Unique Applications - Section IV Testing

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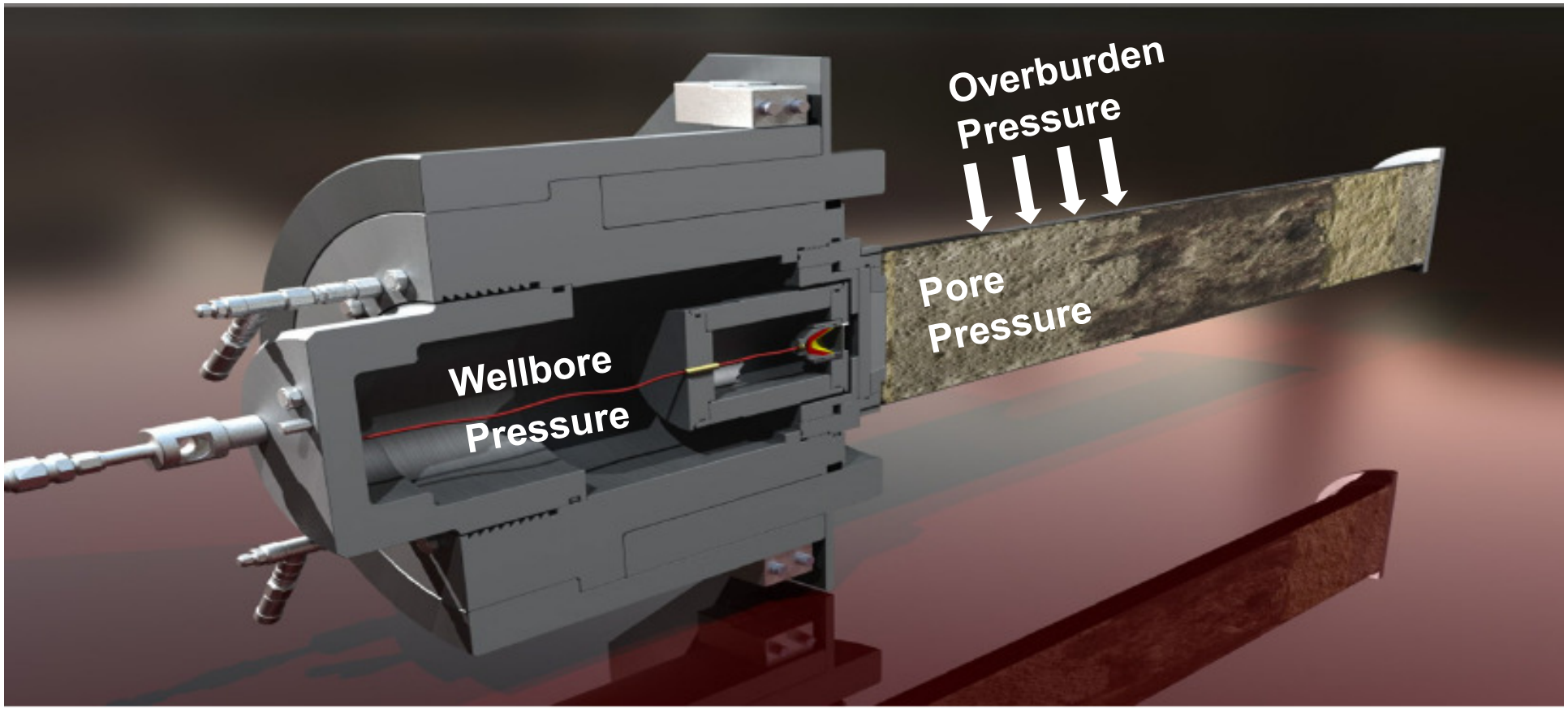
Technology Manager

APPS-13-004

HALLIBURTON

Basics of Section IV



Visual reminder: Why are Section IV tests conducted? ...we want to simulate downhole conditions!

