Additional Test Cases for case F

HOCLOOP project - Task 2.2

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1 Case-F - Baseline

In the table below the main parameter used in the definition of case F. **Notice that the inlet pressure has been increased to 13bar** due to some numerical issue in reaching a solution considering the original 10bar inlet pressure.

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
FLUID INLET CONDITION		
Inlet Pressure	13	bar
Inlet Temperature	45	°C
Flow Rate	8.80149	kg/s

Under these conditions the *BHEModel2.0* developed by UNIFI is able to reach a solution but, due to the high friction losses in the pipeline (especially in the annulus), a negative outlet pressure is predicted. For these reason other cases have been tested.

2 Case-F - Other cases

The other cases have been generated from case F by modifying two parameters: the **flow rate** $\dot{m}$ and the **annulus outlet diameter** $d_{cas_{in}}$.

The parameters have been modified as follows:

$$\dot{m}_{F.x} = \alpha_{\%}\ \dot{m}_F \tag{1}$$

$$d_{cas_{in}\,F.x} = \beta_{\%}\ d_{cas_{in}\,F} \tag{2}$$

where $\alpha_{\%}$ and $\beta_{\%}$ are two modifiers that has been set according to the table below:

Table 2: **Modifier considered for different test cases**

Test Case	$\alpha_{\%}$	$\beta_{\%}$
Case F (baseline)	1.00	1.00
Case F.1	0.50	1.00
Case F.2	0.25	1.00
Case F.3	1.00	1.10
Case F.4	1.00	1.25

the outer diameter of the casing has been modified as well:

$$d_{cas_{out}F.x} = d_{cas_{in}F.x} + 0.015m \tag{3}$$