# RESMAN tracers for multi rate tests

## Operator uses data to verify reservoir model and identify unsupported zones

### Challenge

The operator wanted to verify the reservoir model, that was predicting water from the heel of one of the production wells.

The well had a five-mile tie back to an FPSO and commingled production with several subsea production wells from the same field, hence gathering this data by well intervention would be costly, with a significant risk.

### Solution

RESMAN tracer systems, RES•OIL and RES•H2O had already been installed pairwise in the well, distributed in five zones ranging from the heel to toe of the long horizontal. By performing a multi-rate test with tracers, the tracer systems would show how each reservoir layer performed.

### Application

The well was produced at 3000, 1000, and 2000 m3/day, while samples were collected, and later analyzed for tracer concentration.

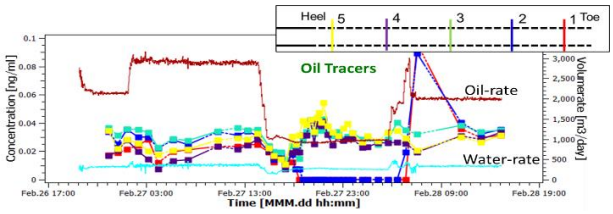


**Fig. 1 – Oil tracer signals and oil and water production rates**

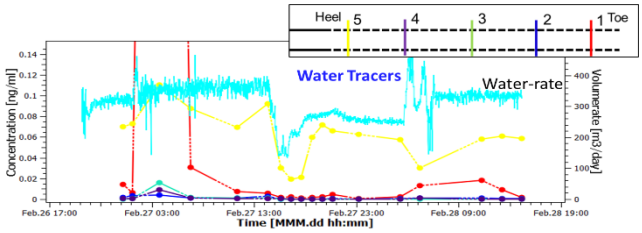


**Fig. 2 – Water tracer signals and water production rates**

| Oil-rate total → | 1000 | | 2000-3000 | |
|---|---|---|---|---|
| Zone | H2O | Oil | H2O | Oil |
| 1 (Toe) | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 (Heel) | | | | |

**Fig. 3: Signal performance per zone at low = 1000 m3/d oil production and medium/high = 2000-3000 m3/d oil production. Green = oil production, blue = water production, Black = no production.**

The oil and water tracer signals are shown in Fig. 1. and Fig 2, respectively. Fig. 3 displays the zone performance based on the signals, and can be narrowed down to two main observations:

- The different reservoir layers support the well unevenly: zones 1 and 2 receive less pressure support as they do not produce at the low draw-down.
- Zones 1 and 5 both produce water, however zone 1 stops producing at low draw-down. Hence, zone 5 seems to be the main water contributor, and the only zone supported by water injection.

### Results

The insight from tracers was used to verify the reservoir model. One particularly significant insight was that the reservoir did not properly support zones 1 and 2. As a result, RESMAN tracer systems revealed the potential for additional reservoir drainage.


HQ +47 925 64 070 • Norway/EU +47 976 35 227 • UK/Africa +44 78 99 763 463 • Russia/CIS +7 977 956 48 43
M. East +971 4 572 6318 • Far East Asia +60 122 412 056 • Americas +1-504-239-7705
**info@resman.no • www.resman.no**

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