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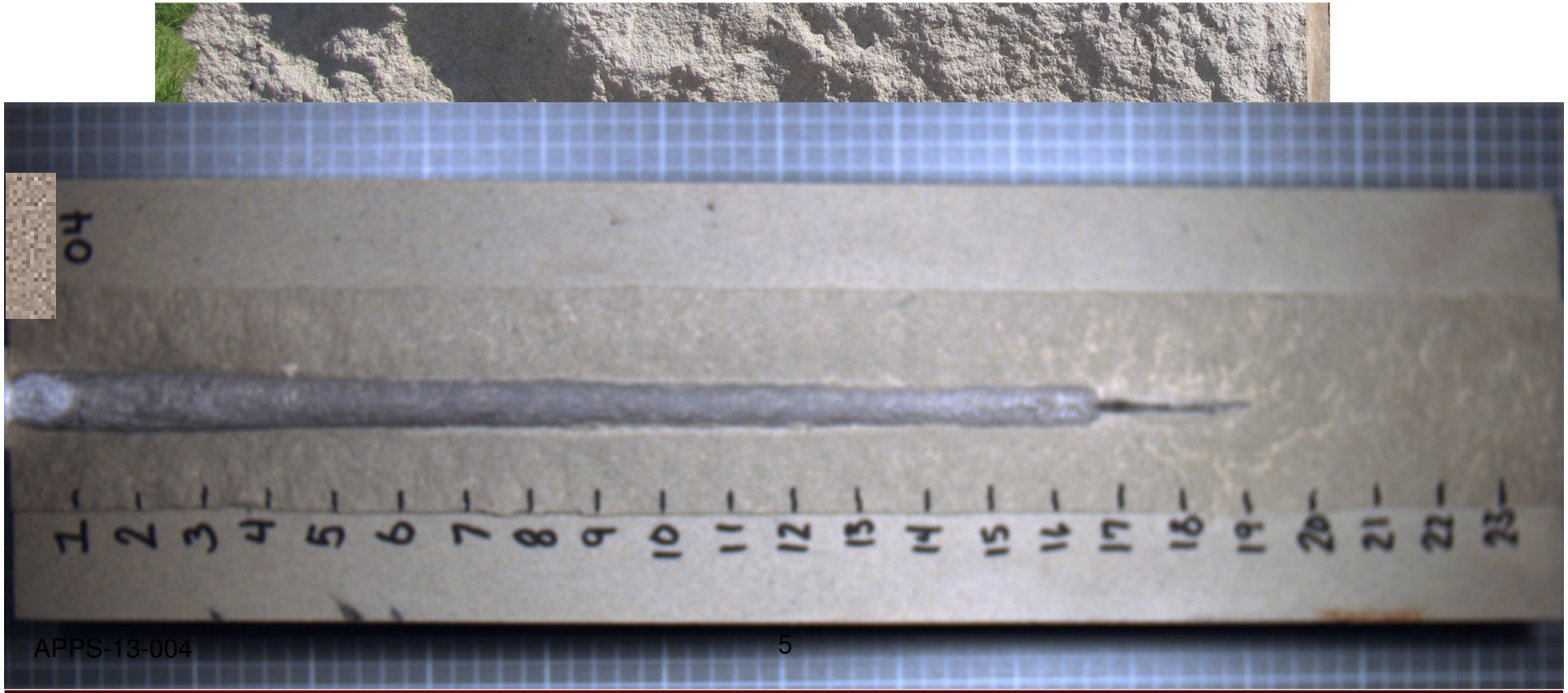
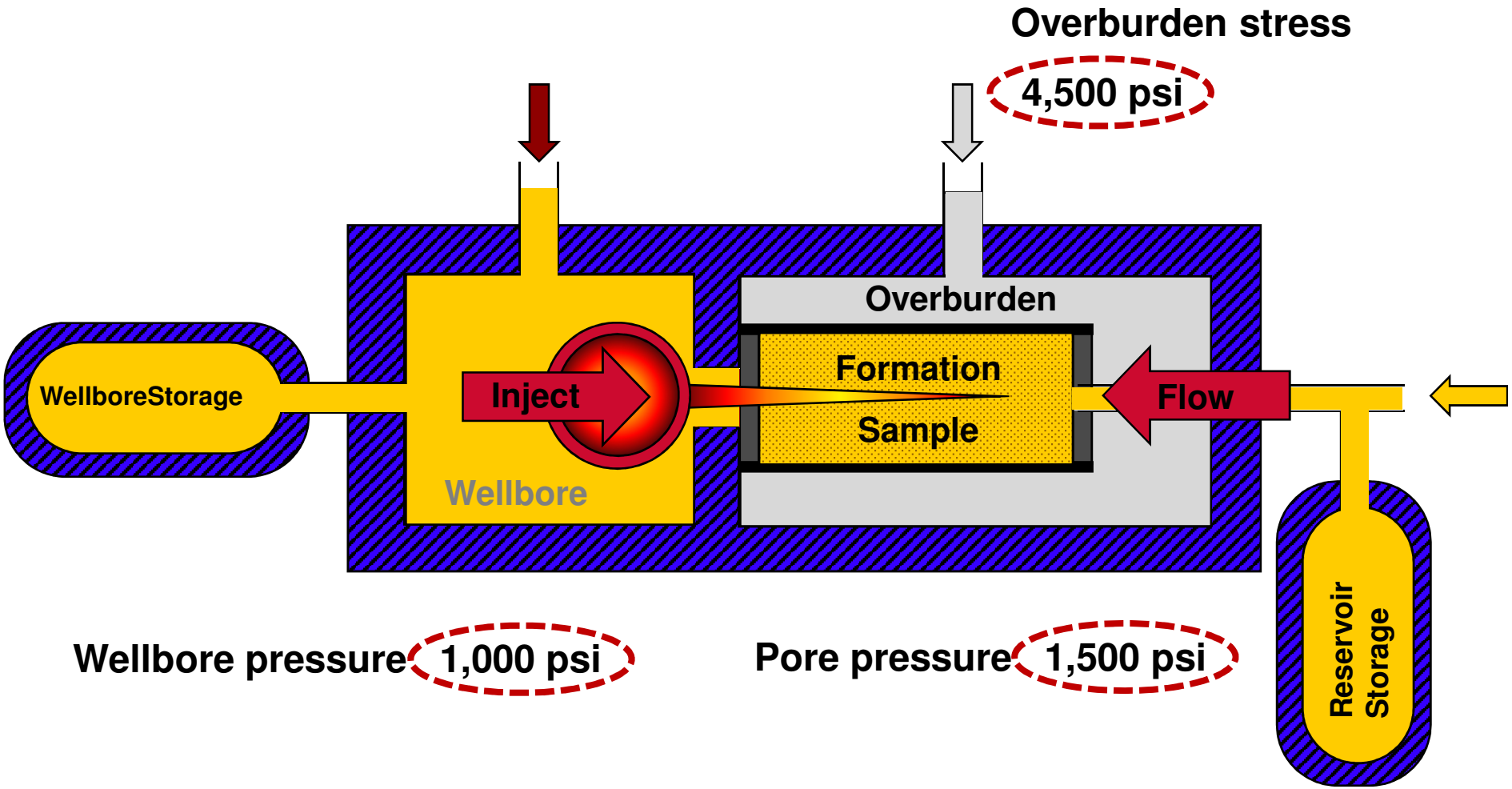
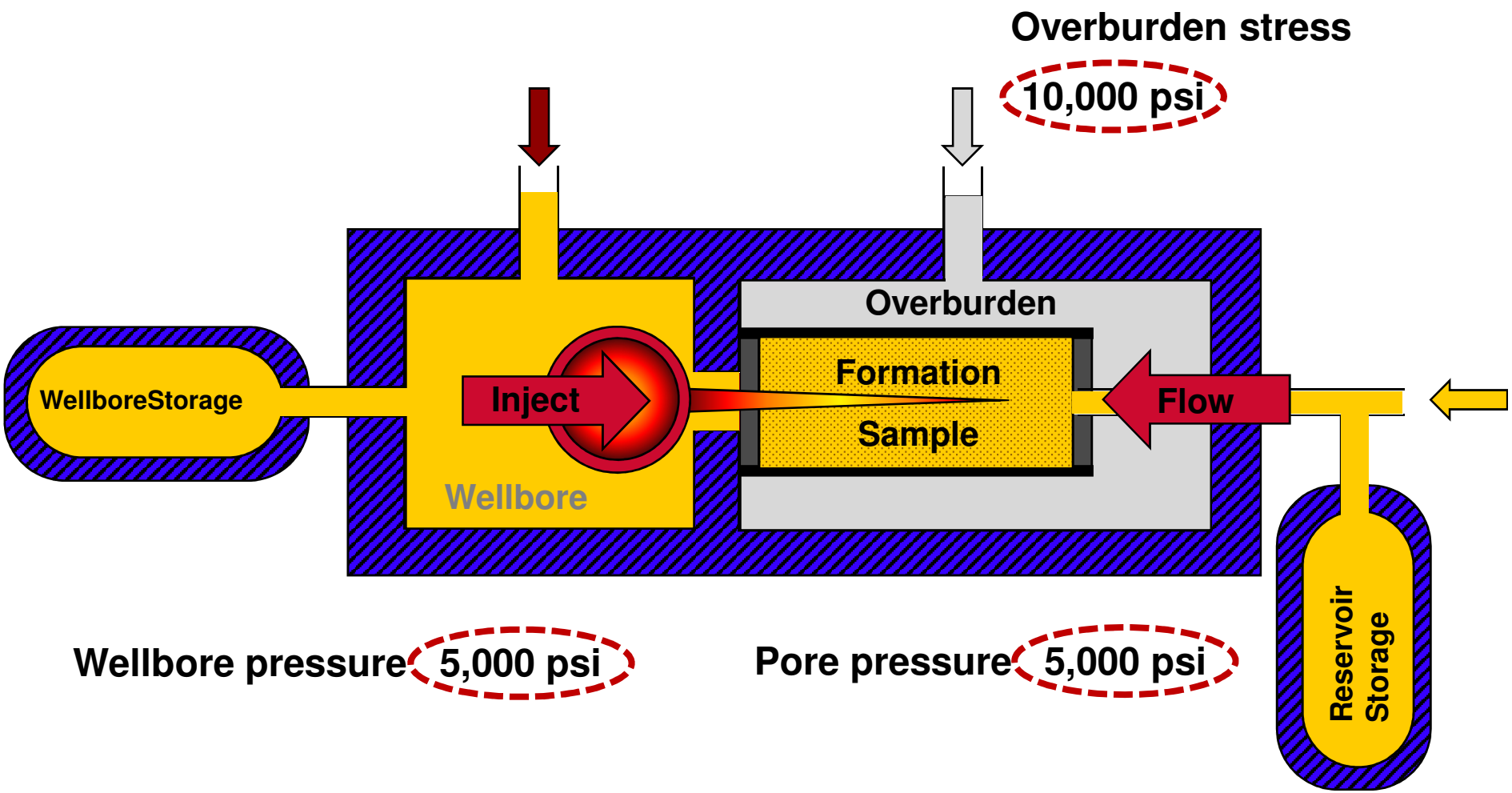


Perforation Flow Laboratory Schematic
The Original API Section IV Conditions



Net Effective Stress = Overburden – Pore Pressure

Perforation Flow Laboratory Schematic



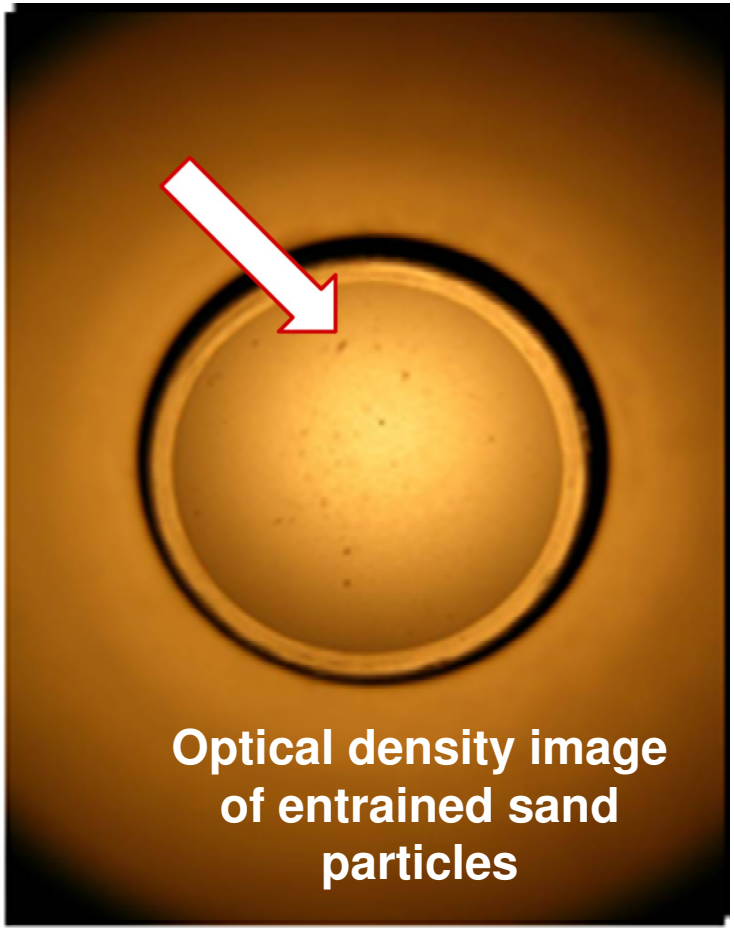
Net Effective Stress = Overburden – Pore Pressure

