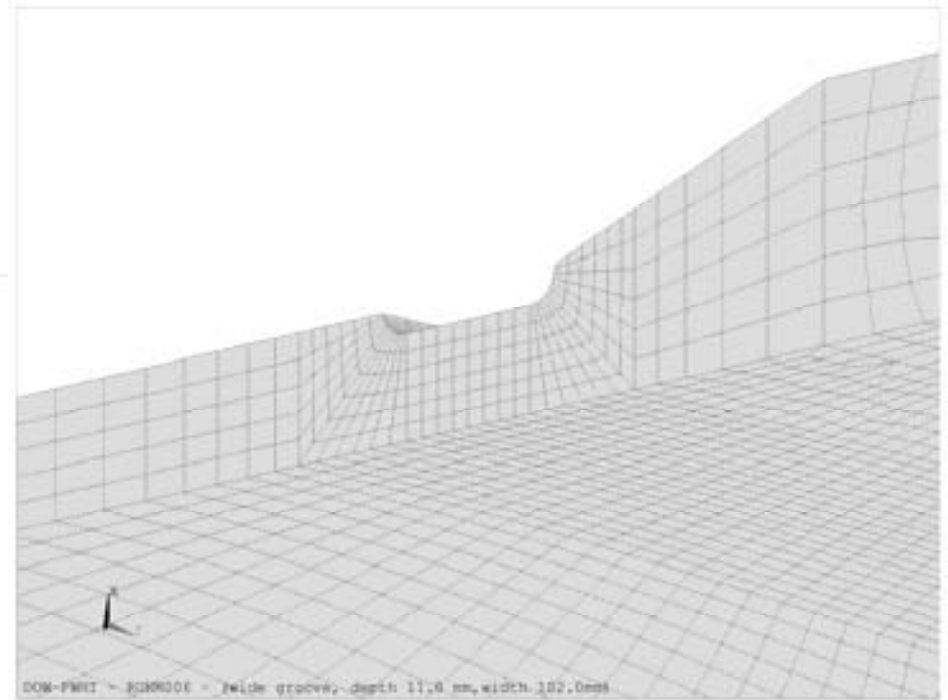
Bepaling van:

- Verbeterde start-up transient ter reductie van de thermische spanningen in het SIC gevoelige materiaal
- Uitvoerbaarheid van een In-Situ PWHT
- Warmteïnbreng van de heater matten voor het bereiken van en het houden op de PWHT temperatuur

Eindig elementen model



DOM-PWET - 3020201 - (no groove)



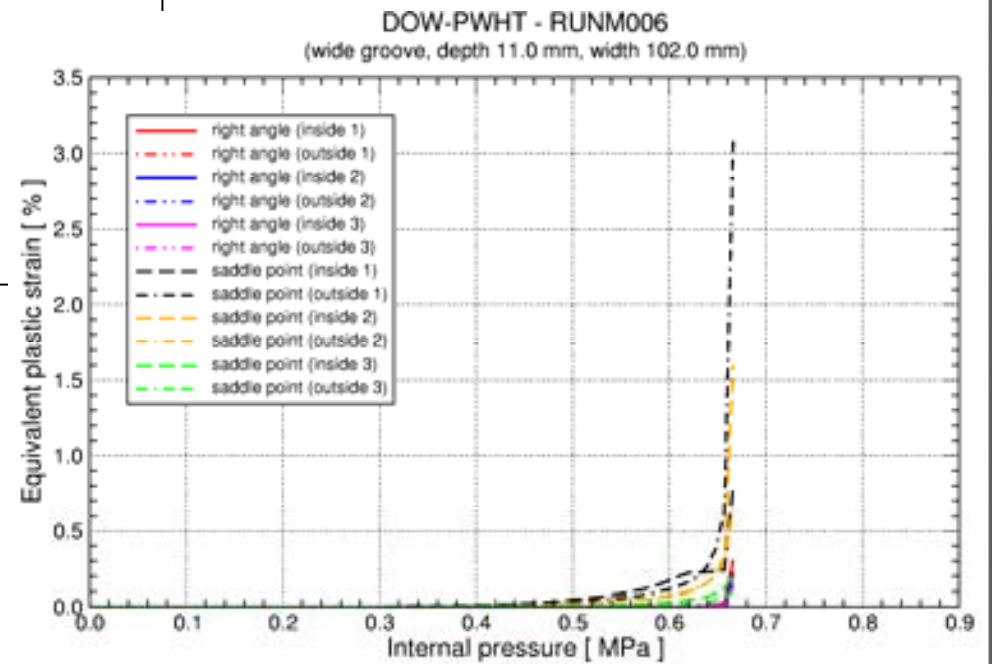
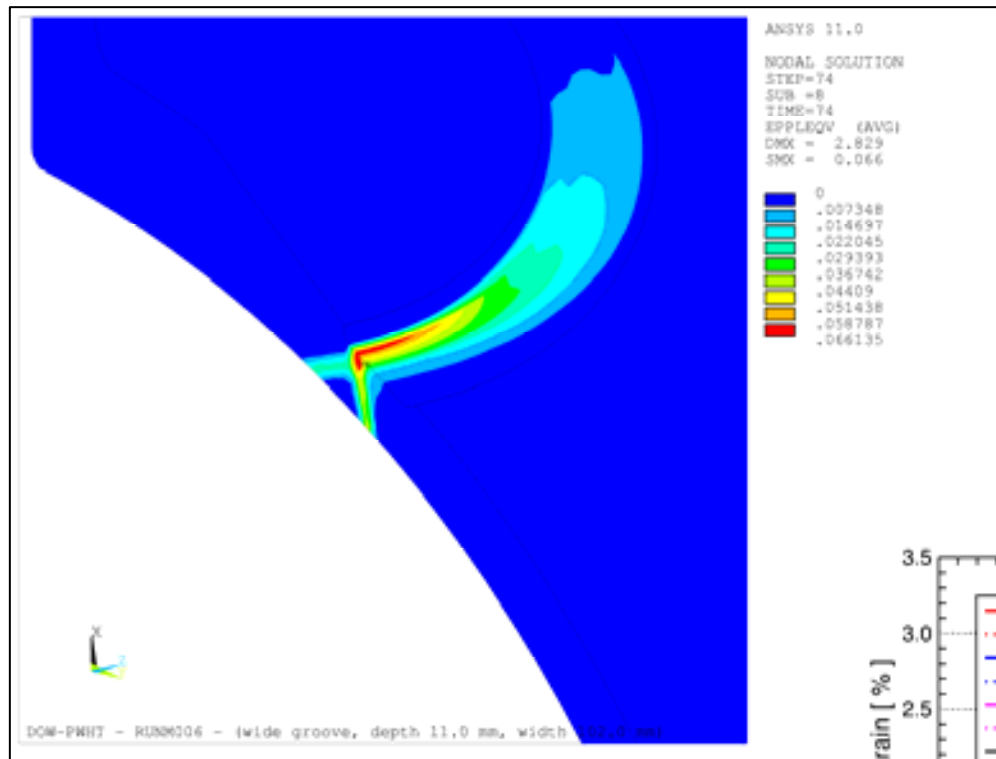
DOM-PWET - 3020201 - (wide groove, depth 11,6 mm, width 102,0mm)

