Advances in Quantification of Miscible Contamination in Hydrocarbon and Water Samples from Downhole to Surface Laboratories

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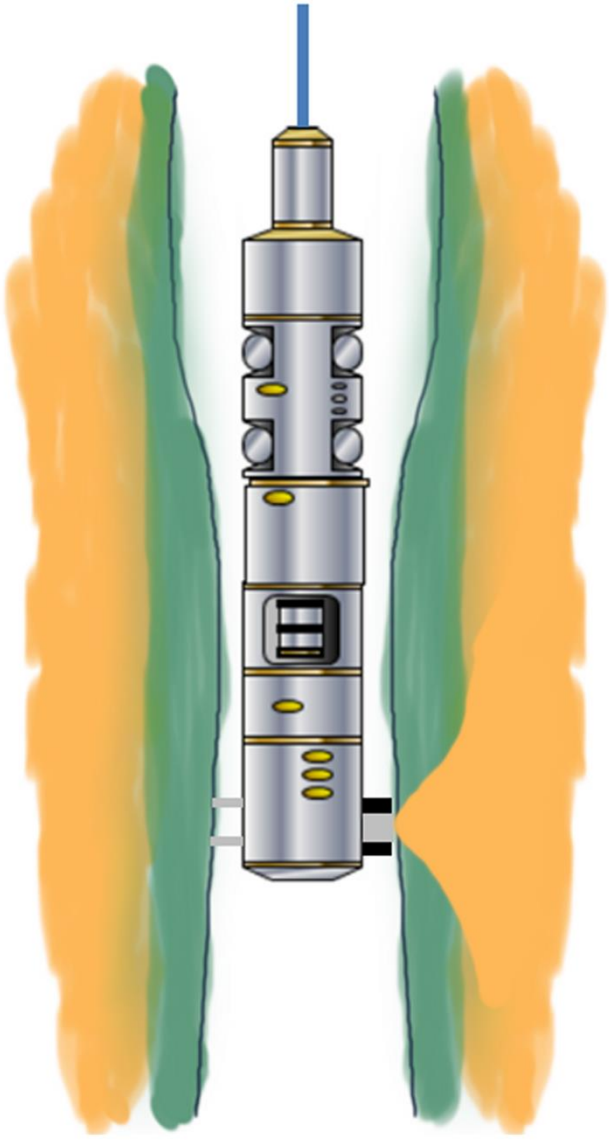
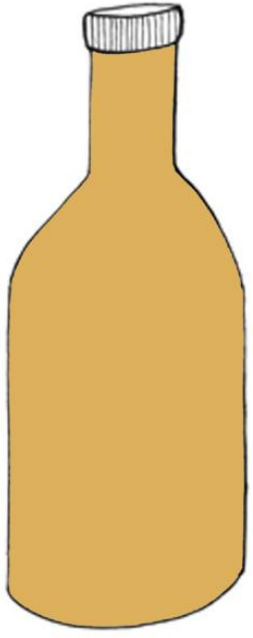
Schlumberger



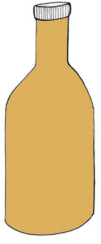
Wireline Sample



OBM Decontamination Methods in PVT Laboratories

Fundamental Assumption: C_{8+} of native fluid follows an exponential decay

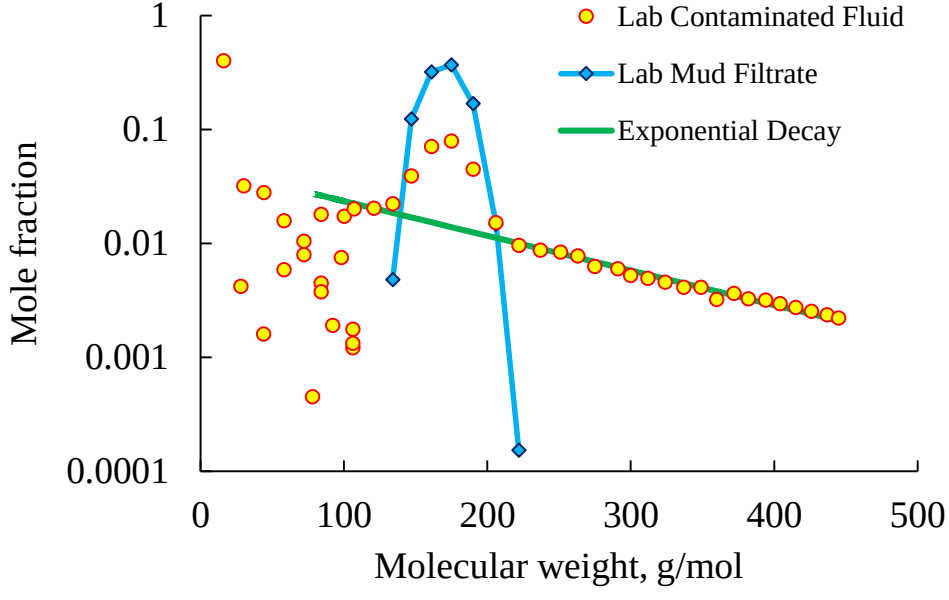
- **Subtraction Method:** Known OBM composition
- **Skimming Method:** Unknown OBM composition



