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Wireless In-well Production Assessment and Quantifying Well-to-Well Connectivity

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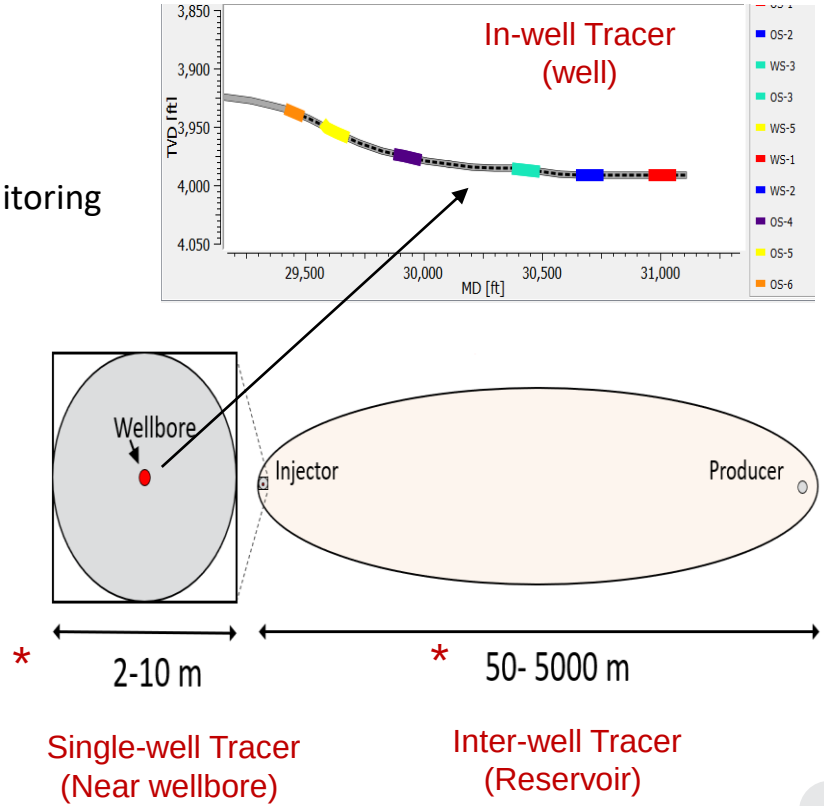
RESMAN Wireless Reservoir Surveillance

Tracer Technology for Well & Reservoir Surveillance

- **In-well tracer**
  - Permanently installed in production wells
  - Wireless and risk free monitoring technology
  - Longevity of up to 10 and 7 years for oil and water monitoring
  - Several unique signatures for commingled production
  - Environmentally approved
  - Cost effective

- **Pumpable tracers**
  - Pumped into the reservoir
  - Inter-well and Single-well applications
  - Chemical and thermal stability
  - Not adsorbing to rock surface
  - No/known partitioning to other phases
  - Environmentally approved and cost effective



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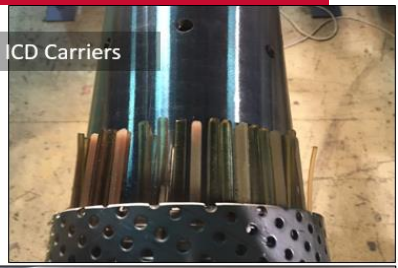
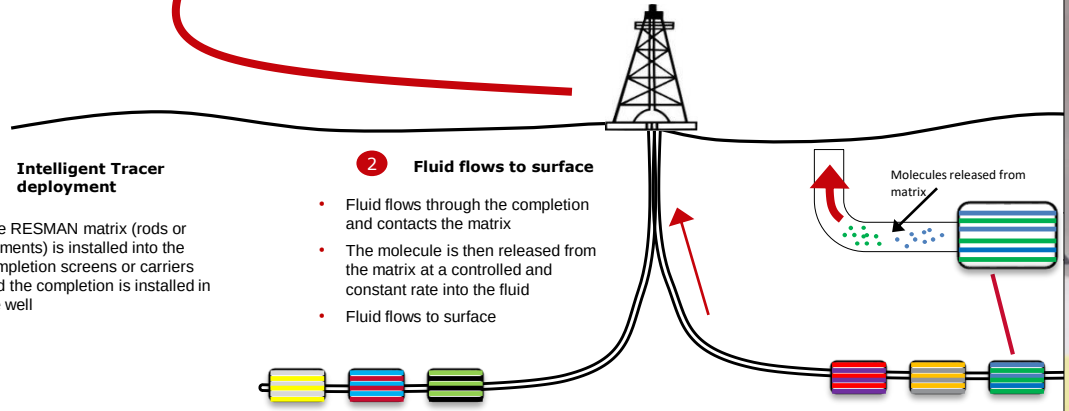
In-well Tracer Technology – How does it work?



