Caney Shale
Oklahoma’s Shale Challenge
Bill Grieser Halliburton
<table>
<thead>
<tr>
<th>Play</th>
<th>TOC (%)</th>
<th>Ro</th>
<th>H</th>
<th>( P^* )</th>
<th>Scf/ton</th>
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<td>Barnett</td>
<td>3-5</td>
<td>0.9-1.4</td>
<td>100-400</td>
<td>0.52</td>
<td>50-300</td>
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<td>L-Bossier</td>
<td>4-8</td>
<td>0.9-1.6</td>
<td>200-300</td>
<td>0.7-0.9</td>
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<td>Marcellus</td>
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<td>Caney</td>
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<td>0.8-2.0</td>
<td>20-180</td>
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<td>1-4</td>
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<td>0.94-2.6</td>
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Well #1

27,000 BBL
60 BPM
178,000#

Re-FRAC 5/07
34,800 BBL
382,758#
82 BPM

Wild Turkey #1 avg mcf/d

mcf/d

Re-FRAC 5/07
34,800 BBL
382,758#
82 BPM

Well #1
Well #2

7500 BBL
20% CO2
30 BPM
87,000#
## McIntosh CO OK Horizontal Caney

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<tr>
<th>API_NO</th>
<th>Lease</th>
<th>well #</th>
<th>operator</th>
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<th>GAS_CUM</th>
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<td>BLACKBIRD B</td>
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<td>DYNE EXPLORATION COMPANY</td>
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Porosity  7-12%
Sw:  30-70%
Sg:  65-30%
So:  0.3%-0.1%
SpGr:  2.5-2.72 gm/cc
K:  0.00001 – 0.000000003 md

Ro=1.5-2.0
TOC = 1.9-8.0
TOC= 41.11 – 14.464(g/cc)
Scf/ton = 19.866(TOC) + 10.518    Schad 2006
Shale Mineralogy Comparison

- Bossier
- Marcellus A
- Marcellus B
- Ohio
- Woodford/Barnett
- Barnett
Brinell Hardness Comparison

- Bossier Shale
- Coal
- Marcellus Shale
- Ohio Sand
- Woodford Shale
- Barnett
- Carthage Lime
Embedment in Soft Shales
Thin Section

Shale / Prop Interface

Extruded Shale
Caney Rock Properties:

**Young's Modulus:**
- 4-8 E6 PSI

**Poisson’s Ratio:**
- 0.12-0.25

**Compressive Strength:**
- 12,000 – 24000 PSI
Jarvie and others (2007) defined brittleness as $B = (Q)/(Q+C+CL)$ where $B$: brittleness, $Q$: quartz, $C$: carbonate, and $Cl$: clay.

Caney $0.31 < B < 0.46$

Barnett $0.40 < B < 0.65$

Woodford $0.40 < B < 0.75$
Fracture Geometry Change
Experience: Is what you get,, when you did not get what you wanted.  
Randy Pausch
Frac Types Used

- Slick Water Fracs 11,000-35,000 BBL 75-200k#
- X-Link N2 Foam, N2Acid 3-4MMscf N2 150K#
- Acid/Water Fracs 10,000/15000BBL 75K#
- 50-100 BPM
Caney reacted surface after immersion
Some Basic Caney Questions:

Is the Caney on the low end of thickness and gas content?

Is it water sensitive because of clay, carbonate or other minerals.

Is it too ductile or does it fracture as a simple bi-wing?
If you answer YES to one or more; Then completion methods to consider are…

Vertical inexpensive completions.

Brine or Foam as a base frac fluid.

Hybrid systems with low to high viscosity and high ppg.

Hybrid pump schedules with multiple injection/shutdown and diversion stages. “complex-frac generators”