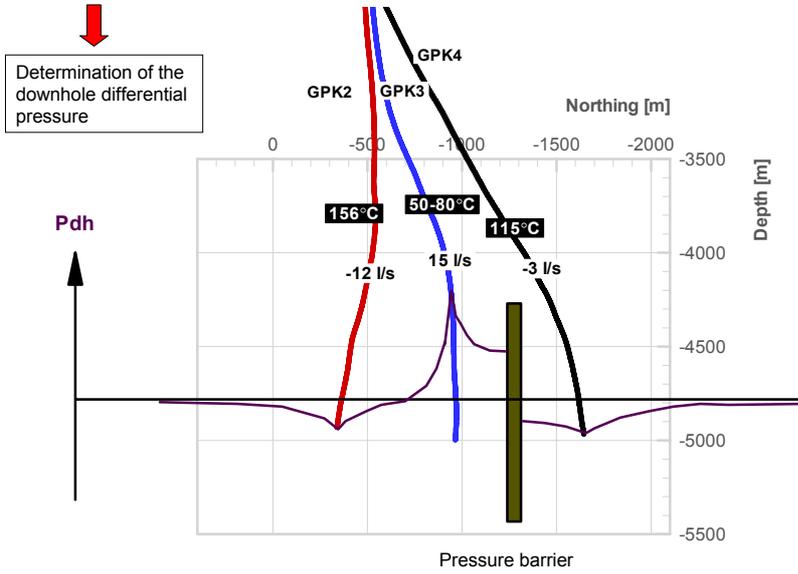
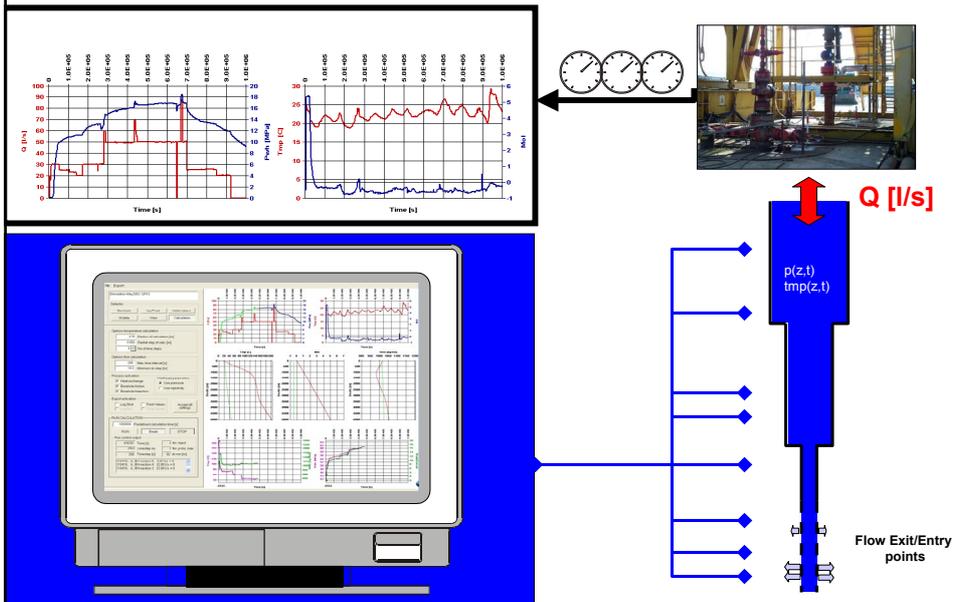


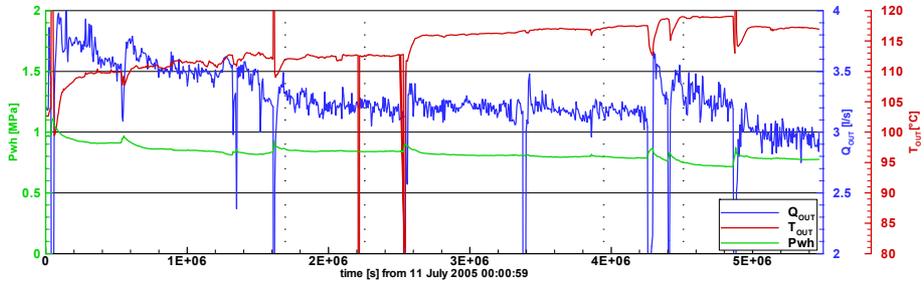
Circulation test 2005 (Mégel/Kohl/Bassetti)



pT-Simulator HEX-B



Circulation Test: GPK4 - p/T/Q History



Initial conditions:

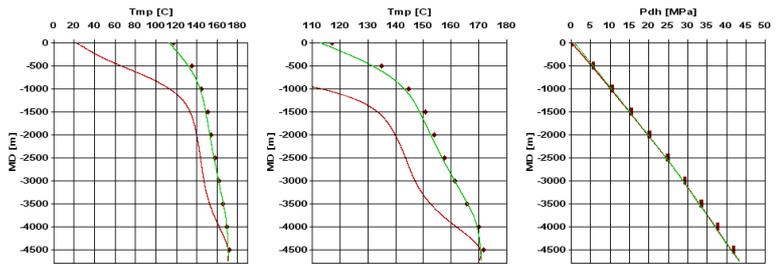
- Unperturbed temperature
- $\rho_0 = 1065.0 \text{ Kg/m}^3$ (20°C, 0.1 MPa) $\rightarrow p_{cs0} = 44.36 \text{ MPa}$

During Circulation

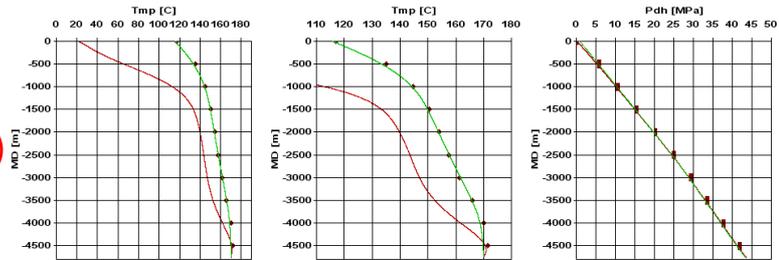
- $\rho_{t1} = 1050.5 \text{ Kg/m}^3$ (21 °C, 0.1 MPa)
- \rightarrow Used NaCl-molality for the simulation = 1.367

Circulation Test: GPK4 - Calibration of thermal model with data

$\Delta\lambda = -10\%$



$\Delta\lambda = -20\%$



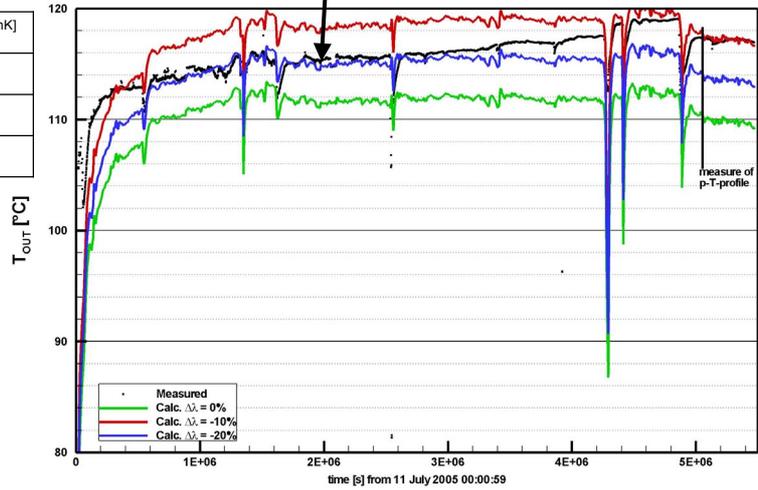
Circulation Test:
GPK4 - T History / Simulation T_{OUT}

Variation of thermal conductivity
Standard λ -profile ($\Delta\lambda = 0\%$)