3 Sampling

4 Lab. Analysis
(parts per trillion)

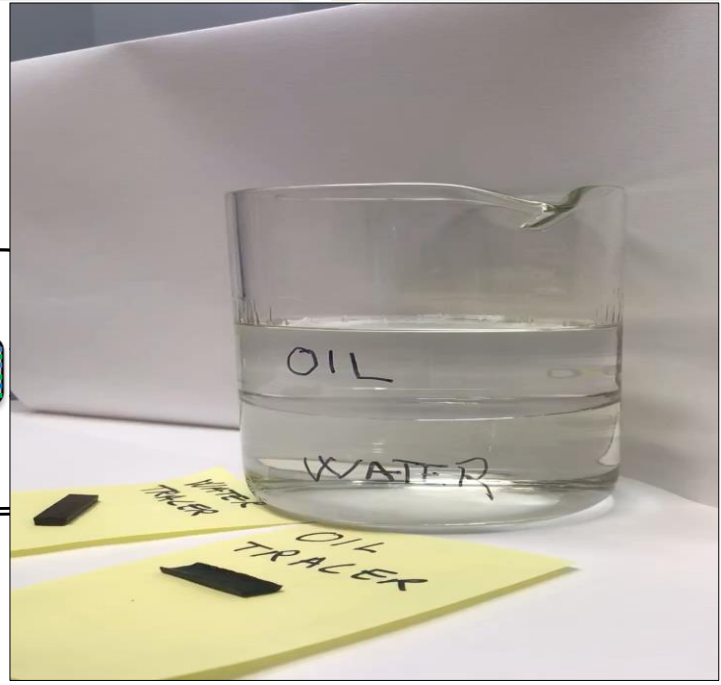


1 Intelligent Tracer deployment

- The RESMAN matrix (rods or filaments) is installed into the completion screens or carriers and the completion is installed in the well

2 Fluid flows to surface

- Fluid flows through the completion and contacts the matrix
- The molecule is then released from the matrix at a controlled and constant rate into the fluid
- Fluid flows to surface

