

SPWLA Topical Conference RRT in carbonates

15-18 February 2010, Abu Dhabi

Break-out Session 1: RRT at Lab Scale

General discussion on RRT

- Why RRT? Primary to constrain Saturation Height functions and secondary for K prediction
- The main parameters for a reservoir are: Saturation, Permeability and Porosity
- Link between Geology and RRT
- PG (Petrophysical Group) versus RRT (Reservoir Rock Type)
- “Lumper” versus “Splitter” (optimum number of groups/types)
- Tools to optimize lumping or splitting and to access coherency within an RRT.
- Propagation of lab measurements to larger volume of rock, larger scale (log domain, geo-cellular cell, dynamic cell) --- SIZE MATTERS
- Quantitative work (lab measurement) versus Descriptive work---Integration.

Size of Sample:

Whole Core	4" x 12"
Large Plug	1.5" x 3.5"
Plug	1" x 2"
Mini Plug	1" x 1" or less
Trim	1" x ¼"
Mini Perm	½" x ½" or less (~ 2 cc to 0.5 cc)
Cutting	¼" x ¼" or less (~ 1 cc)
Thin Section	1" x 30 micron

Sample size should larger than the Heterogeneity to characterize.

Key Lab Parameters:

Static:	Porosity Permeability (need to correct to Klinkenberg) Pc MICP (must have a TS of MICP sample) Grain Density “m”
Additional Static:	Poro-Elastic properties Mineralogy (XRD, etc) “n”
Complementary:	Facies Description (Dunham classification, etc) Pore Types Description Diagenesis Description (incl cement, leaching, stylolite, etc) Fracture Description (macro and micro) Photo (core location of sample and sample); extremely useful
Dynamic:	Pc Porous Plate Kr Sor, Swi, etc Wettability, IFT PVT

Issues:

- Cleaning (oil, asphaltene, salt, etc)
- Conditions of measurement (need to follow protocol and be reported comprehensively) API RP-40 measurement standards should be followed rigorously
- Repeatability (need to follow protocol)
- Corrections (need to be reported comprehensively)

Protocol:

For Porosity

- Helium
- at confining stress of 800 psi
- - for key samples at anticipated reservoir pressures (initial, under depletion, under injection and at expected abandonment pressure)

For Permeability

- Nitrogen, Air, Brine, Oil,
- at confining stress of 800 psi
- Klinkenberg correction
- - for key samples at anticipated reservoir pressures (initial, under depletion, under injection and at expected abandonment pressure)
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For Pc MICP

- Sample size as large as possible for heterogeneous and/or high K samples (max sample size for most lab: 1" x 1.2")
- Minimum 100 pressure points (can be 200)
- =>15 points per decade equally sampled in log scale
- Need to go up to 60,000 psi (to get maximum BV occupied)
- Thomeer analysis offers a more rigorous insight towards capturing macro/micro porosity interactions

For Pc Porous Plate: not discussed

Pc from Numerical Rocks: need to be further evaluated and need to be economical

For Kr: When, How many and under What conditions ? ? ?

Facilitator: Gerard Bloch and Chris Smart