Field Profiles P10, P50, P90

Evaluation of multiple drilling targets for an oil field

A ● Exercise objective

- The use of Rubis to quickly evaluate several exploration plays potential
- Duplicate runs based on existing scenarios
- Compare different recovery performances

B ● Problem presentation

You have been requested to provide initial production profiles for a North Sea exploration play. 3 reservoirs configurations are provided (a P10, P50 and a P90 cases).

Data and map are provided for each case, P90, P50, and P10.

For a first stage evaluation, we plan to evaluate the following simple development scenarios:

For P90:

1. One vertical well
2. Two vertical wells (try to place them far enough to drain all area)
3. One horizontal well of 1500 ft long

For P50 and P10:

1. One vertical well
2. Two vertical wells
3. Three vertical wells
4. One horizontal well (1500ft)
5. One horizontal well (1500ft) + One vertical well

For the sake of this exercise, just select one possible well placement for each of the development case.

C ● Workflow

- Using provided data build a model for p90 reservoir configuration.
- Evaluate the production forecast using the first scenario: one vertical well. Select in result settings extra plots: recovery factors and global production plots for oil and gas. Target rate and production time are indicated in the data section.

- From this, duplicate the run and add another well to make scenario #2, and continue as such until all scenarios are completed.

- Make oil recovery factor comparison using the compare functionality in Rubis. You can also visualize the simulation history to display the drainage behavior.

- What scenarios look interesting in terms of recovery? What improvement of recovery are we getting from one scenario to another?

- Repeat the procedure for p50 and p10.

D ● Additional exercise

You have been notified that rock permeability may be 20 md instead of 10 md. Select the single horizontal well case for P90, P50 and P10, duplicate it and change the rock permeability. How is this going to impact the recovery?

E ● Reservoir and well data

The different reservoir characteristics based on a real example are as follows:

	h, ft	NTG	Phi	perm, md	kv/kh
P10	**165**	**0.5**	**0.18**	**10**	**0.1**
P50	**165**	**0.4**	**0.16**	**10**	**0.1**
P90	**165**	**0.3**	**0.14**	**10**	**0.1**

Other properties set as default.

The reservoir contains only oil. Using the following saturated oil PVT properties:

Reservoir temperature 300 F
Display Pressure of the sample = Reservoir pressure 10000 psia
Solution GOR = 500 scf/stb
Pressure range 14.7 psia – 15000 psia

Gas Gravity = 0.7
Oil Specific gravity = 0.83
Choose Glaso volatile for bubble-point pressure correlation and solution gas oil ratio Rs. Verify that for 300 F, we have Pb ~ 1980 psia.

Load bitmap to draw reservoir area. Make sure to scale the model. The depth of reservoir top is 8,000 ft with a 165 ft pay.

Initial state definition:
Reservoir pressure 10000 psia @ reference depth 8000 ft
Set the GOC outside of reservoir limits to define an oil filled only reservoir (for ex., "GOC" @ 6000 ft) and set saturation pressure to 1980 psia @ reference depth.

Relative permeability and capillary pressure:
Sorg 0.2 Sgr 0.05
Pc min = Pc max = 0 psia
Leave other as default.
Create a vertical well scenario first by creating the well, enabling a well model with storage of 0.01 bbl/psi and "all trajectory", and set controls as defined below:

Targets are 1500 bpd for vertical wells and 3000 bpd for horizontal wells. There is a surface pressure constraint of 200 psia. Choose **Hagedorn and Brown** for flow correlation (**Dukler and Ansari** for horizontal wells).

Make a forecast from 01/01/2010 until 12/31/2019 to evaluate recovery for 10 years. Select additional plot output: global surface oil and gas rates, and gas recovery factor.