Resultaat limit load berekeningen (1)

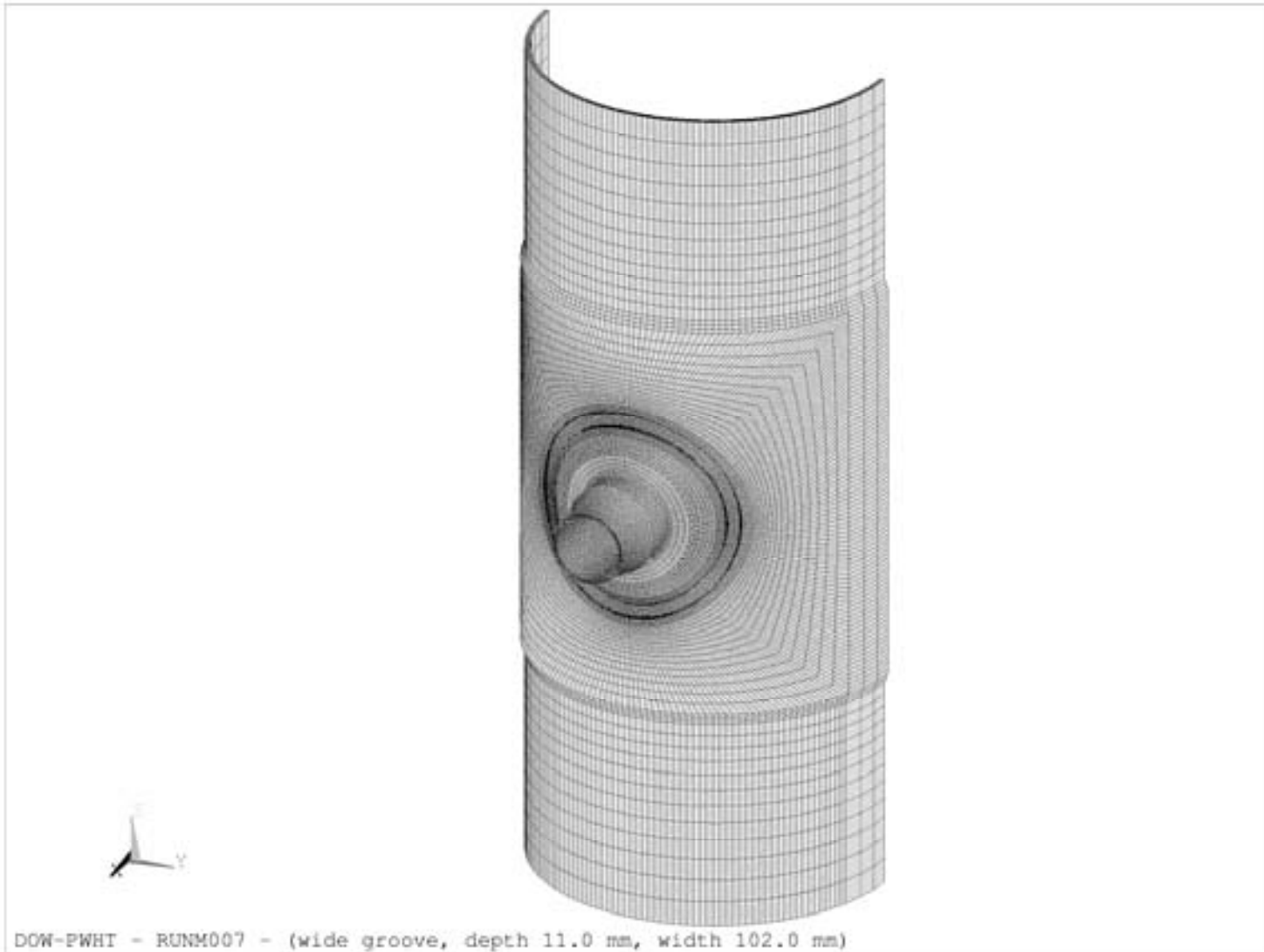


Geometrie	diepte	breedte	limit load
	[mm]	[mm]	[MPa]
no groove	-	-	0.765
semi-elliptical	10.2	43.3	0.704
semi-elliptical	20.2	56.9	0.596