Beyond conventional Section IV testing…

Four unique applications:

1. Sanding and resin treatment
2. Complex tubular geometries
3. Kill fluid evaluations
4. Hydrojetting

1. Sanding and resin treatments

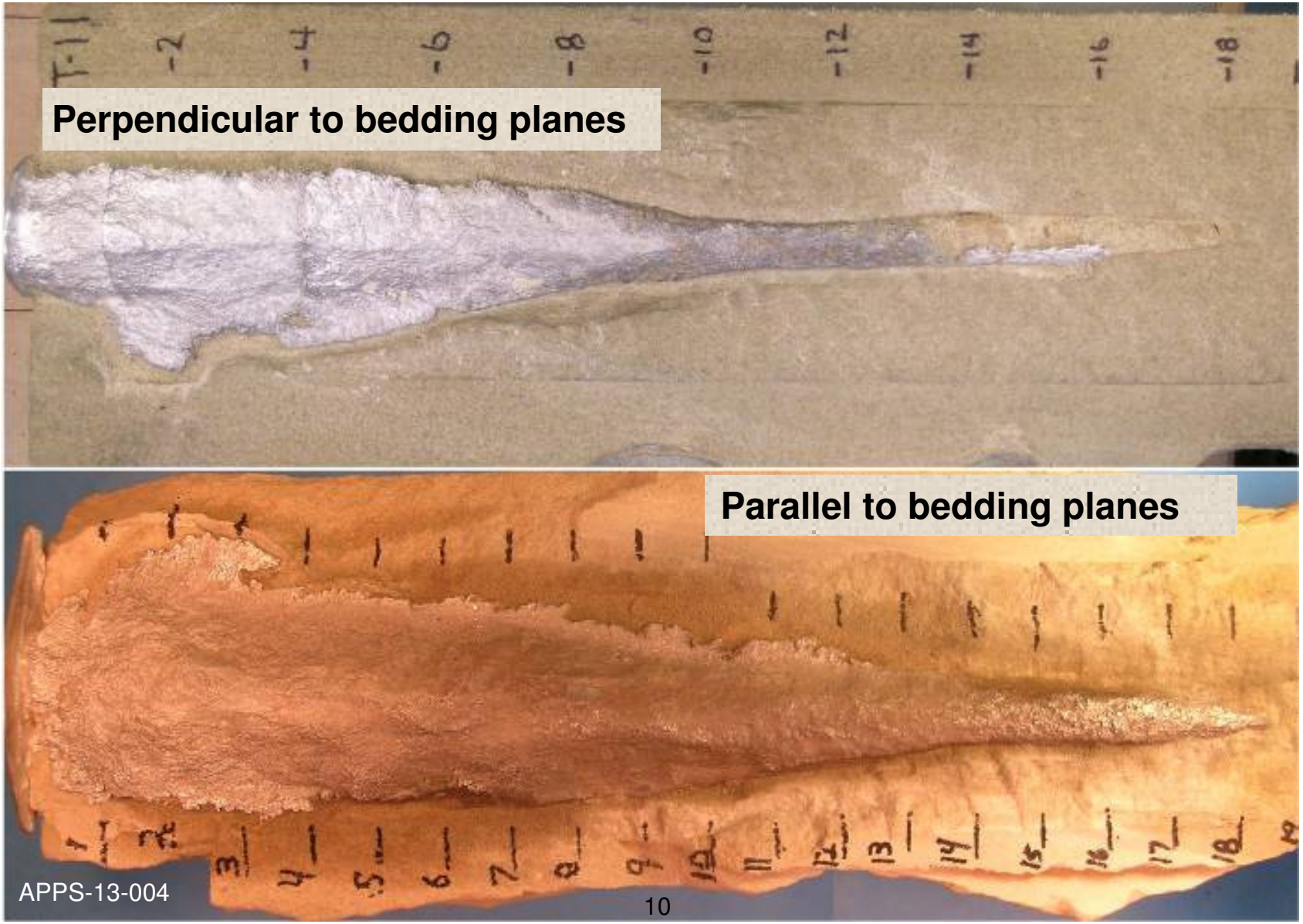


Testing rationale:

Implement sand control to avoid lost production

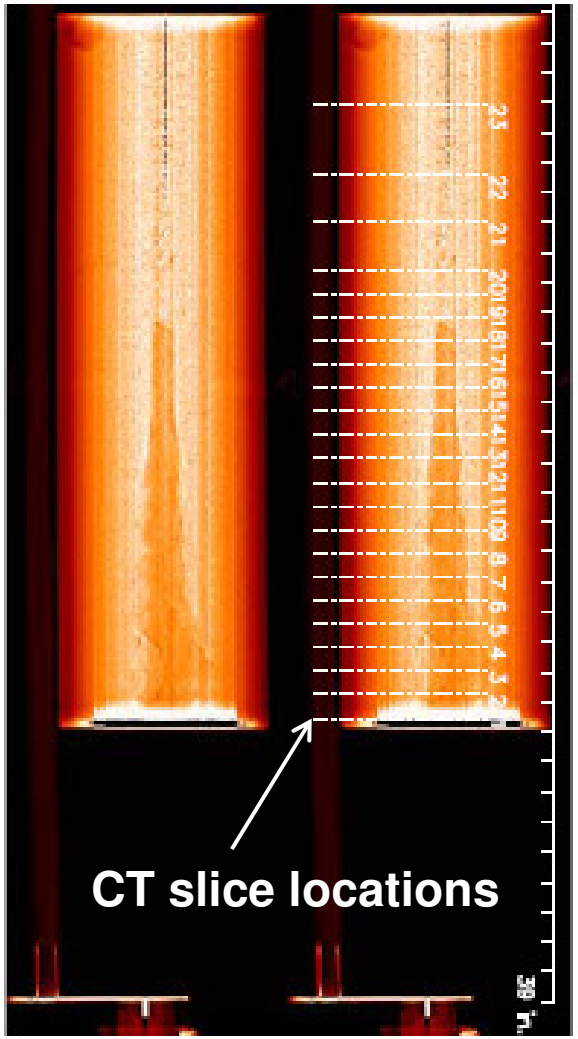
1. Perforate core
2. Flow until onset of tunnel collapse
3. Treat with resin to stabilize tunnel
4. Continue to flow and assess performance

