GEIE
Route de Soultz
F-67250 Kutzenhausen

Injections GPK3

07Feb07 and 07Mars11

HEX-B correction

Technical Note

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1. Aims

The purpose of this technical note is to calculate Injectivity index from two injection tests realised in well GPK3 on 07.02.2007 and 11.03.2007, and thus to quantify injectivity improvement due to OCA injection that was preformed between both tests.

2. Well model used for Hex-B calculations

The well model used in this technical note is the same one used for interpretation of the circulation test of summer 2005 (see technical note 017-16). Table 1 shows properties of the well GPK3 model used.

Table 1: Borehole/rock model in HEX-B for GPK3 production well

Bore hole parameters						Rock mass parameters	
Depth section MD [m]			Inner radius [m]	Flow rate [% of injection rate]	Average wall roughness [mm]	Thermal conductivity [W/m K]	Specific heat capacity [J/m^{3}K]
Nr	from:	to:					
1	0	1700.	0.110	100	0.15	3.0	2.2 10^6
2	1700	2200	0.110	100	0.15	15.00	2.2 10^6
3	2200	3800	0.110	100	0.15	3.00	2.2 10^6
4	3800	4556	0.110	100	0.15	4.00	2.2 10^6
5	4556	4768	0.108	100	0.15	4.00	2.2 10^6

3. Results for injection test 07Feb07

Origin is taken on 05.02.2007 at 00:00.

As shown on figure 1, the temperature profile is assumed to be at the thermal equilibrium at the beginning of the simulation. As a production test was run a few days before the injection test treated here, the molality in the well is taken to a constant value, 1.75 mol.kg^{-1}, corresponding to a fluid density of 1060 kg m^{-3}.

As initial wellhead pressure is equal to 1.22MPa at the beginning of the test, this temperature and molality distribution result in a initial downhole of 45.4MPa, which is generally the agreed downhole pressure at the equilibrium.

Results of the calculations are shown in figure 2.

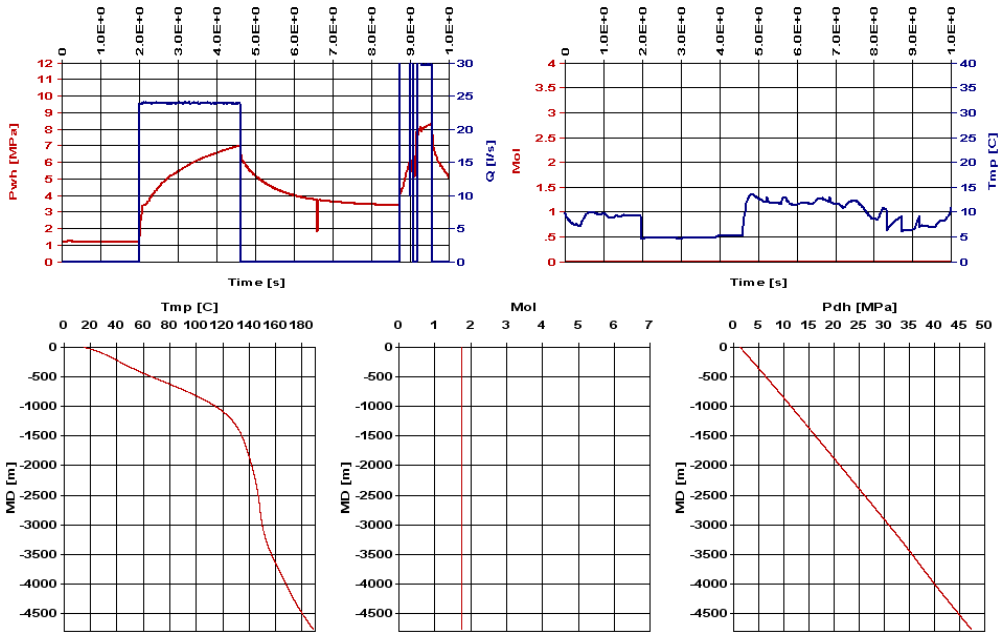

Figure 1: Initial conditions for HEXB calculations for injection test 07Feb07 in GPK3