small groove	12.0	56.0	0.677
wide groove	12.0	102.0	0.656
wide groove	11.0	102.0	0.667

Resultaat limit load berekeningen (2)



Eindig elementen model

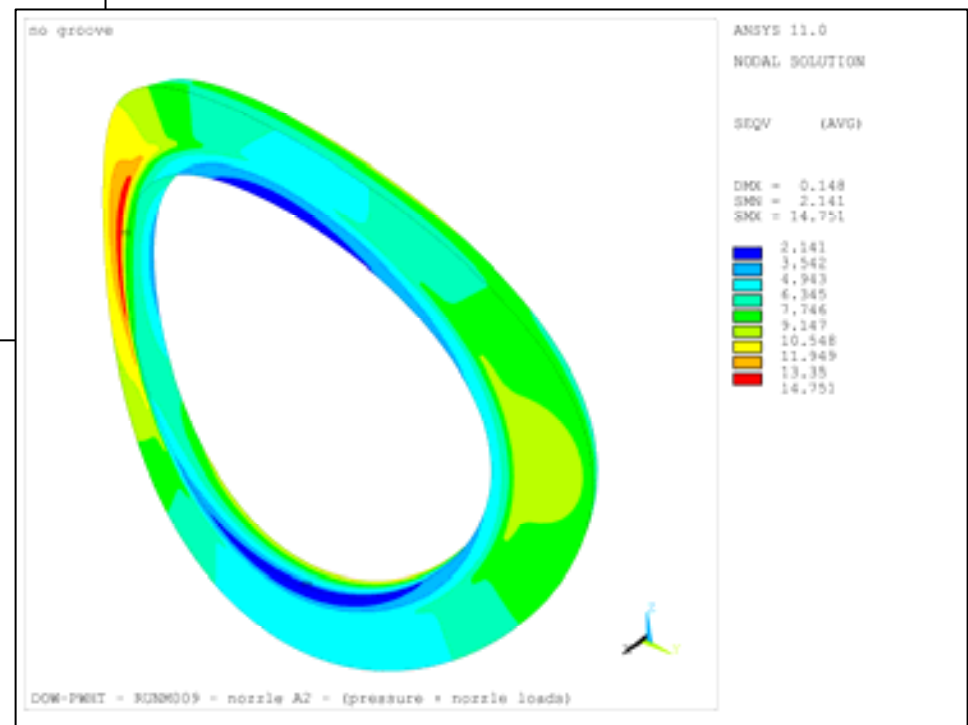
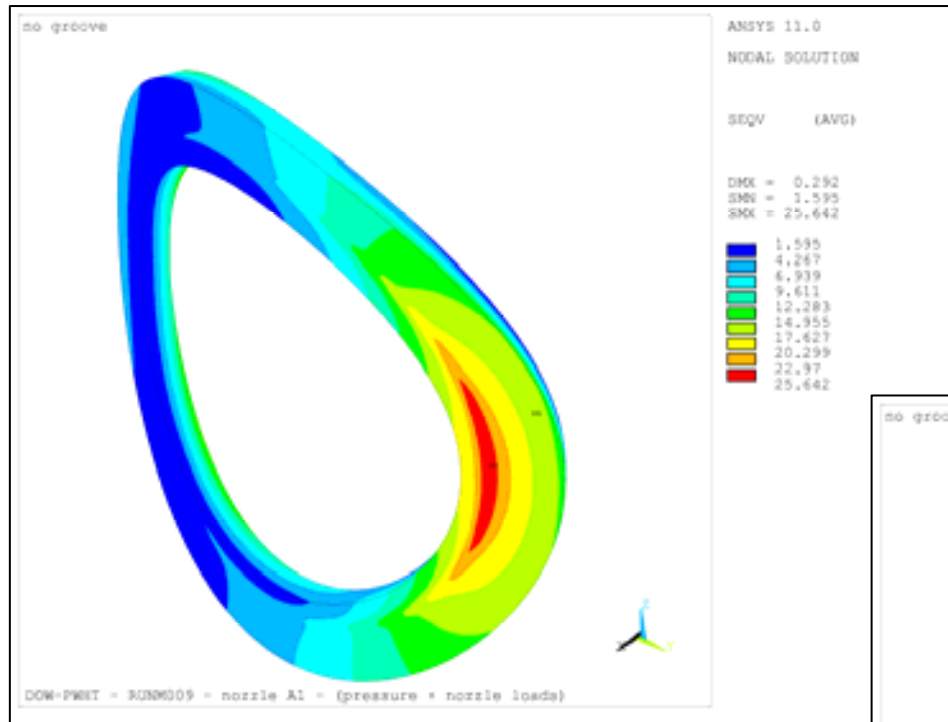