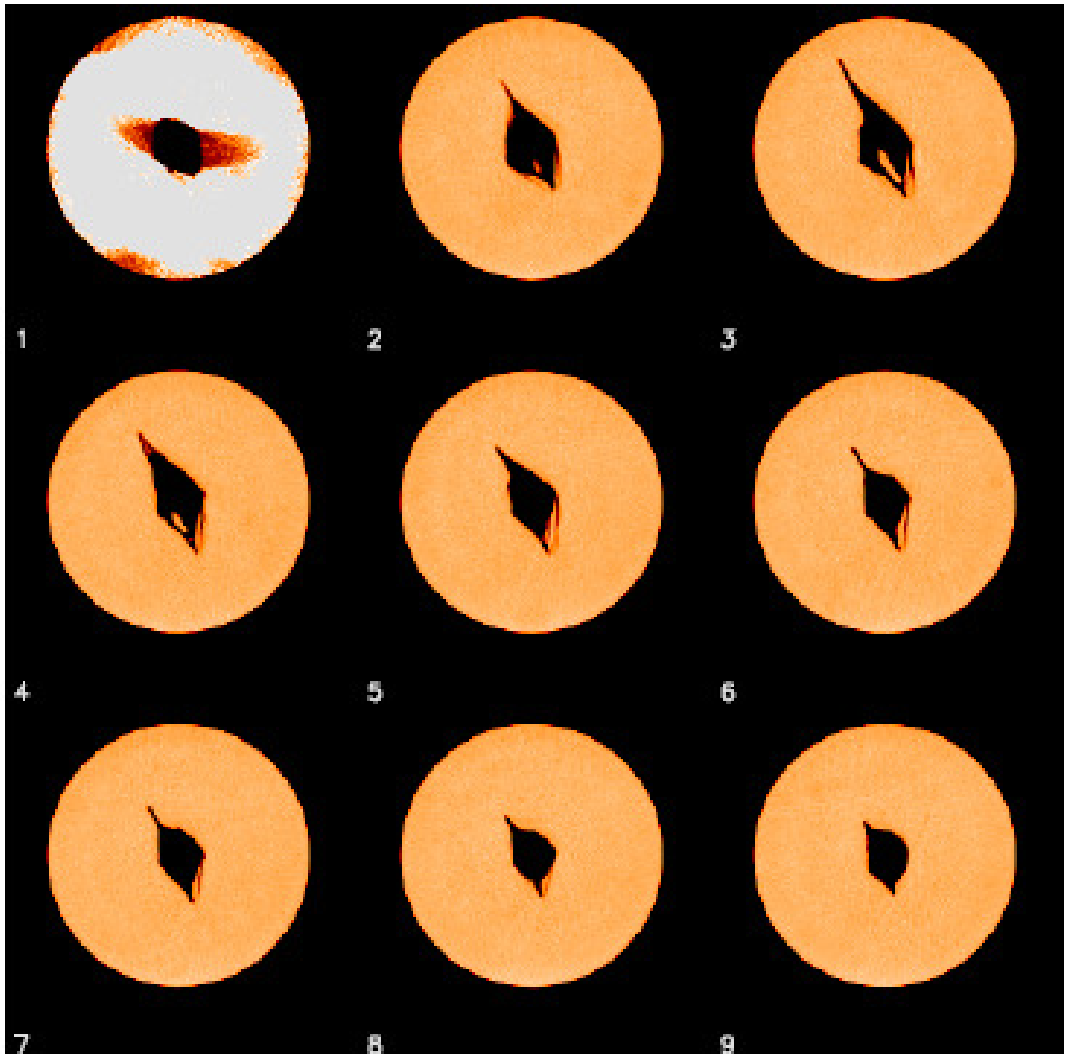
Tunnel Geometry



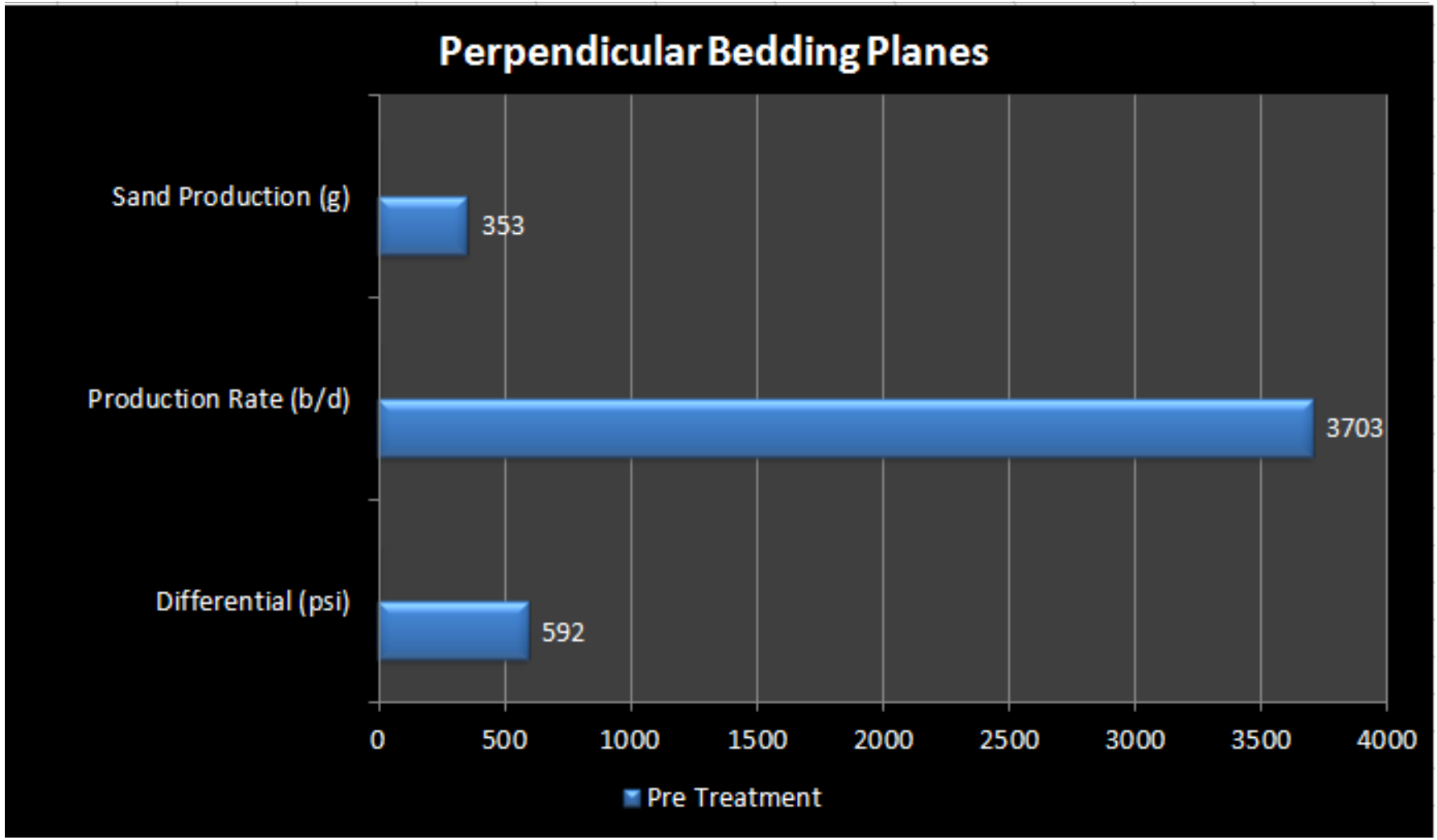
Erosion of the Perforation

SPE120901

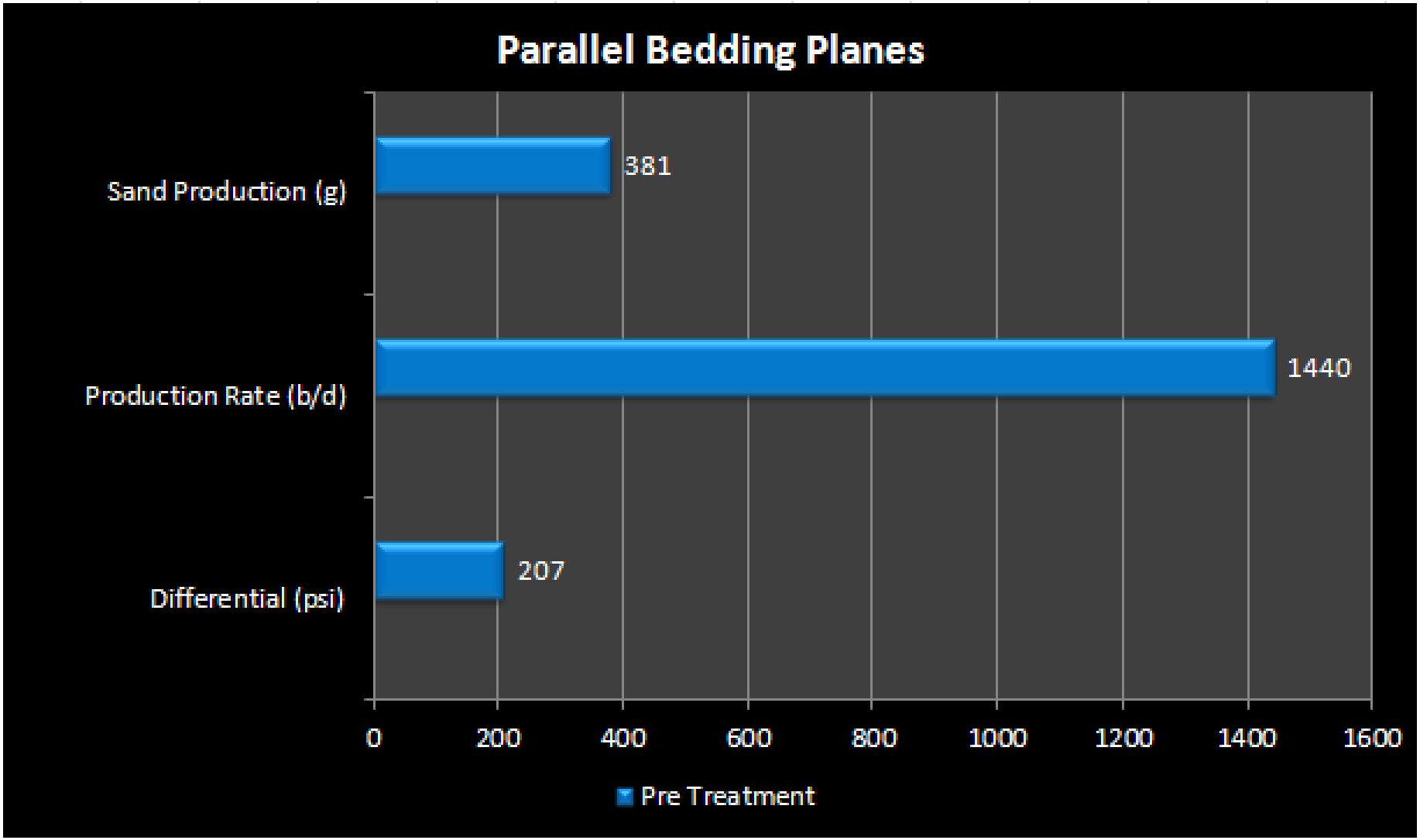




Sanding Production



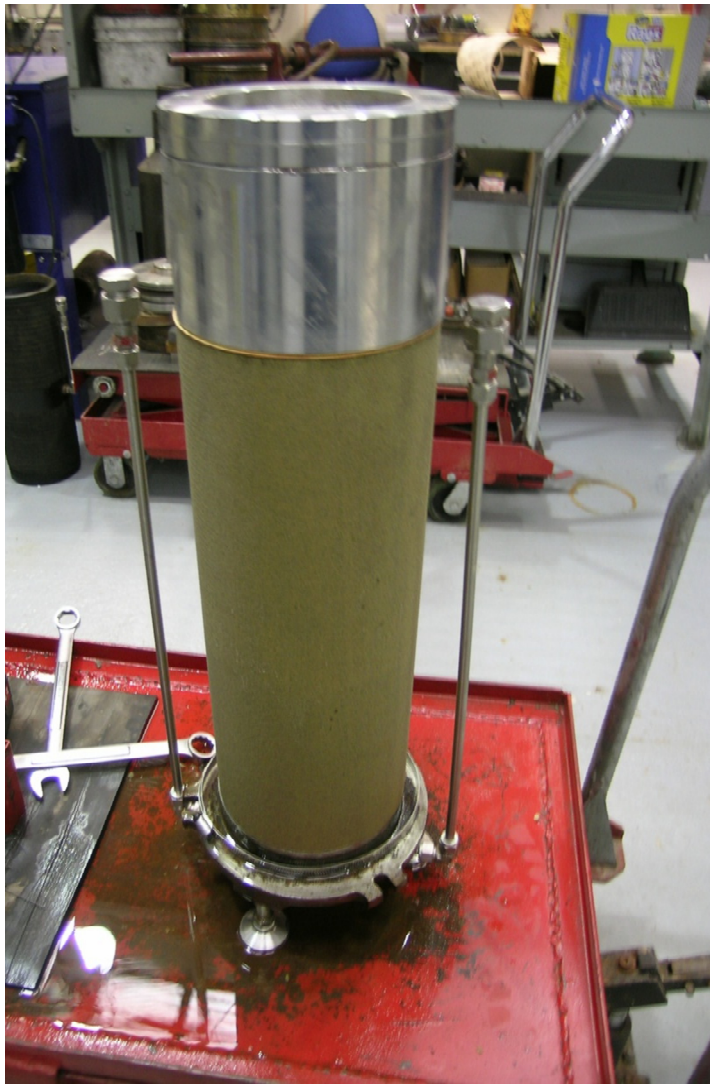
Sanding Production



Matching downhole conditions is the goal.

- Wellbore deviation