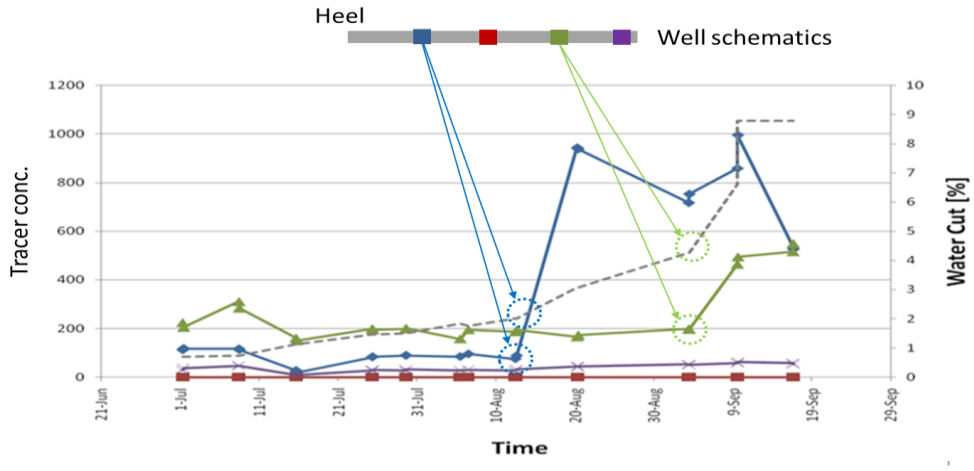


In-well Tracer Technology – Applications

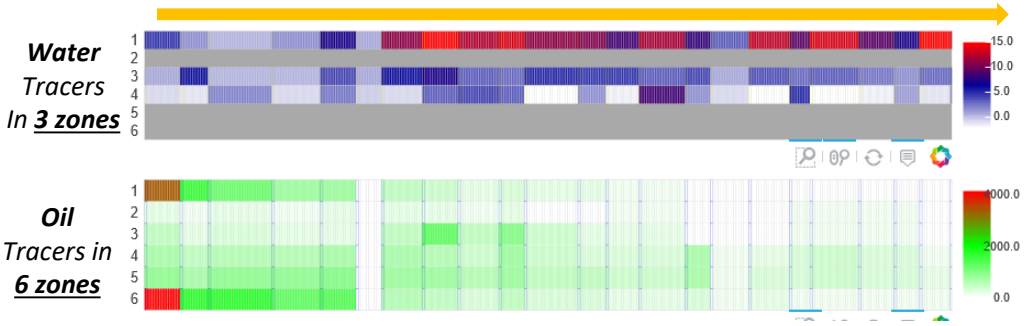
In-well tracer provides zonal resolution for production optimisation during well life.

- Did my well clean up?
- Is my toe producing?
- Where in my production well the water breakthrough coming from?
- How much is the inflow contribution from different sections of well?
- When did my reservoir perfromance change?
- Why did my reservoir perfromance change?

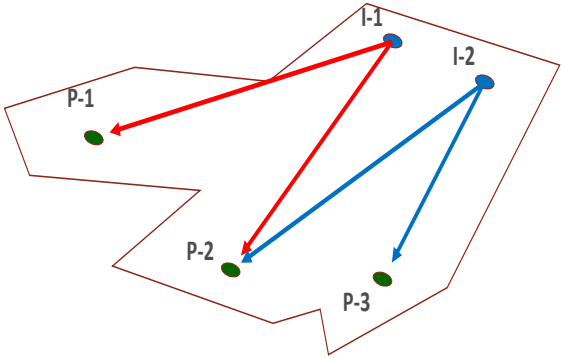
Water Breakthorugh detetction



Continous Monitoring for 8 months

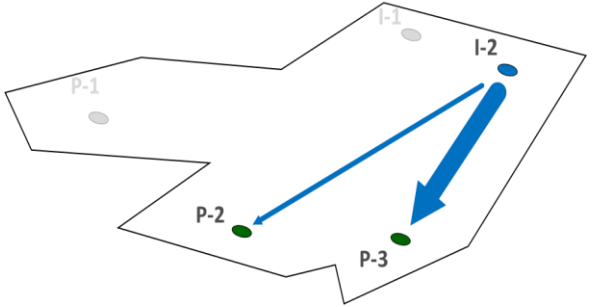


Inter-well Tracer Technology – How it works & Applications?



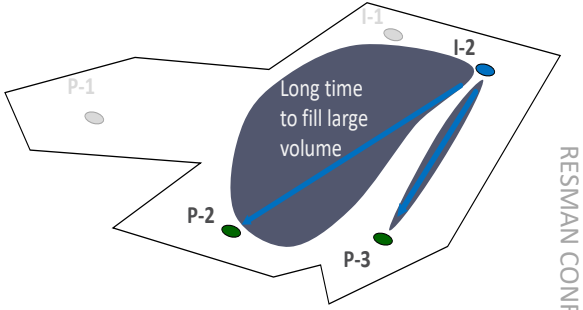
- Injector and producer connectivity
- Reservoir connectivity