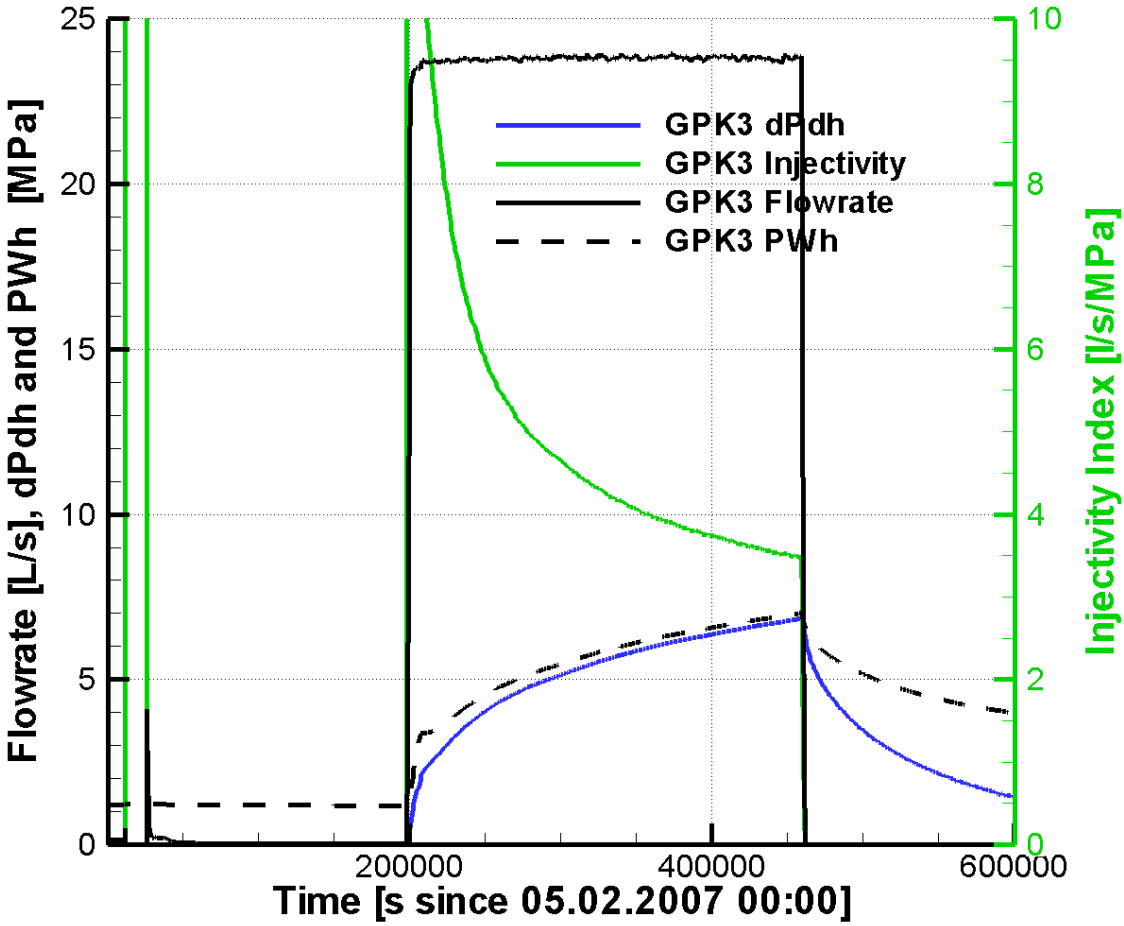

Figure 2: Results of HEXB correction for injection test 07Feb07 in GPK3

4. Results for test 07Mar11

Origin is taken on 11.03.2007 at 00:00

As shown on figure 3, the temperature profile is assumed to be at the thermal equilibrium at the beginning of the simulation. As a production test was also run a few days before the injection test treated here, the molality in the well is this time set to 1.55 mol.kg^{-1}, corresponding to a fluid density of 1040 kg m^{-3}., which was the corresponding measure fluid density during this previous production test.

As initial wellhead pressure is equal to 1.62MPa at the beginning of the test, this temperature and molality distribution result again in a initial downhole of 45.4MPa.

The difference observed in the initial wellhead pressure between both tests is here explained by the fluid density difference in the borehole at the beginning of the simulation.

Results of the calculations are shown in figure 4.