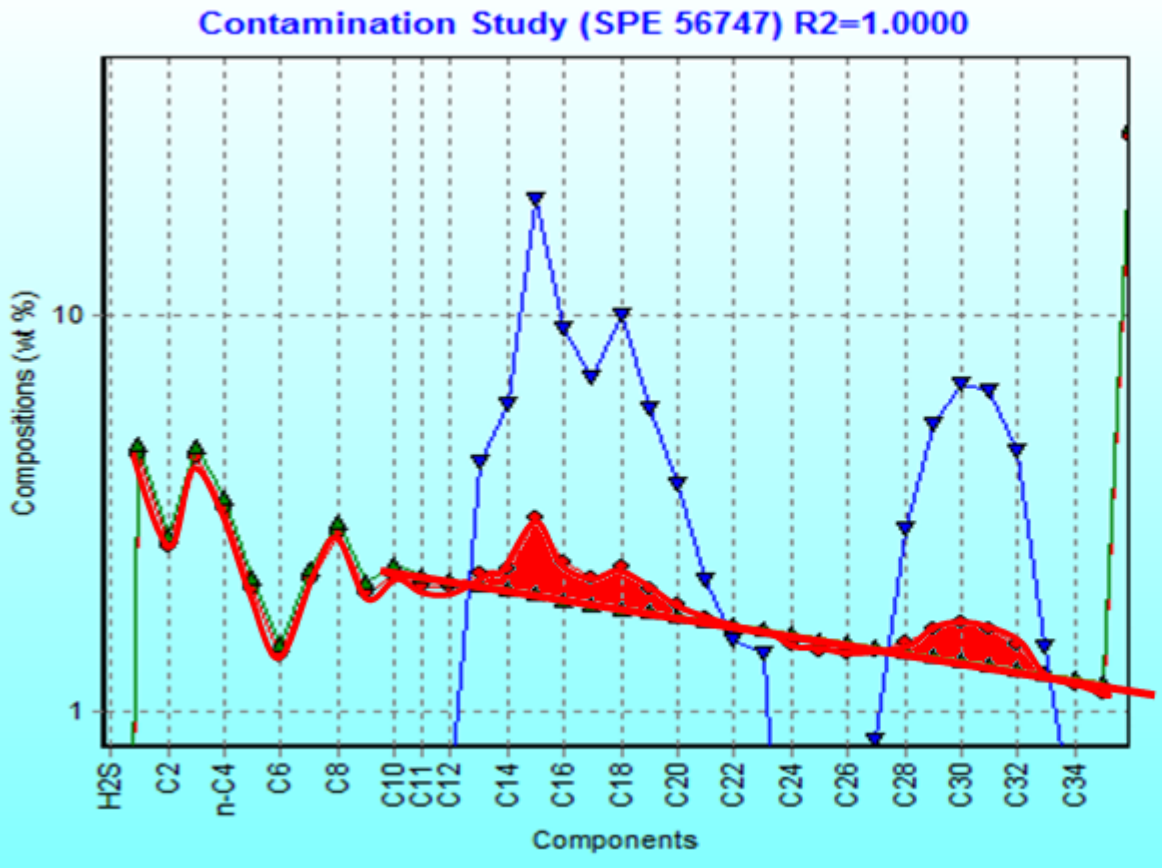
Downhole: real time Multi-sensor contamination monitoring

Uncovering discrepancies is difficult

Evaluate applicability



Oil from Multiple Charges - WBM



GOR = 680 scf/bbl

Bo = 1.34

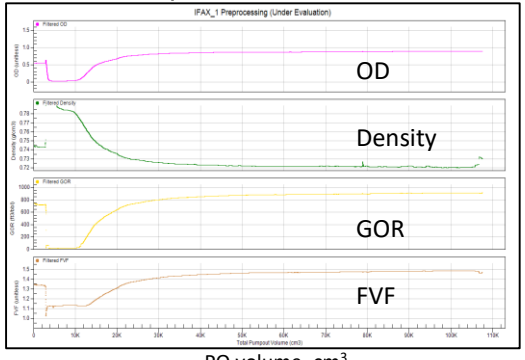
Software: 8.25wt%
OBM Contamination

In Water Based Mud!