Good agreement of T_{out} with calibrated thermal model

Depth section MD [m]	λ [W/mK]
0-1500	3.0
1500 - 3800	4.0
3800 - 4430	3.0

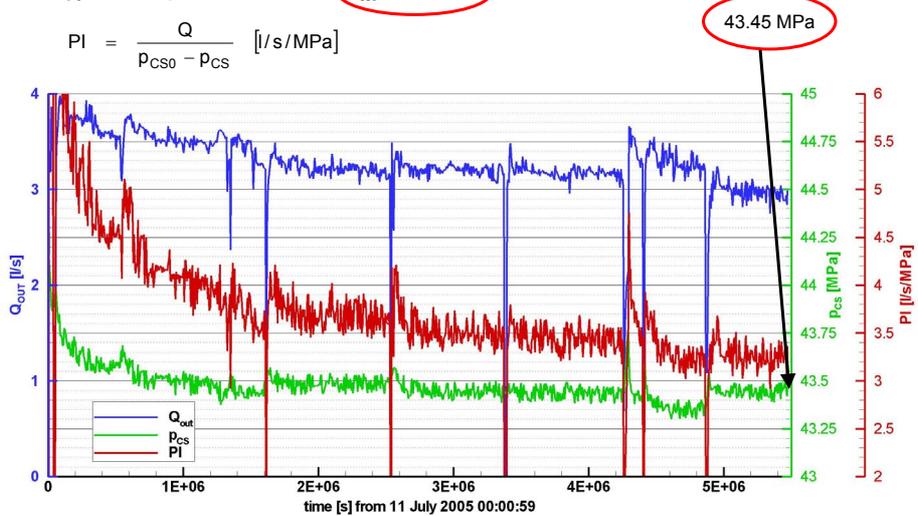
Compare GPK2:
 $\lambda = 2.0$ [W/m K]



Circulation Test:
GPK4 - Calculated P_{CS}/PI

$\rho_0 = 1065.0 \text{ Kg/m}^3$ (20°C, 0.1 MPa) → $p_{cs0} = 44.36 \text{ MPa}$

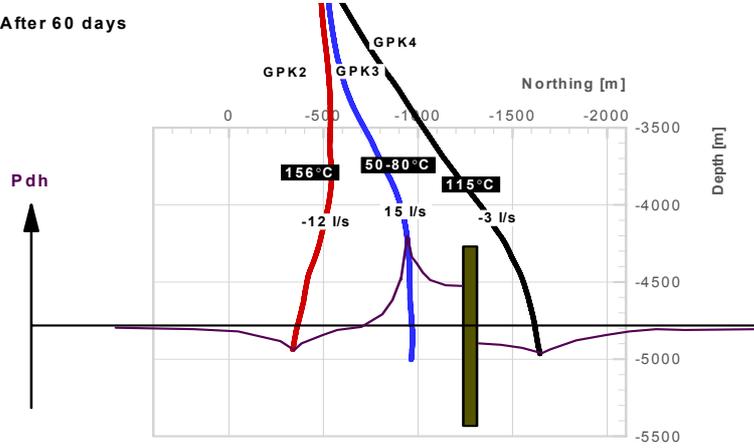
$$PI = \frac{Q}{p_{cs0} - p_{cs}} \quad [l/s/MPa]$$



Circulation test 2005

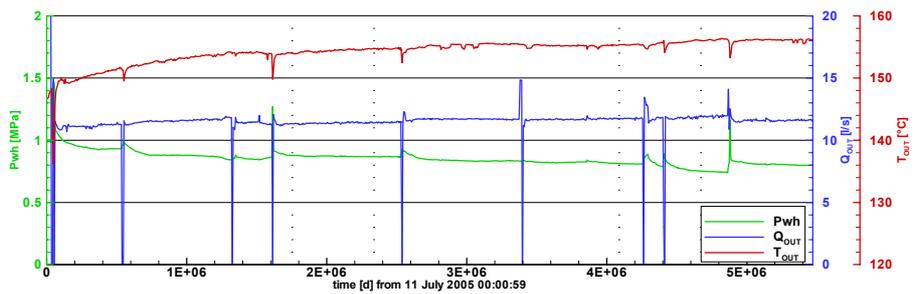


After 60 days



P_{cs0} [MPa]	44.36
P_{cs}	43.45
ΔP_{cs}	-0.91

Circulation Test: GPK2 - p/T/Q History



$\rho_0 = 1065.0 \text{ Kg/m}^3 (20^\circ\text{C}, 0.1 \text{ MPa}) \rightarrow \rho_{cs0} = 43.29 \text{ MPa}$