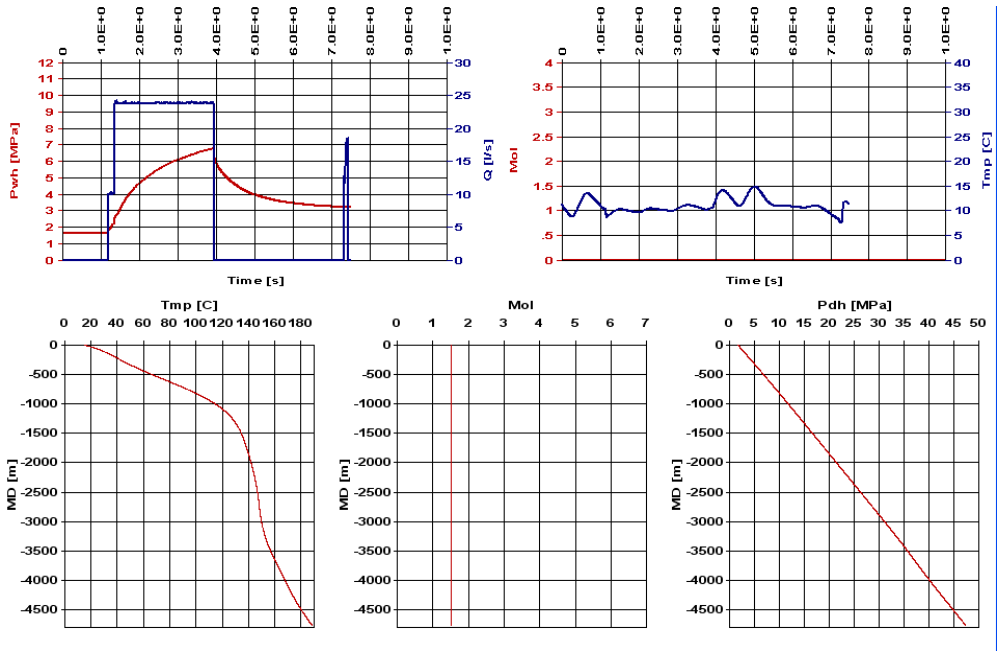

Figure 3: Initial conditions for HEXB calculations for injection test 07Mar11 in GPK3