- Absolute pressures and stresses
- High temperature

2. Complex Tubular Geometries

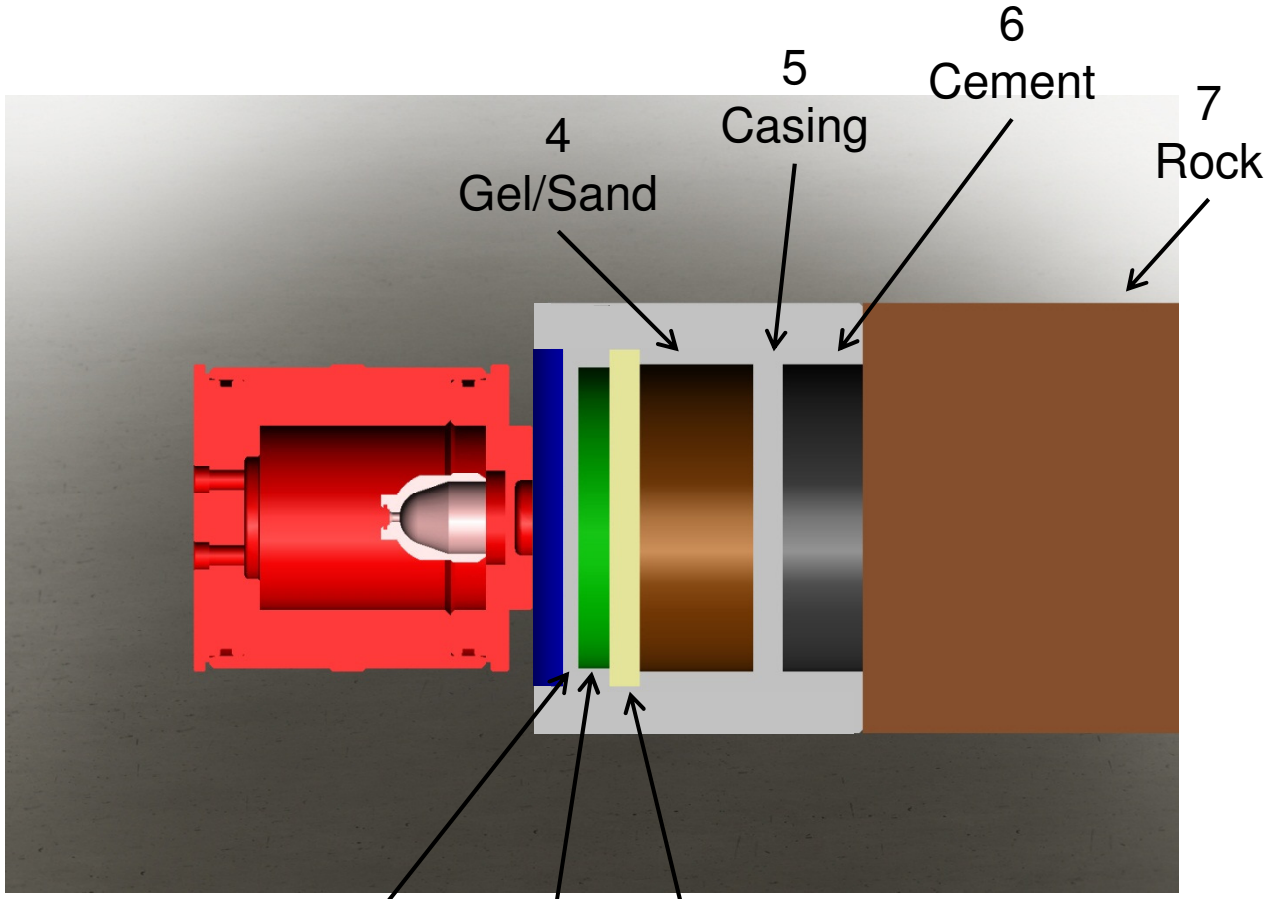


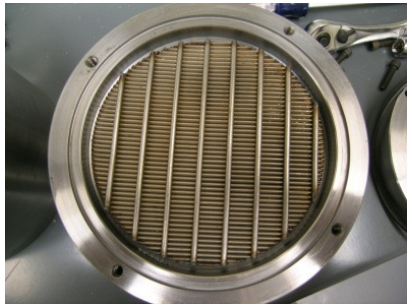
Testing rationale:

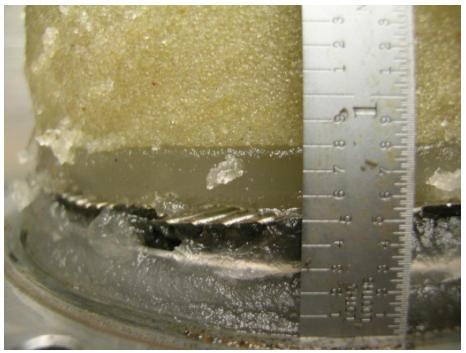
- Life extension for gravel pack well using small gun system for gas shutoff workover.
- Evaluate perforator and flow performance.