Better reservoir understanding and identify flow paths



Quantify the magnitude of water breakthrough

Injection optimisation



Sweep volume calculation

Identifying un-swept areas for infill wells

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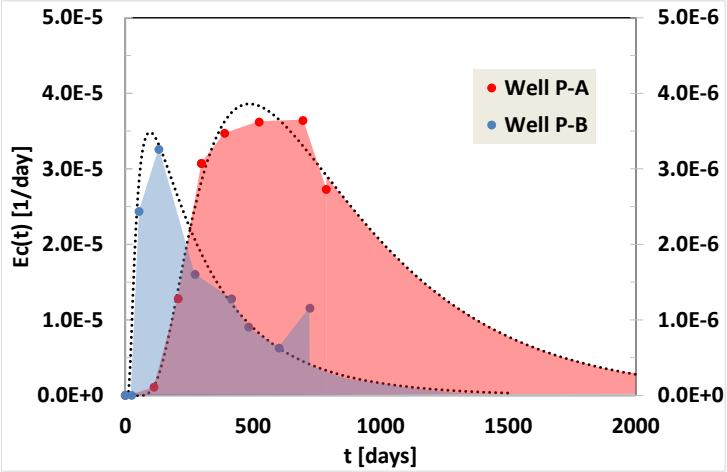
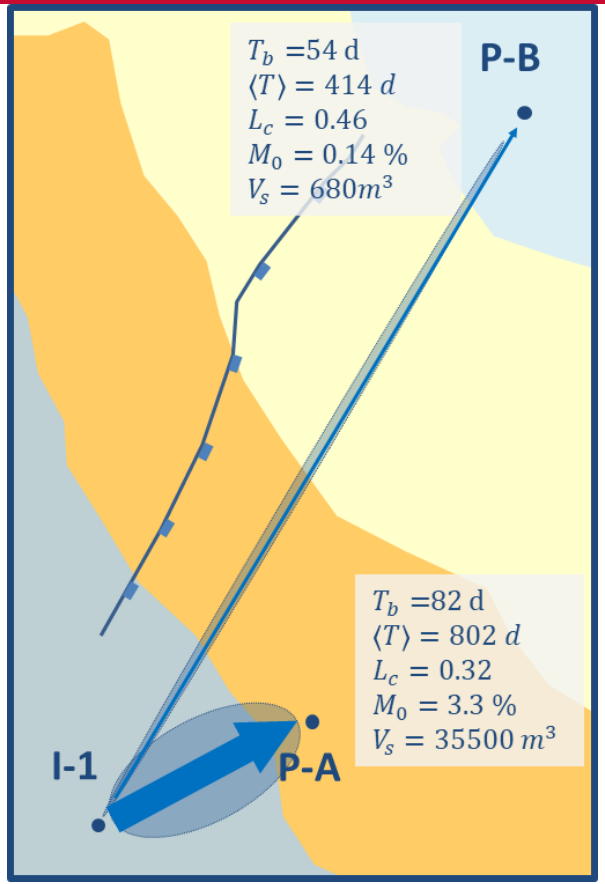
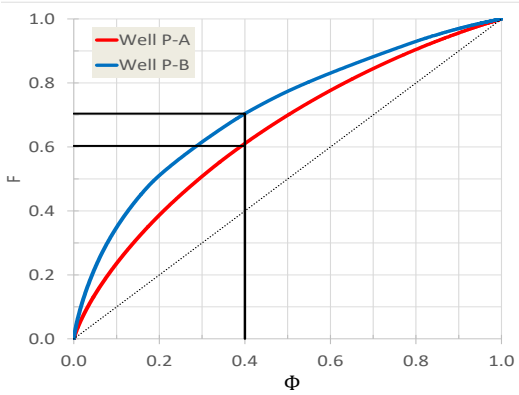
Quantification of Heterogeneous Flow



Residence time distributions (above) from concentration curves and production rates give relative produced amount in each producer (M_0) and swept volume (V_s) illustrated as arrows and ellipses.



Connectivity map and swept volume



Heterogeneity quantification

Huseby; SPE tracer technology workshop Abu Dhabi, 2018

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