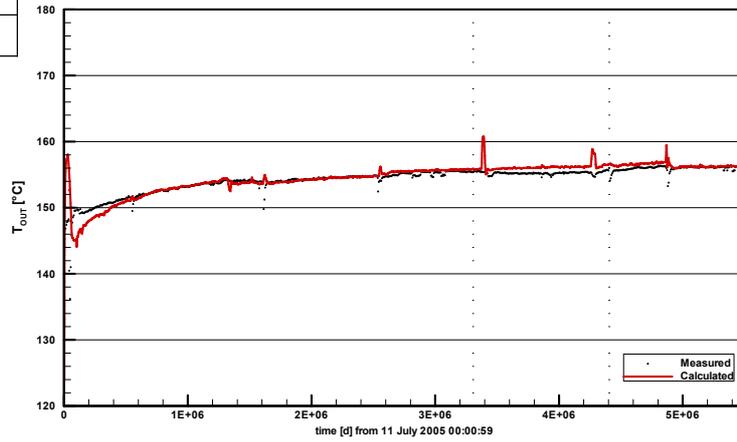
$\rho_t = 1055.0 \text{ Kg/m}^3 (20^\circ\text{C}, 0.1 \text{ MPa})$
 → Used NaCl-molality for the simulation = 1.525

Circulation Test:
GPK2 - Simulation T_{OUT}

λ -profile

Depth section MD [m]	λ [W/mK]
0-1500	2.0
1500 - 3800	2.0
3800 - 4600	2.0

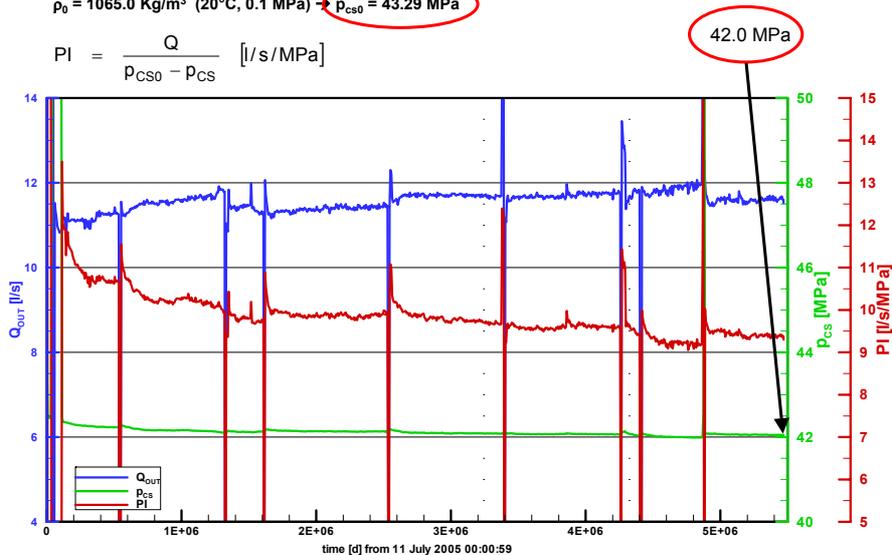
Good agreement of T_{out} with calibrated thermal model



Circulation Test:
GPK2 - Calculated P_{CS}/PI

$\rho_0 = 1065.0 \text{ Kg/m}^3$ (20°C, 0.1 MPa) $\rightarrow P_{CS0} = 43.29 \text{ MPa}$

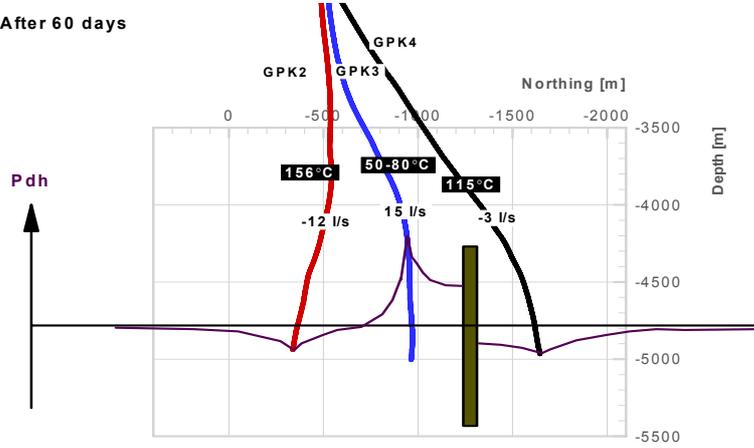
$$PI = \frac{Q}{P_{CS0} - P_{CS}} \quad [l/s/MPa]$$