1. Perforate across multiple layers - extreme impedance mismatches
2. Balanced pressure conditions

Target Geometry – 7 layers

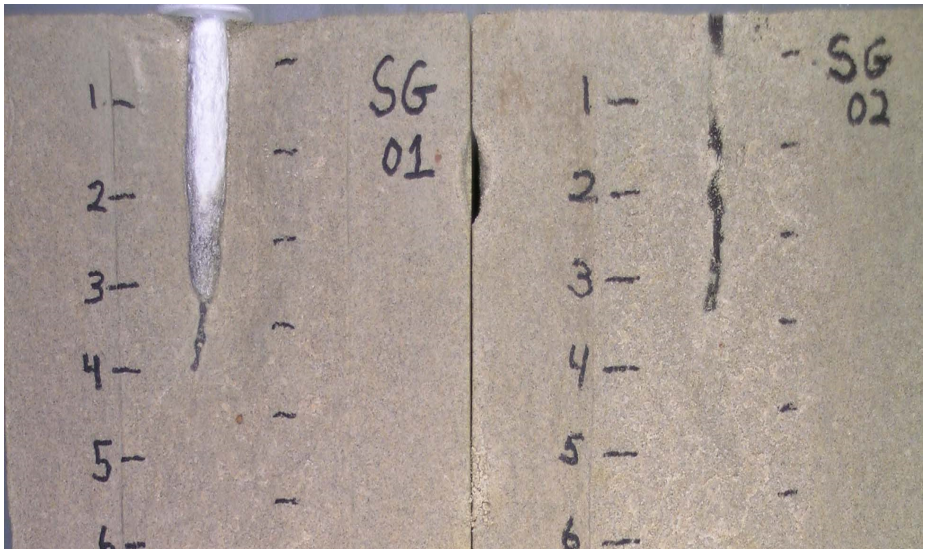






Results

Test Shot	Tubing Exit Dia (in)	Base Pipe Exit Dia (in)	Casing Exit Dia (in)	Core Penetration (in)
1	0.23	0.17	0.13	3.98
2	0.24	0.15	0.14	3.80



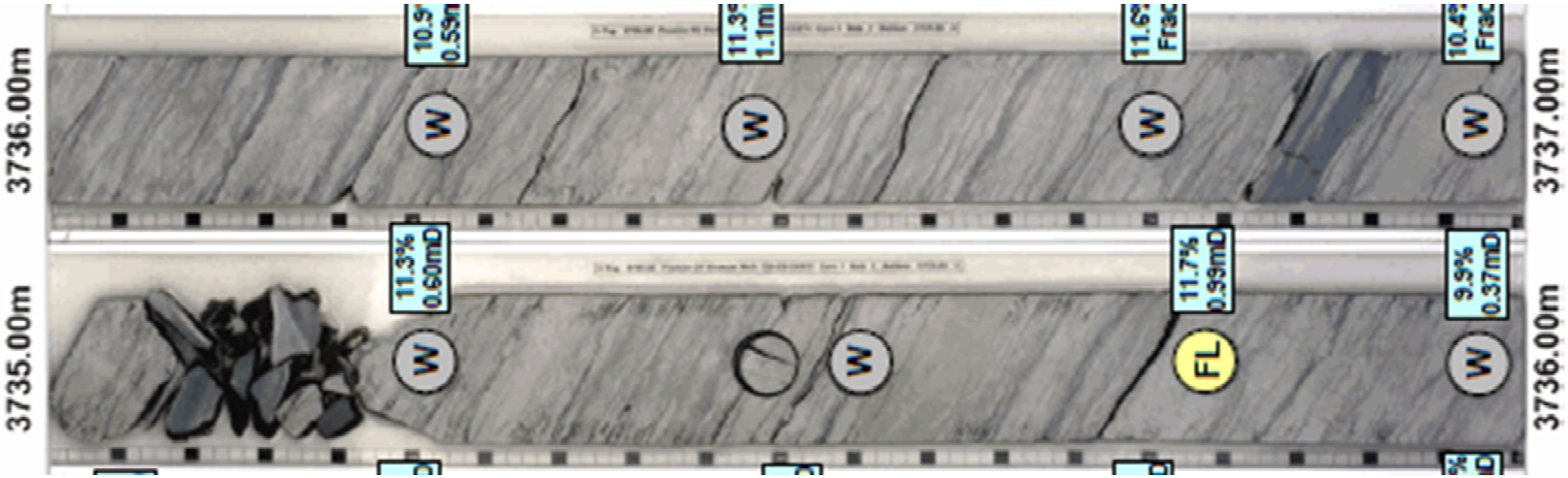
API 19B Section 1 penetration: 18.3 inches

Decision to perforate can only be made with confidence by conducting Section IV test

3. Kill Fluid Evaluation

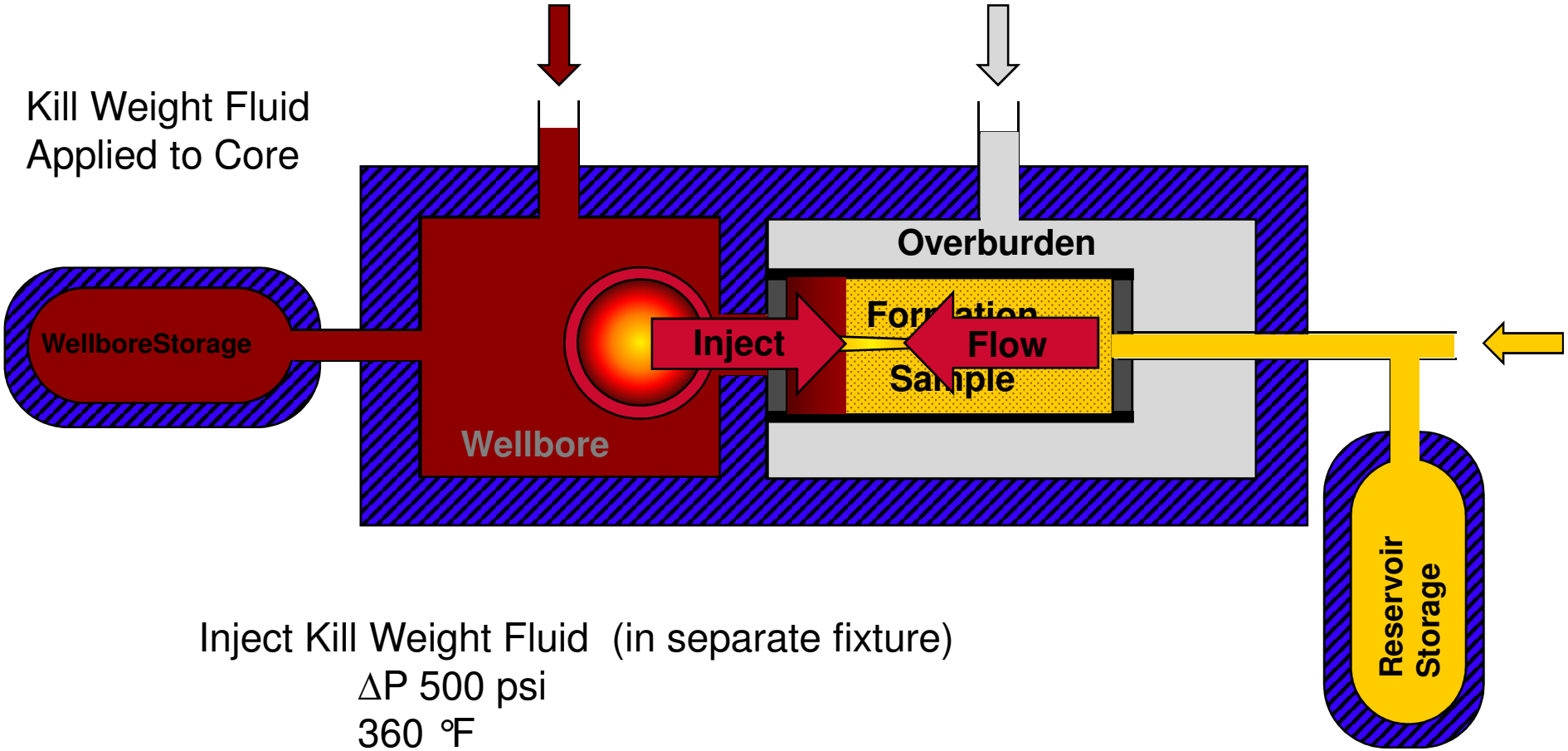
Testing rationale:

- Conventional permeability testing showed no difference between kill fluids
- Confirm using Section IV testing
- 200 psi overbalance



Kill Weight Selection – Return Permeability Analysis

Kill Weight Fluid
Applied to Core



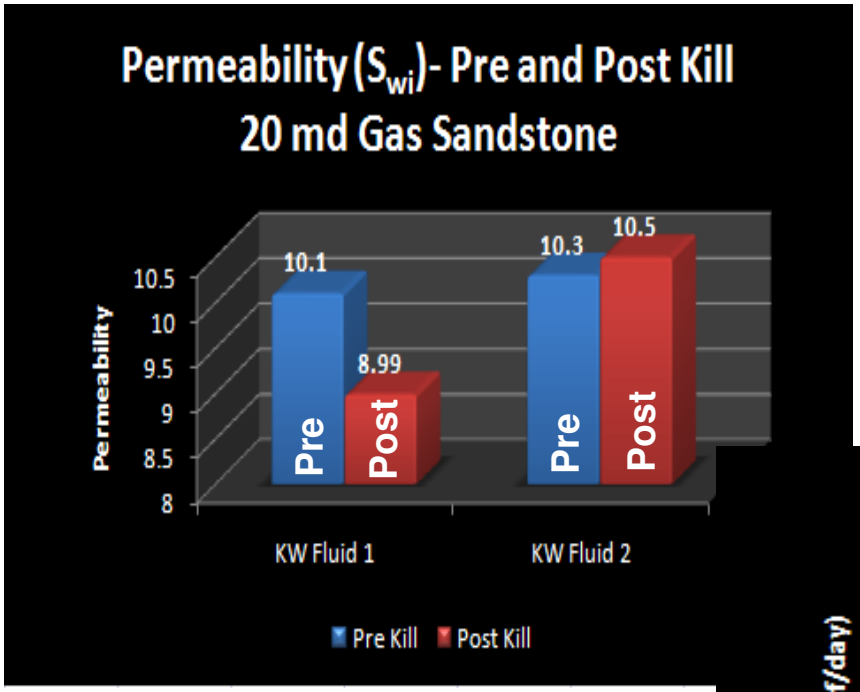
Inject Kill Weight Fluid (in separate fixture)