Full Workflow – Formation Testing Sampling

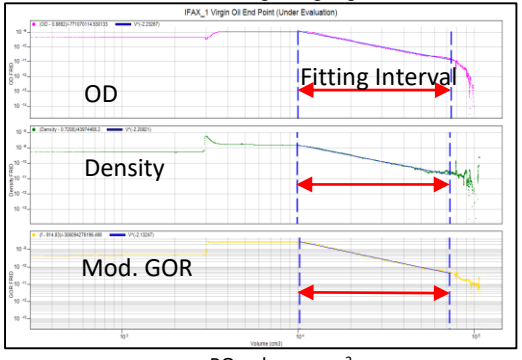
Preprocess → Virgin Fluid Endpoints → Filtrate Endpoints → OBM% → Comparison with Lab Data

Cleanup Data- DFA Measurements



PO volume, cm³

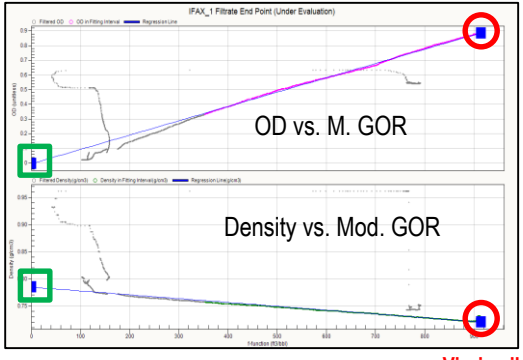
Power Law Fitting in log-log Plot



PO volume, cm³

Model and measured data are overlapped

Linearity & Endpoints

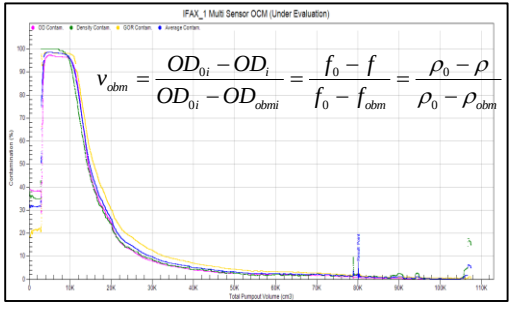


Filtrate from extrapolating to 0 GOR

Modified GOR, scf/bbl

Virgin oil from power law fitting

OBM Contamination



Comparison with Lab Data

Channel	Color OD	Density g/cm3	GOR scf/STB	Average	Lab
Mud Filtrate	0	0.7847	0		
Native Oil	0.8862	0.7205	914.83		
Sampling Point	0.8768	0.7214	891.41		
OBM, vol%	1.06	1.52	2.56	1.71	
OBM, wt%	1.15	1.65	2.78	1.86	3.5

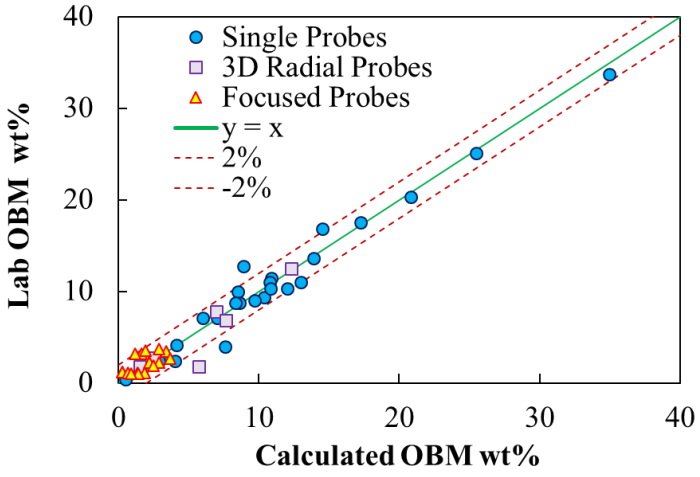
Conclusions

Laboratory analysis

- Uses “exponential decay”
- Struggles with Biodegraded oil or multiple charges

Downhole analysis

- Independent of “exponential decay”
- Uses power law fitting & x-plots
- Offers quality control



- ➢ Laboratory has long been the “ground truth”
- ➢ Multi sensor OCM is a real alternative when the Lab struggles