Circulation test 2005

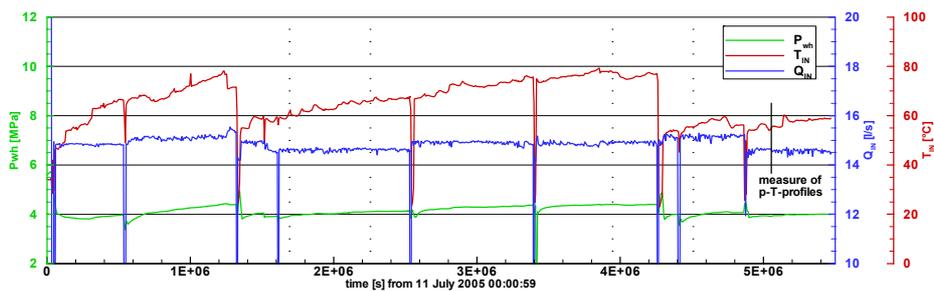


After 60 days



P_{cs0} [MPa]	43.29	44.36
P_{cs}	42.00	43.45
ΔP_{cs}	-1.29	-0.91

Circulation Test: GPK3 - p/T/Q History

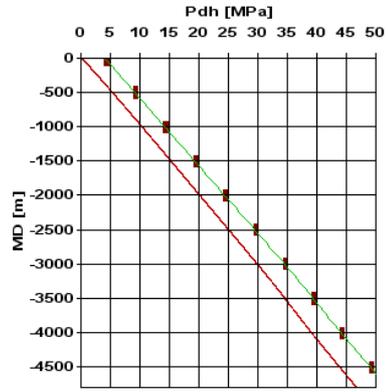
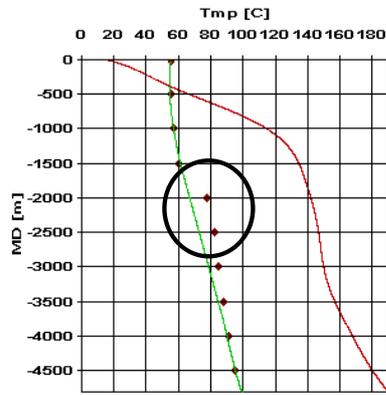


$\rho_0 = 1065.0 \text{ Kg/m}^3$ (20°C, 0.1 MPa) $\rightarrow p_{cs0} = 46.2 \text{ MPa}$

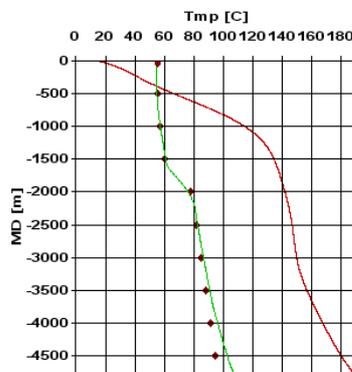
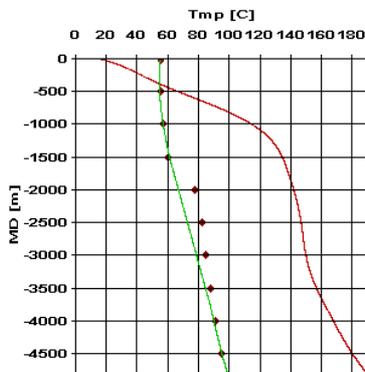
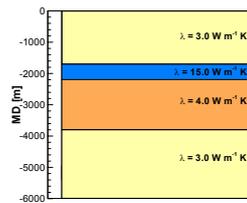
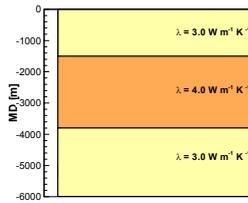
$\rho_t = 1053.5 \text{ Kg/m}^3$ (21 °C, 0.1 MPa)