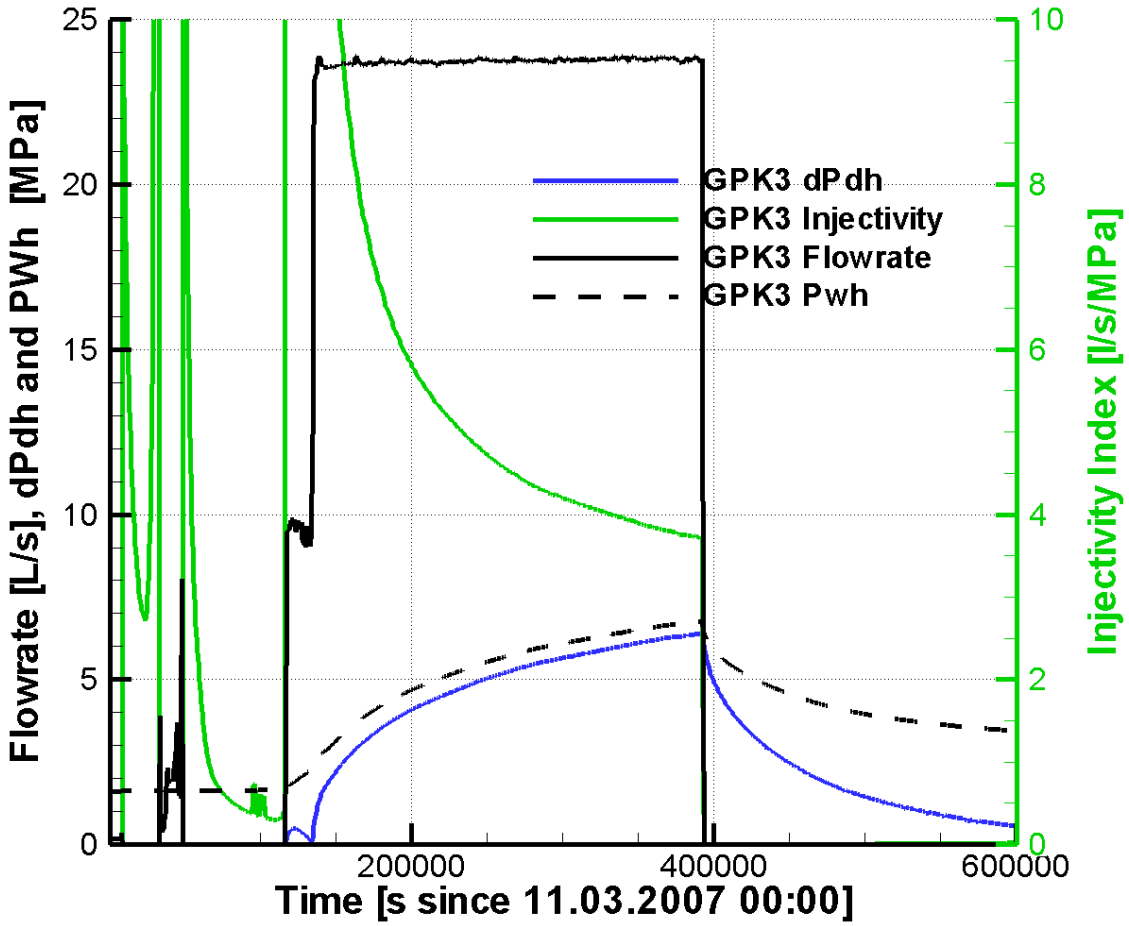

Figure 4: Results of HEXB correction for injection test 07Feb07 in GPK3

5. Conclusion: comparison of injectivities

The next figure shows a comparison of computed injectivities for both tests. The time origin for both curves has been modified in order to superpose them. The small decay that one can observe at the end is due to an injection of cold water in the borehole at 10 l/s at the beginning of the injection test of 07Mar11.

To conclude injectivity at the end of injection test 07feb07 is equal to 3.48, whereas injectivity computed at the end of test 07Mar11 is equal to 3.72. **Thus, the increase of injectivity due to OCA injection in GPK3 can be estimated to 7%.**

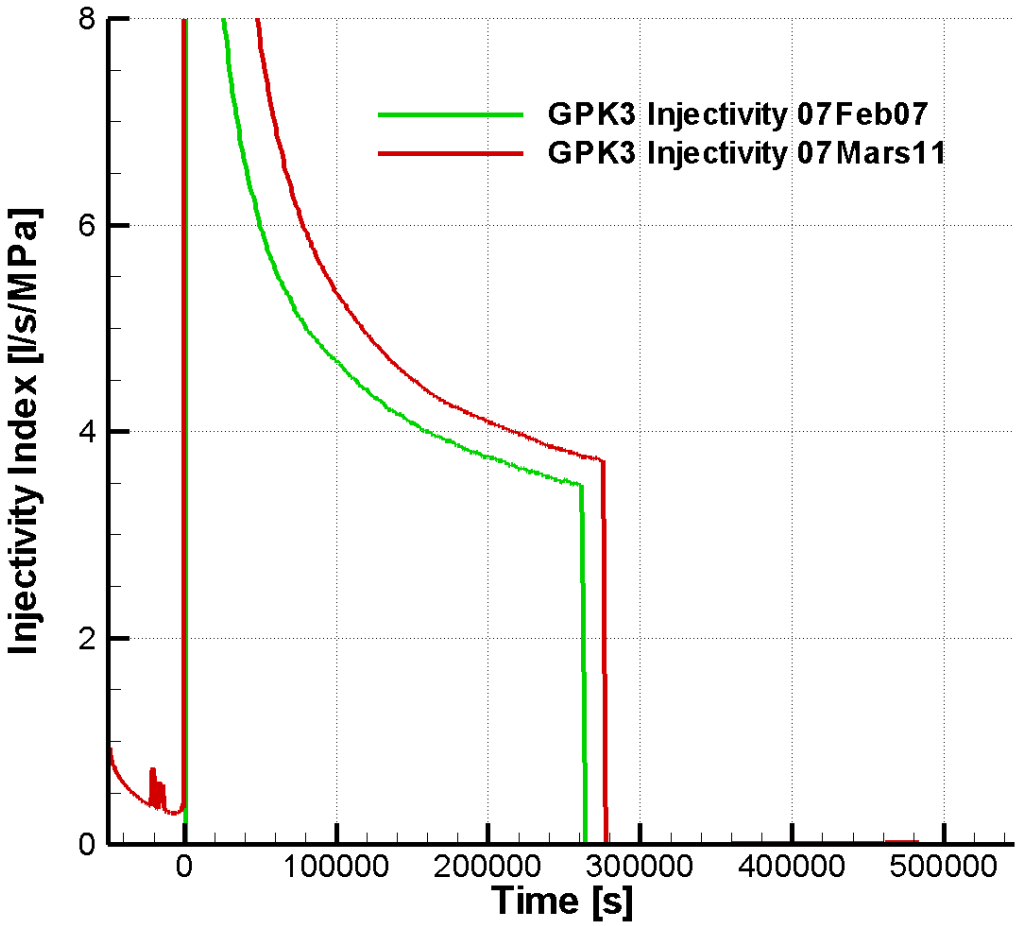

Figure 5: Comparison of computed injectivities results of both tests