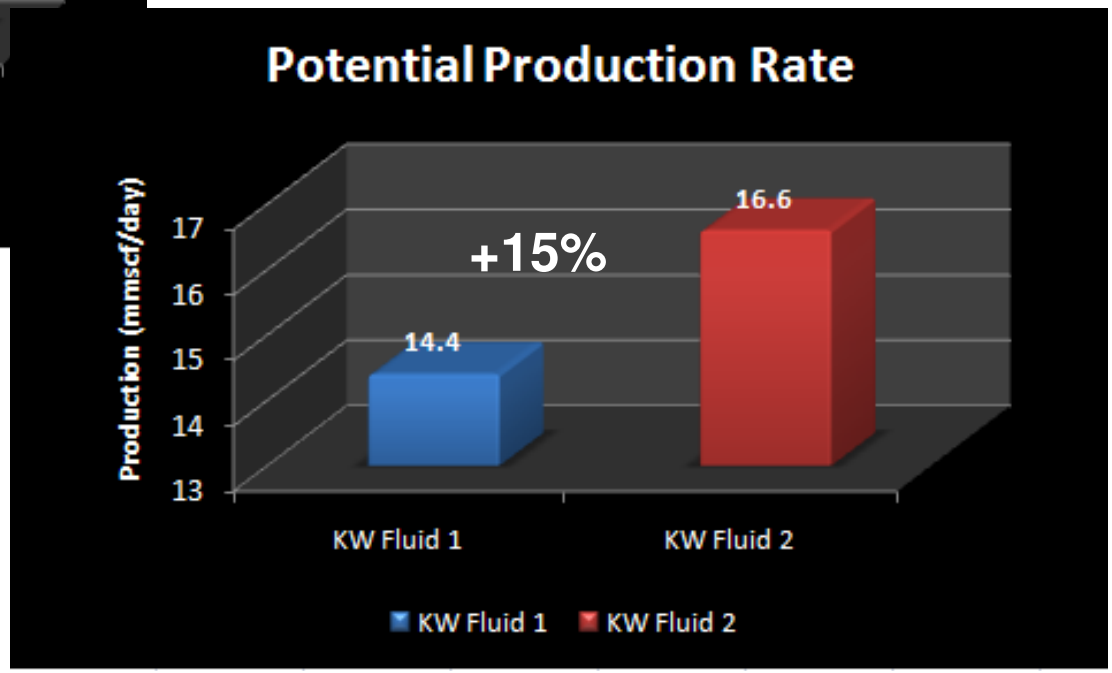
ΔP 500 psi

360 °F

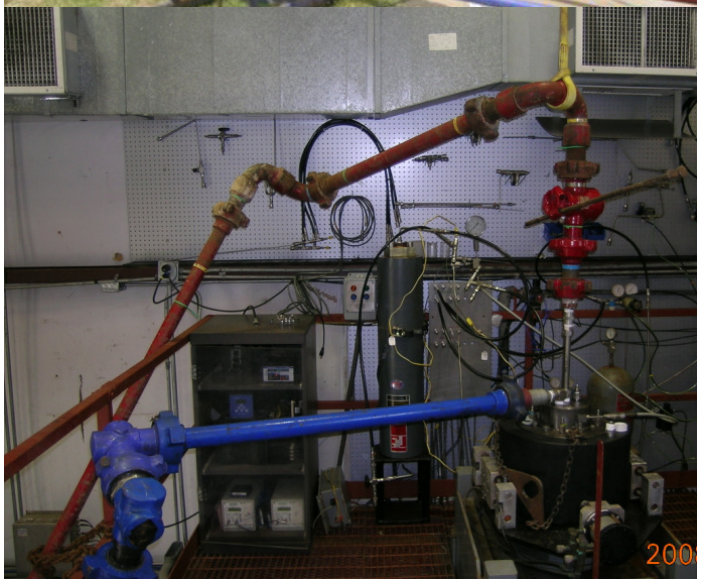
7 days

Return Permeability Testing





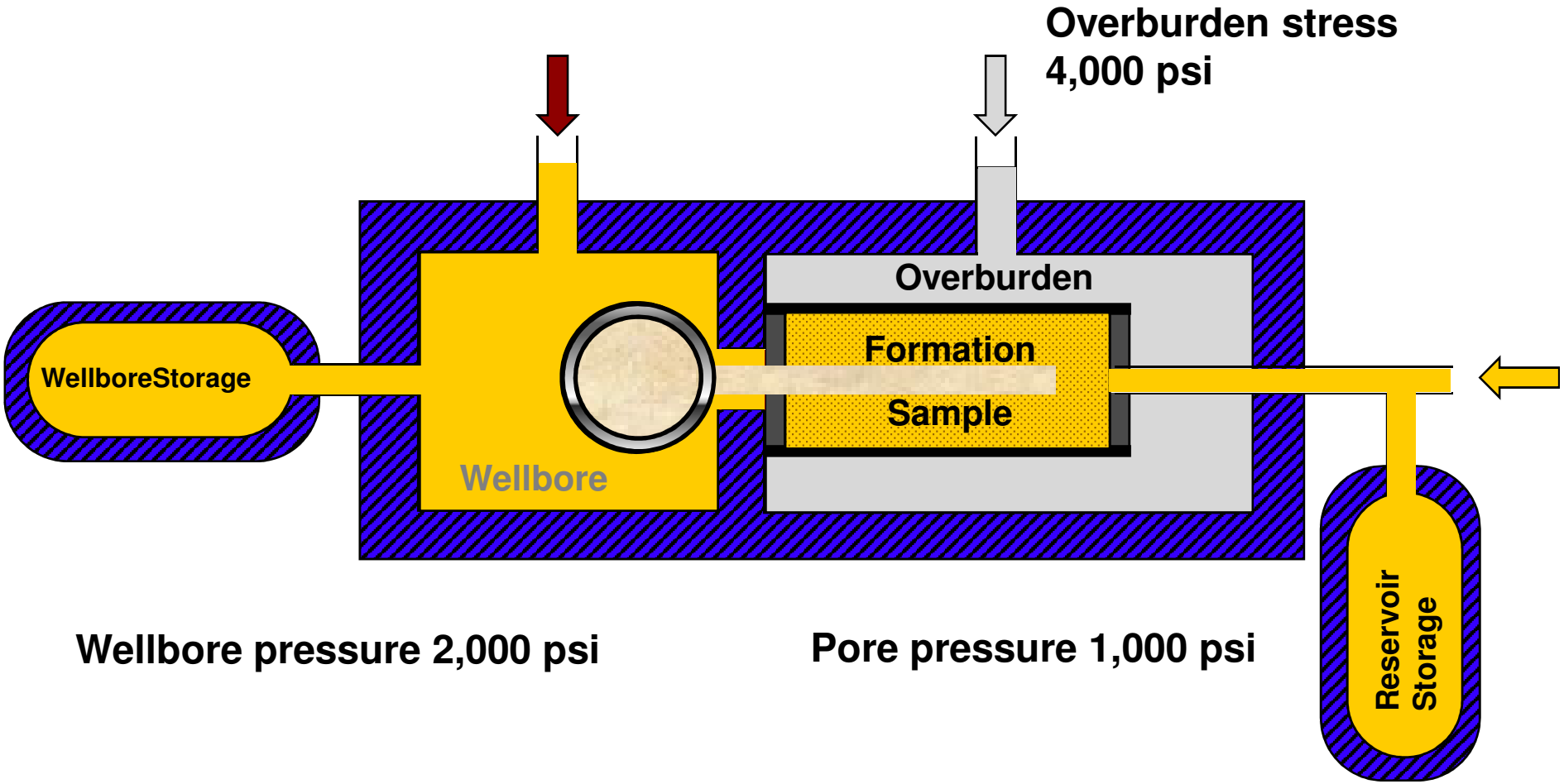
4. Hydrojetting



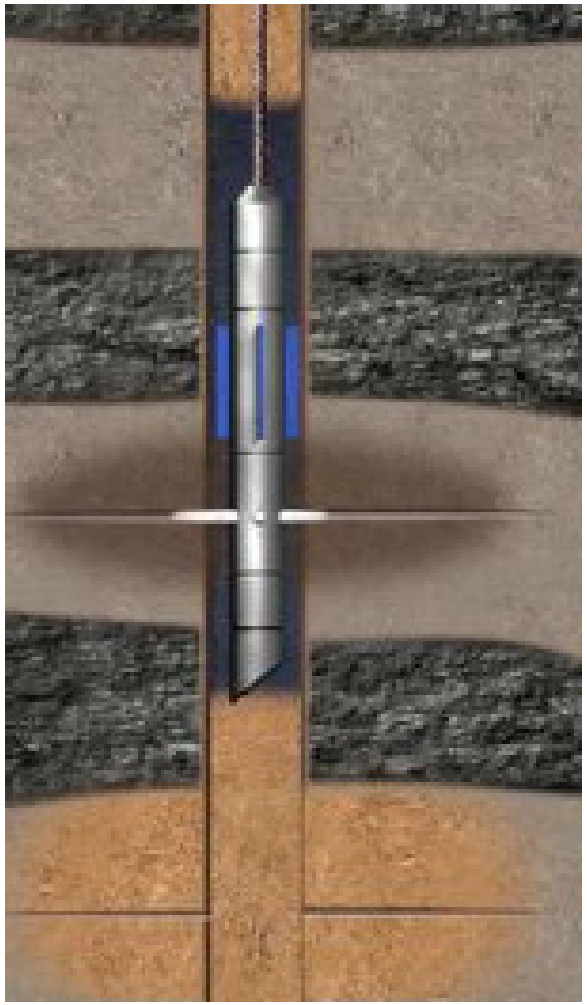
Testing rationale:

- Evaluate effects of hydrojet perforating using CT in a laboratory environment