\rightarrow Used NaCl-molality for the simulation = 1.49

Circulation Test:
GPK3 – Calibration of thermal model with data



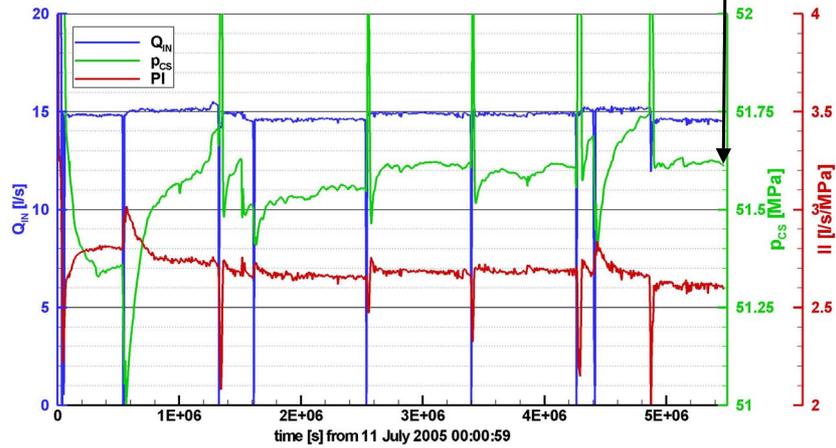
Circulation Test:
GPK3 – T profile with aquifer model



Circulation Test:
GPK3 – Calculated P_{cs}/II

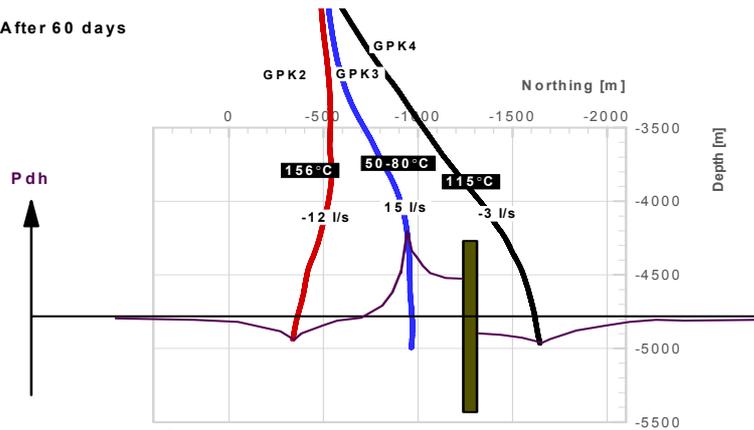
$\rho_0 = 1065.0 \text{ Kg/m}^3$ (20°C, 0.1 MPa) → $P_{cs0} = 46.2 \text{ MPa}$

$$II = \frac{Q}{P_{cs} - P_{cs0}} \text{ [l/s/MPa]}$$



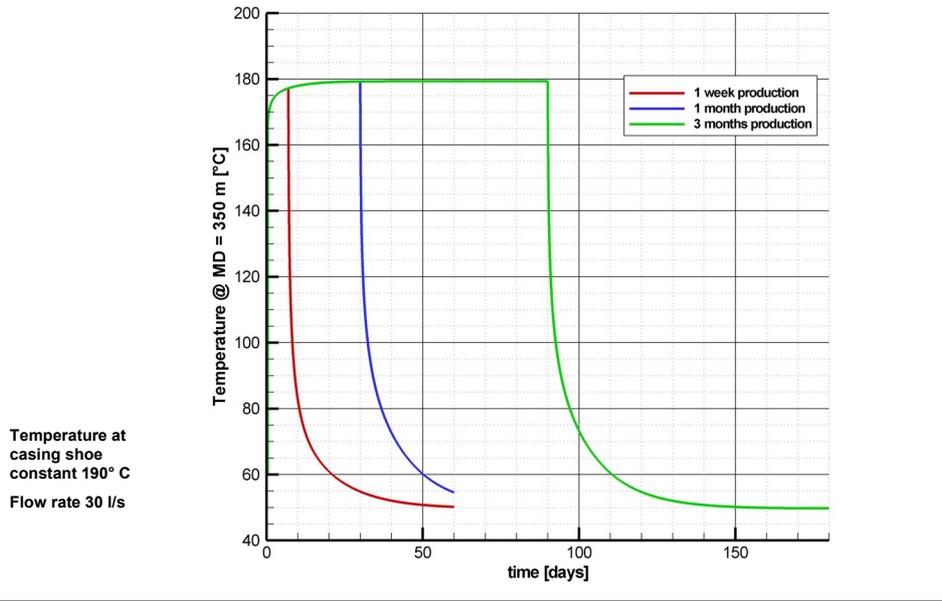
Circulation test 2005

After 60 days



P_{cs0} [MPa]	43.29	46.2	44.36
P_{cs}	42.0	51.6	43.45
ΔP_{cs}	-1.29	+5.4	-0.91
PI/II [l/s/MPa]	9.3	2.8	3.3

GPK4: temperature development at MD 350 m after different production periods



Distances between Trajectories