Resultaat nozzle belastingen (1)



Belasting	Groove	Nozzle A1	Nozle A2
	[mm]	[MPa]	[MPa]
internal pressure	11.0	25.5	25.5
internal pressure + nozzle loads	11.0	50.8	31.7
internal pressure	-	11.3	11.3
internal pressure + nozzle loads	-	25.6	14.8

Resultaat nozzle belastingen (2)



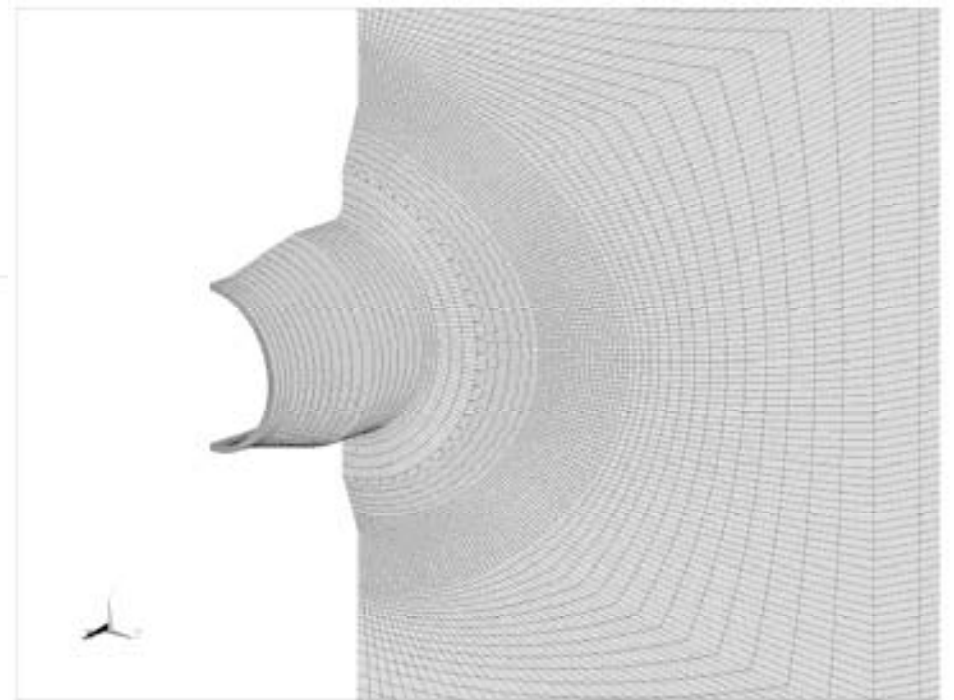
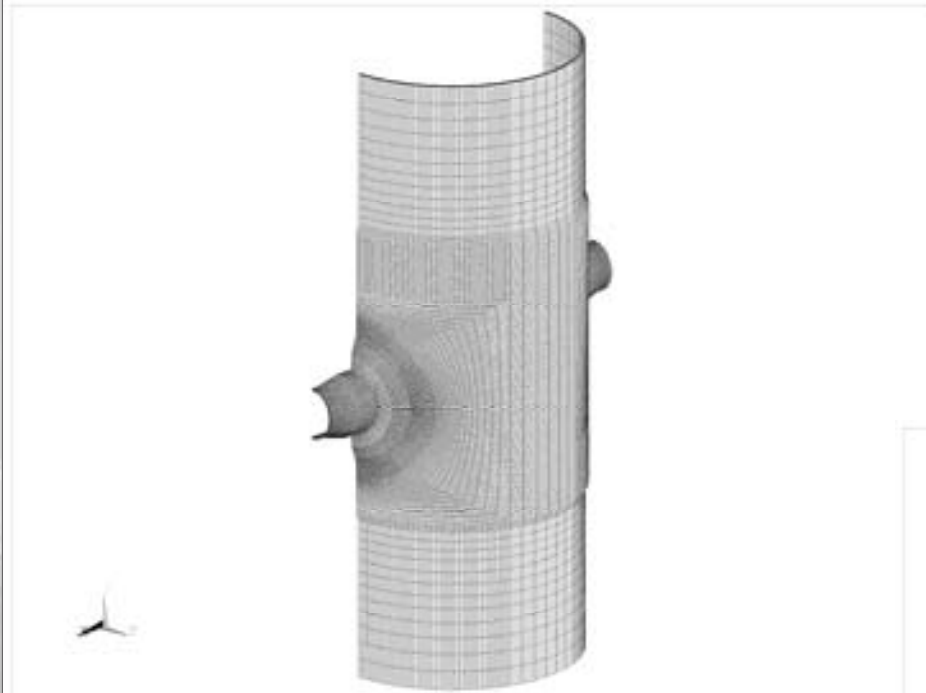
Conclusie limit load



