Benchmarking cases for WP3

HOCLOOP project - Task 3.2

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December 27, 2024

1 Input Parameters

The benchmarking in *Task 3.2* has the goal of comparing the results of the simulation of the different partners for the CO_2-based well. The geometry and the reservoir properties used for the benchmarking of the water-based case in *Task 2.2* (*Case-F*, summarized in Table 1) will be used here has well.

Table 1: Main Parameters for Case F

Parameter	Value	Units
WELL GEOMETRY		
Vertical Depth	3000	m
Horizontal Length	3500	m
DIAMETERS		
Tubing Internal ($d_{tub_{in}}$)	0.1000	m
Tubing External ($d_{tub_{out}}$)	0.1300	m
Casing Internal ($d_{cas_{in}}$)	0.1617	m
Casing External ($d_{cas_{out}}$)	0.1778	m
GEOLOGICAL DATA		
Surface Temperature	11	°C
Geothermal Gradient	0.0325	°C/m
Rock Thermal Conductivity (k_{rock})	2.4230	W/(m K)
Rock Heat Capacity (c_{rock})	0.90267	kJ/(kg K)
Rock Density (ρ_{rock})	2600	kg/m^3

As for the fluid inlet condition the inlet temperature has been considered to be **10°C** while the inlet pressure has set **to 0.1% more than the saturation pressure** ($\approx$ 45 bar) so that the fluid is a sightly super-cooled liquid (for numerical stability).

The inlet condition of the fluid are summarized in the Table 2:

Table 2: Fluid Inlet Condition

Parameter	Value	Units
Injection Temperature (T_{in})	10	°C
Injection Pressure (p_{in})	1.001 $p_{sat}(T_{in})$	bar
Flow rate ($\dot{m}$)	10	kg/s

Finally, regarding the internal heat transfer, two cases have been provided:

Case 1: Internal heat transfer **neglected**

Case 2: Internal heat transfer **evaluated** with $k_{ins} = 0.1$ W/(m*K)
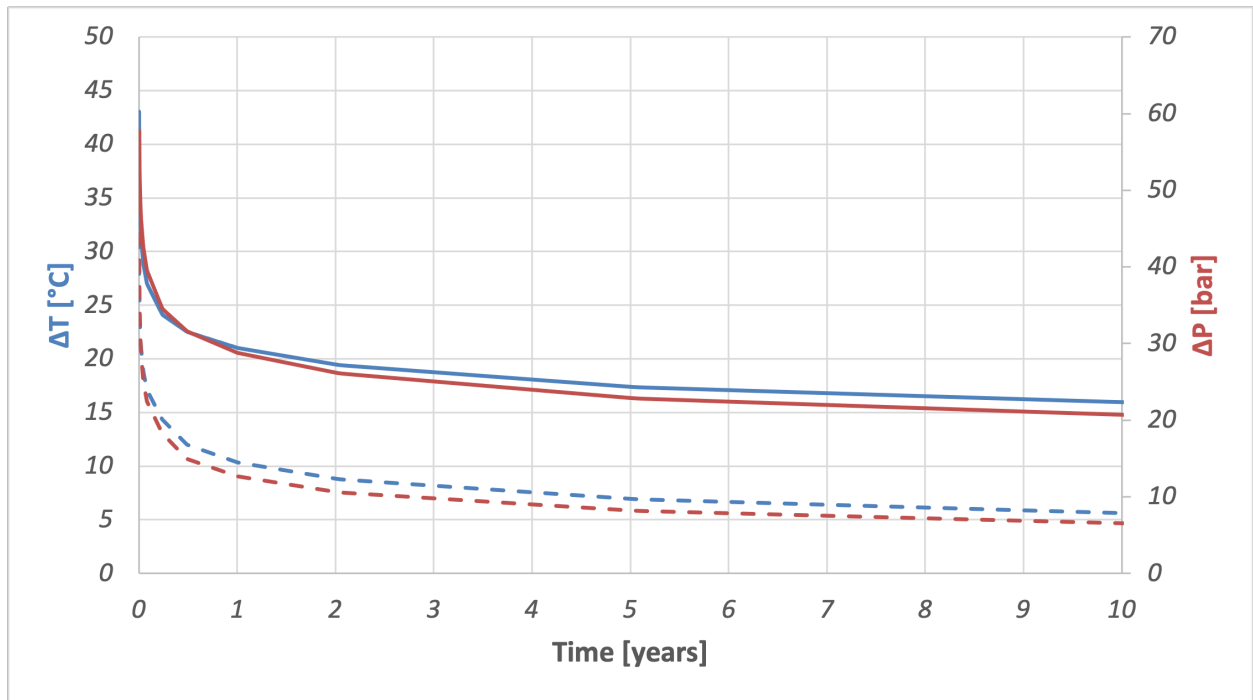
Figure 1: Pressure and Temperature increase predicted with the UNIFI model. Plain line → Case 1, Dashed line → Case 2

2 First Results from UNIFI

The results from *Case-1* and *Case-2* has been updated on the HOCLOOP SharePoint *(Work Packages / WP3 / Task3.2 / 0-Benchmarking / Results / UNIFI-results)*.

Pressure and Temperature increase predicted by the UNIFI code can be seen in Figure 1