# Assessment of saturation from PITT

## Operator used a partitioning inter-well tracer test (PITT) to find oil saturation

### Challenge

An operator wanted to find oil saturation in an inter-well region. An oil saturation estimate was important both to assess remaining oil and to evaluate EOR potential in the field (see EAGE-IOR, Dresden 2015).

### Solution

RESMAN's PITT service – comprising injection of one normal water tracer and one of RESMAN's unique patented (WO2014096459A1) partitioning tracers were deployed in one injector. The tracer data was then interpreted using RESMAN's interpretation methods.
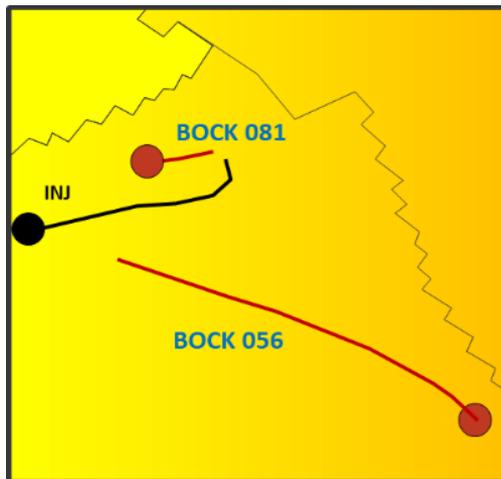


**Fig. 1 – Overview of the Bockstedt field. The reservoir consist of consolidated sandstone, mid to coarse grained, well-sorted and fairly homogeneous. The reservoir temperature about is 54°C and the formation water is saline brine (186,000 ppm TDS). The test area is water-flooded (high water cut) with one PITT injector (INJ).**

### Application

Relevant producers in the field were monitored. In two producers a significant breakthrough of non-partitioning and partitioning tracer was seen (cf. Fig. 2 for one example).
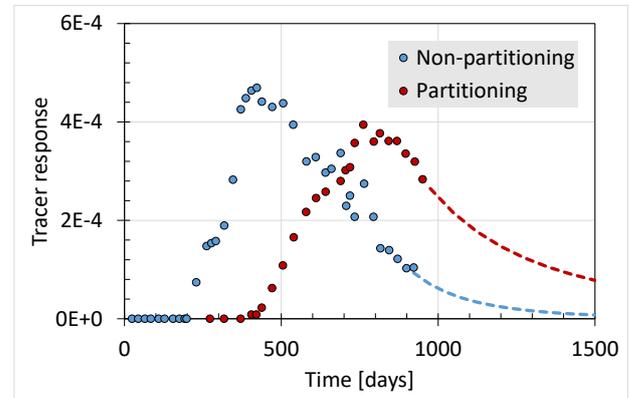


**Fig. 2 – Tracer from the PITT injector (INJ) in one of the adjacent producers (BO-56). The symbols correspond to measured tracer data, transformed into a residence time distribution (RTD). The dashed lines are model curves, used to extrapolate the RTD beyond the last data points.**

In PITTs, provided that the oil is stagnant, remaining oil saturation is given by

$$S_o = \frac{T_P - T_W}{T_P + T_W(K-1)} \qquad (1)$$

where $T_P$ and $T_W$ are retention times found from tracer curves (Fig. 2) for the partitioning and water tracers, respectively, and $K = C_O/C_W$ is the oil/water partition coefficient. Based on retention times the tracers yielded $\overline{S_o} = 18 \pm 1\,\%$.

### Results

The tracer curves provided values for the oil saturation in the inter-well regions. In one of the well-pairs (towards MO-81) a significant volume of movable oil was present. In that case it was possible to determine the oil saturation through inverse modelling using a Corey type relative permeability curve and matching of Sor as one of relative permeability curve parameters.

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