Conclusie:

Er kan geen wanddikte reductie toegepast worden bij de lassen rond de stoominlaat nozzles

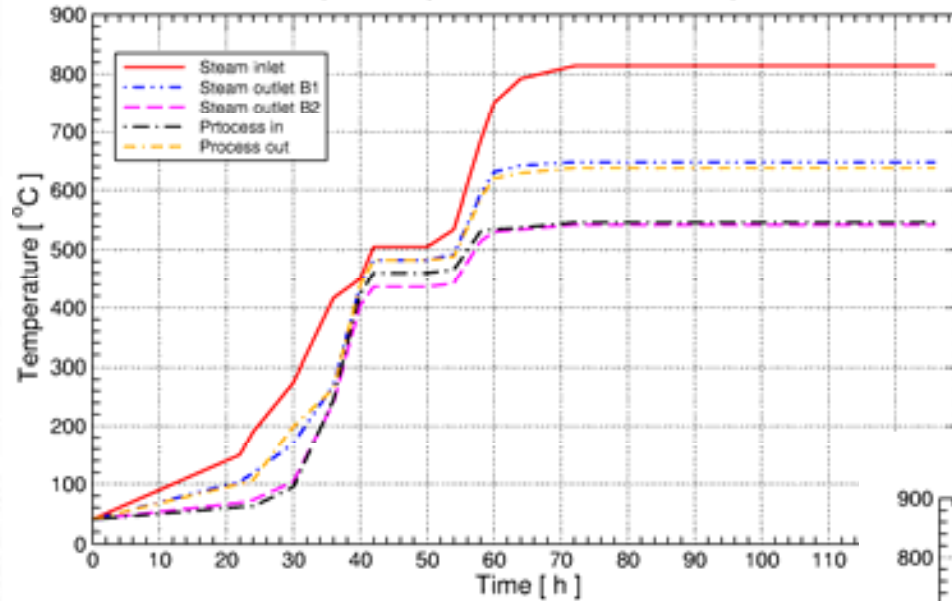
Eindig elementen model



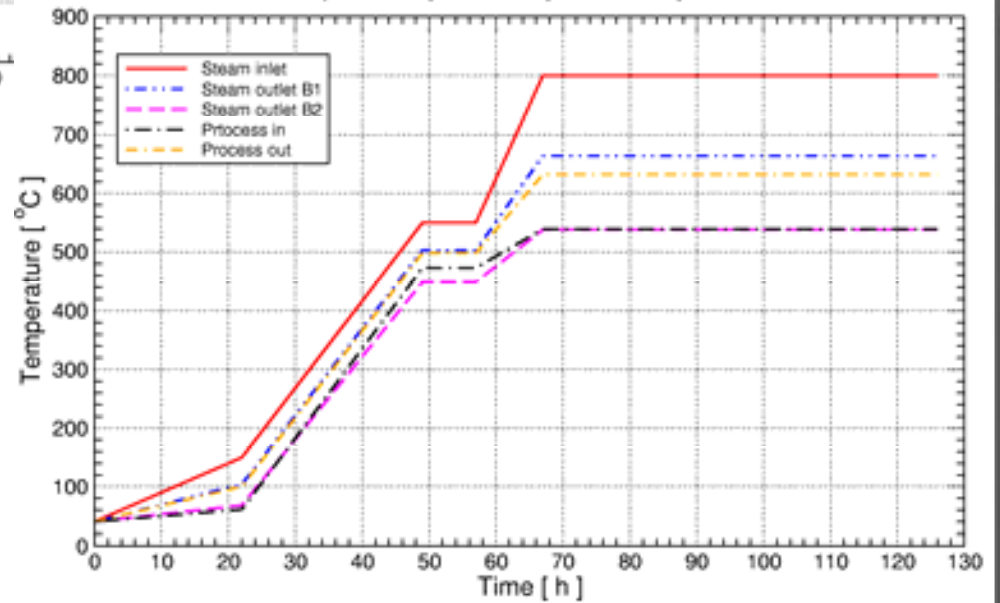
Start-up transient (1)



DOW-PWHT
(corner temperatures transient case 1 and 2)



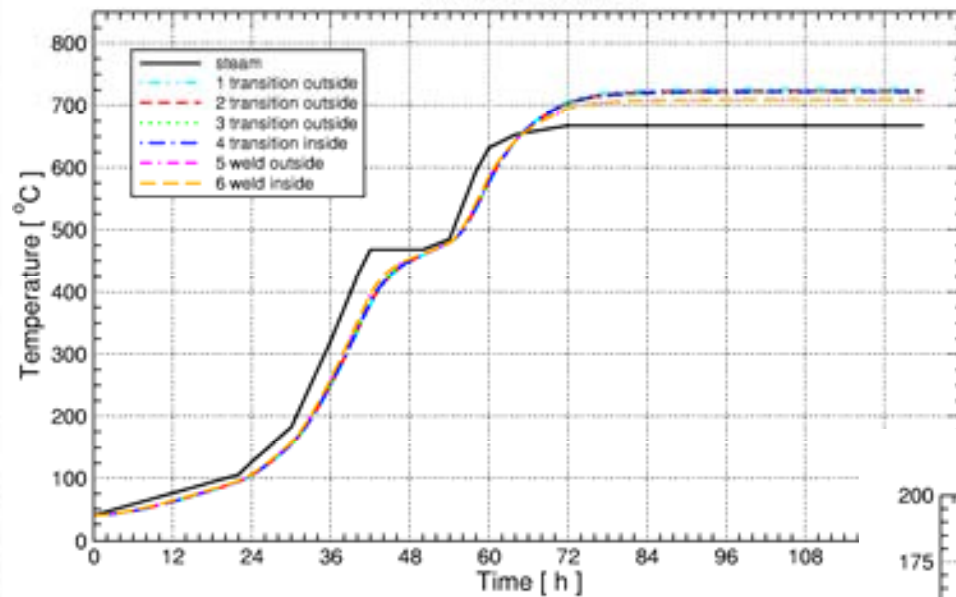
DOW-PWHT
(corner temperatures improved start-up case)