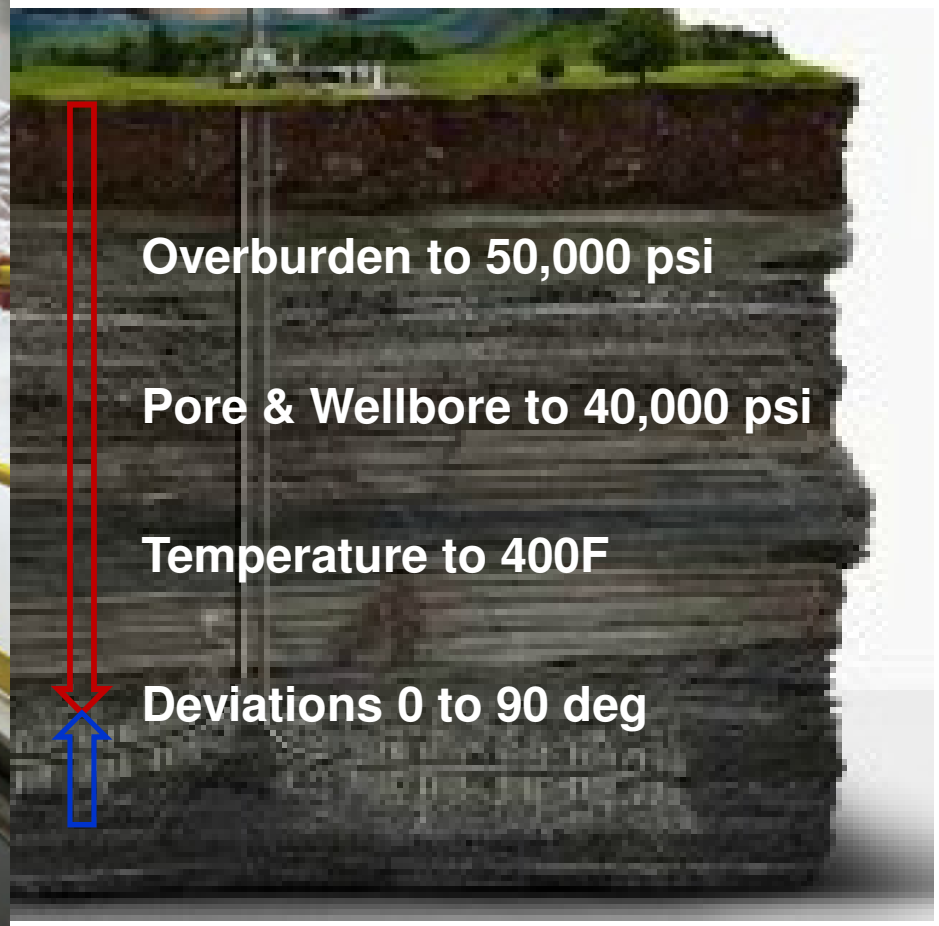
Perforation Flow Laboratory Schematic

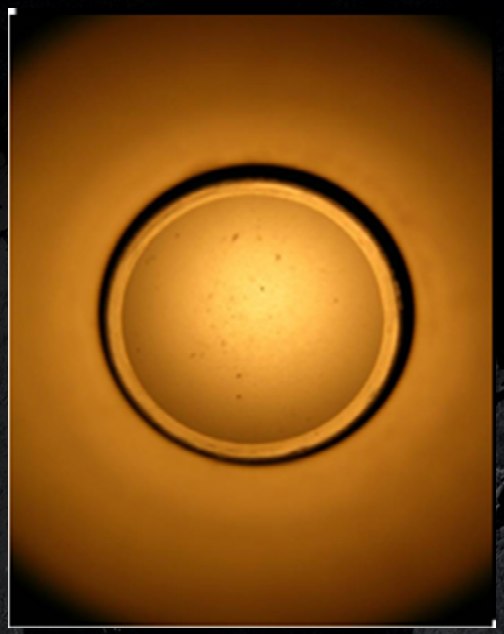


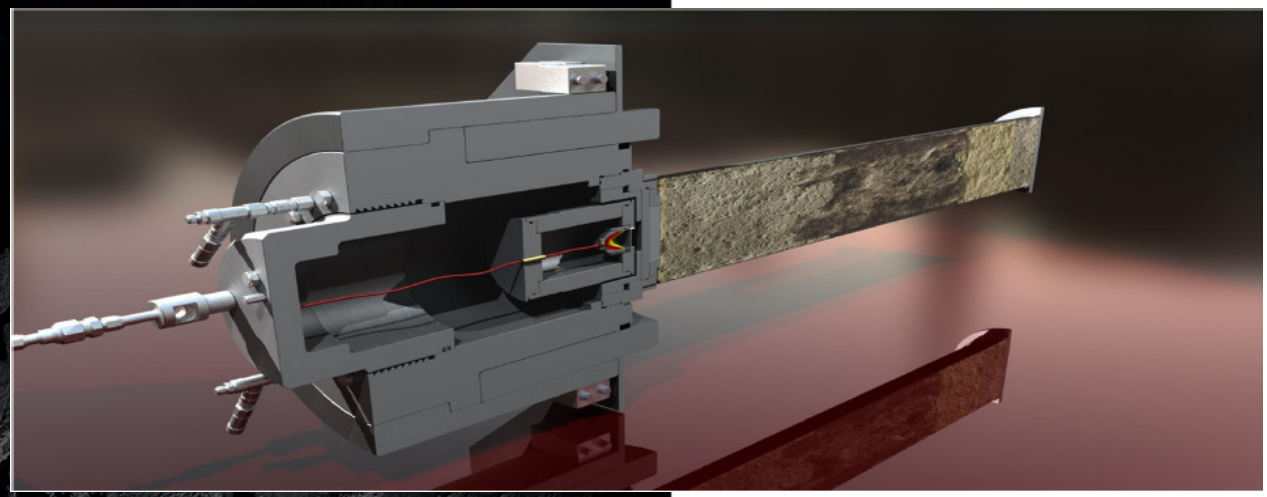
The effects of Hydrojet Perforating on Coil



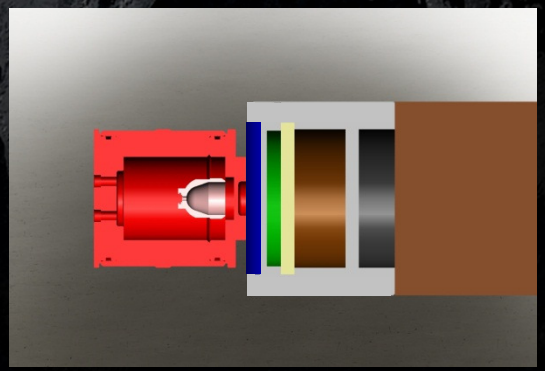
New Capabilities for Simulating Downhole Conditions







Thank You



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