Critical Look at Fracture Diagnostic through a Lens of a Geomechanicist: Oman Experience

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Motivation

• Big percentage of oil and gas wells in Oman are being hydraulically fractured (HF)

• Geomechanical settings are one of the critical controls in the success of HF

• Predictive capability of GM models is most powerful when integrating deterministic and probabilistic treatment
Presentation Objectives

• Highlight some challenges with interpretation of hydrofracture monitoring data

• Articulate industry needs for analytical technology development
Why Geomechanics?

Uncertainties
Example 1

**Geomechanical model input**

<table>
<thead>
<tr>
<th>Layer</th>
<th>TVD Depth to Top of Zone (m)</th>
<th>Type</th>
<th>Stress Difference (MPa)</th>
<th>Stress Gradient from Surface (MPa/m)</th>
<th>Stress at Top of Zone (MPa)</th>
<th>Stress at Bottom of Zone (MPa)</th>
<th>Modulus (GPa)</th>
<th>Poisson's Ratio</th>
<th>Fluid Loss Coefficient (t/root (min))</th>
<th>Spurt Loss (m3/m2)</th>
<th>Proppant Embedment (Kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>883.9</td>
<td>OB</td>
<td>0.0</td>
<td>0.037</td>
<td>32.0</td>
<td>32.8</td>
<td>2.757860</td>
<td>0.26</td>
<td>0.000000</td>
<td>0.000000</td>
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<td>-8.7</td>
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<tr>
<td>3</td>
<td>1539.3</td>
<td>BR0-1</td>
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<td>0.021</td>
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</tr>
</tbody>
</table>

~60m

5 BD attempts with estimated $P_c > S_v$
Example 2

Shear Anisotropy

Well 1

Microseismic
Well 2

Stage 1

Stage 2

Stage 3
Geomechanics Workflow

- PetroPh & GM information
- Geo-Catalogues
- Diagnostics Catalogue

GM simulator
Conclusions

- Refined geomechanics models are most beneficial in brown fields

- High uncertainty in model inputs can negate model sophistication

- For practical utilization it is beneficial to combine deterministic and probabilistic geomechanical analysis