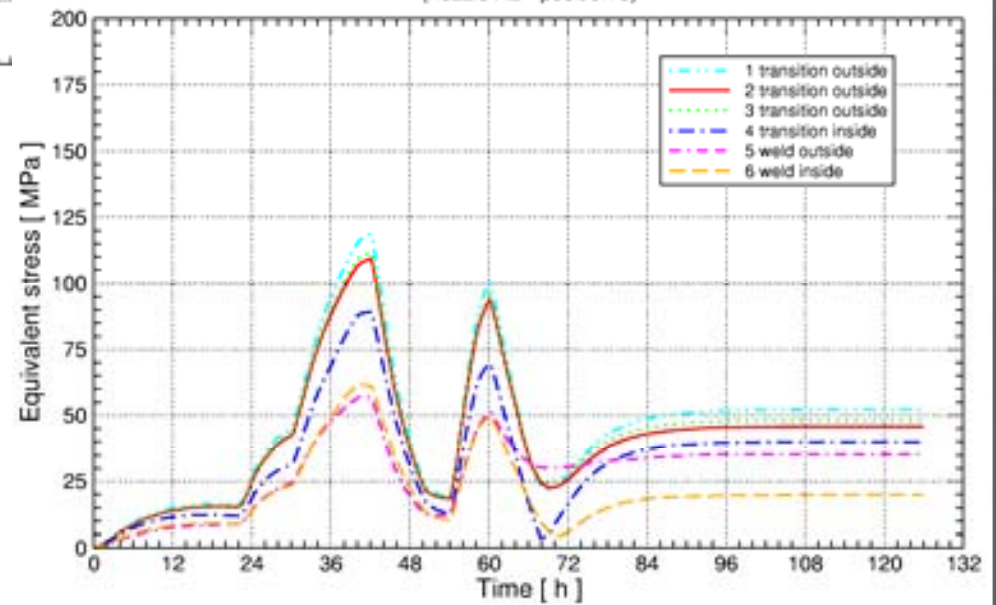
Resultaat start-up transient (1)



DOW-PWHT - RUNM013
(nozzle A2 - position e)



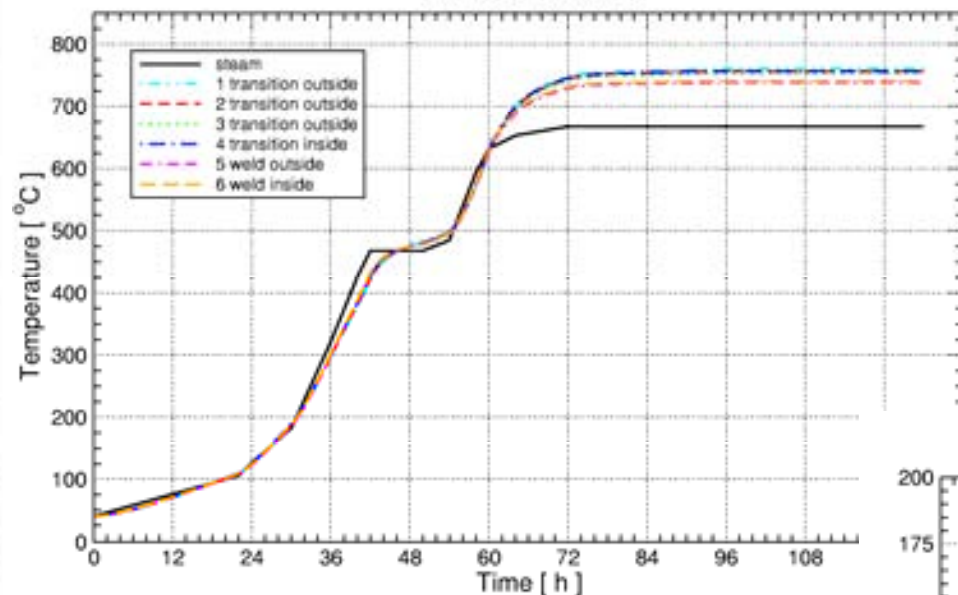
DOW-PWHT - RUNM013
(nozzle A2 - position e)



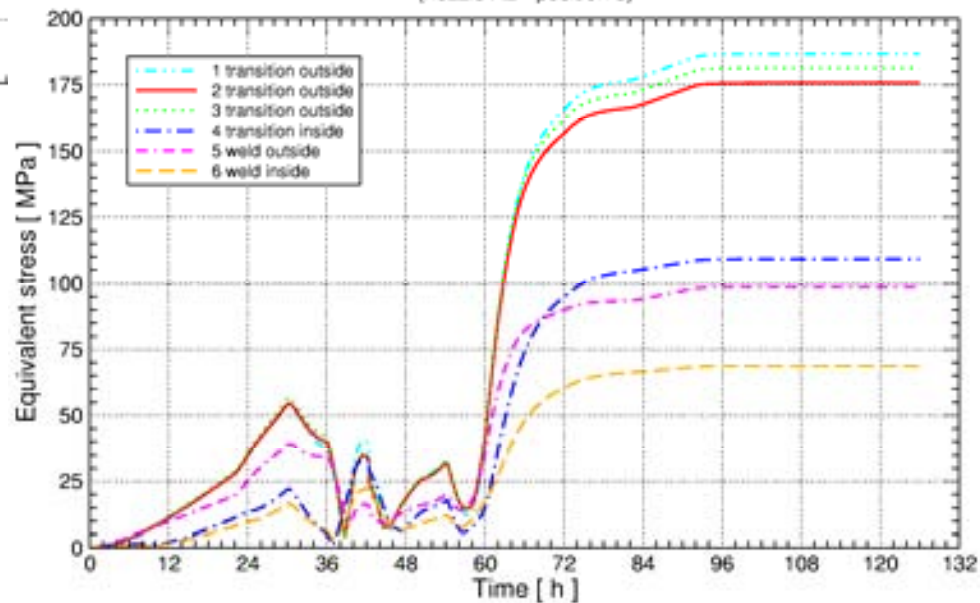
Resultaat start-up transient (2)



DOW-PWHT - RUNM012
(nozzle A2 - position e)



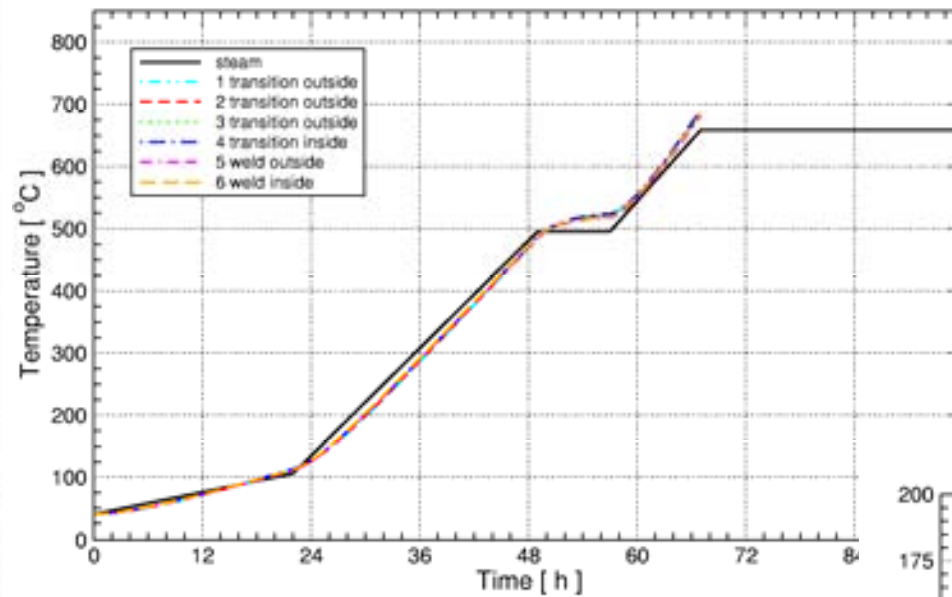
DOW-PWHT - RUNM012
(nozzle A2 - position e)



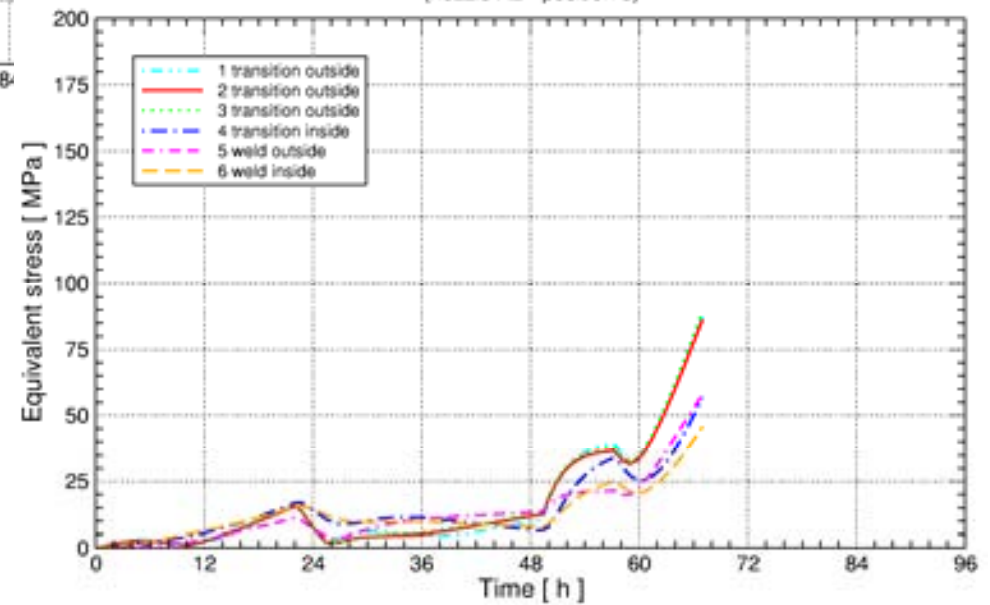
Resultaat start-up transient (3)



DOW-PWHT - RUNM014
(nozzle A2 - position e)



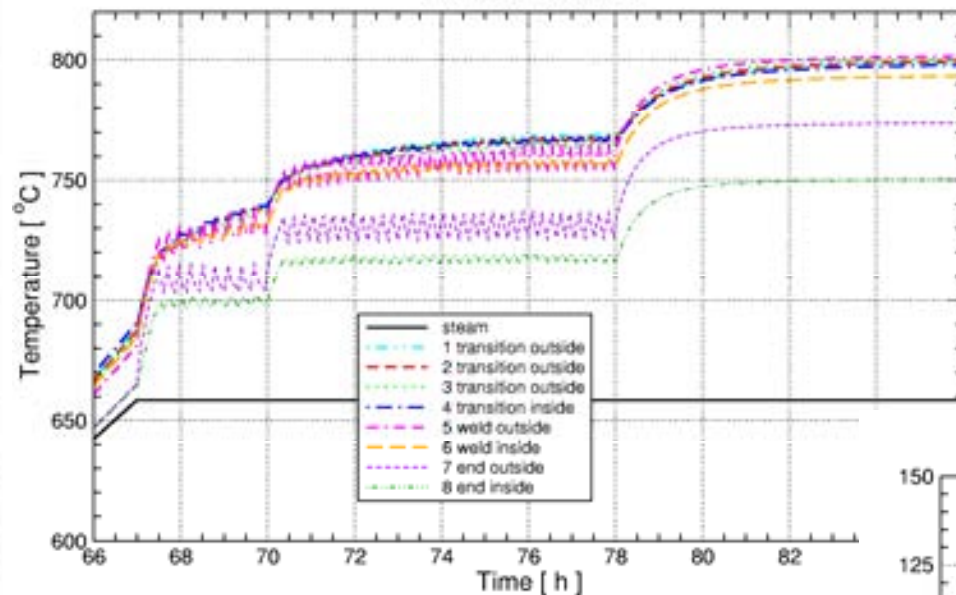
DOW-PWHT - RUNM014
(nozzle A2 - position e)



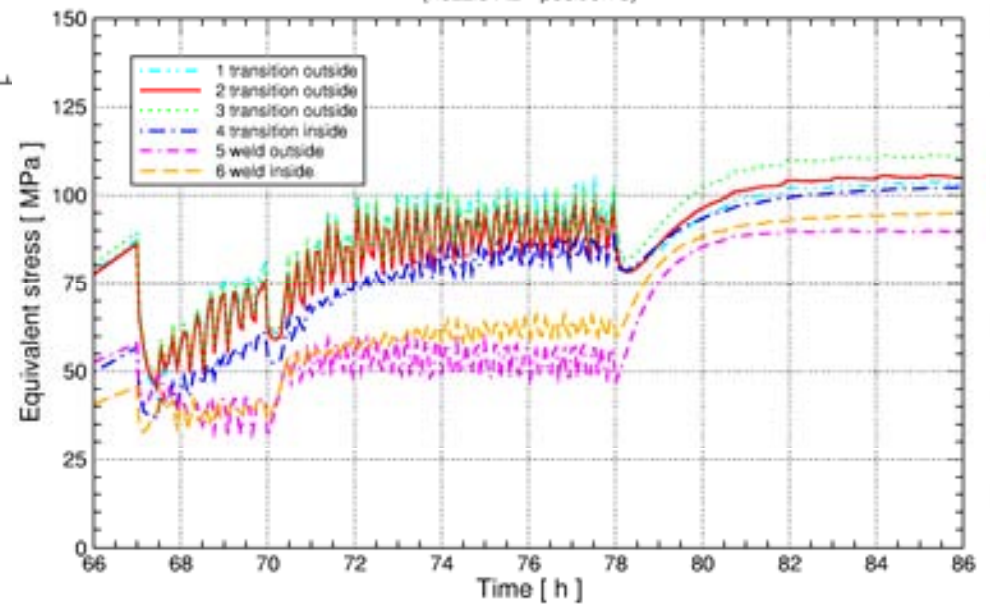
Resultaat start-up transient (4)



DOW-PWHT - RUNM014
(nozzle A2 - position e)



DOW-PWHT - RUNM014
(nozzle A2 - position e)



Conclusies start-up transient



- Verbeterde start-up transient reduceert de thermische spanningen in het SIC gevoelige materiaal
- Met heater matten kan de SIC temperatuur range van 550 tot 700 °C snel doorlopen worden
- In-situ PWHT is mogelijk
- Warmteïnbreng van de heater matten is voldoende voor het bereiken van en het houden op de PWHT temperatuur