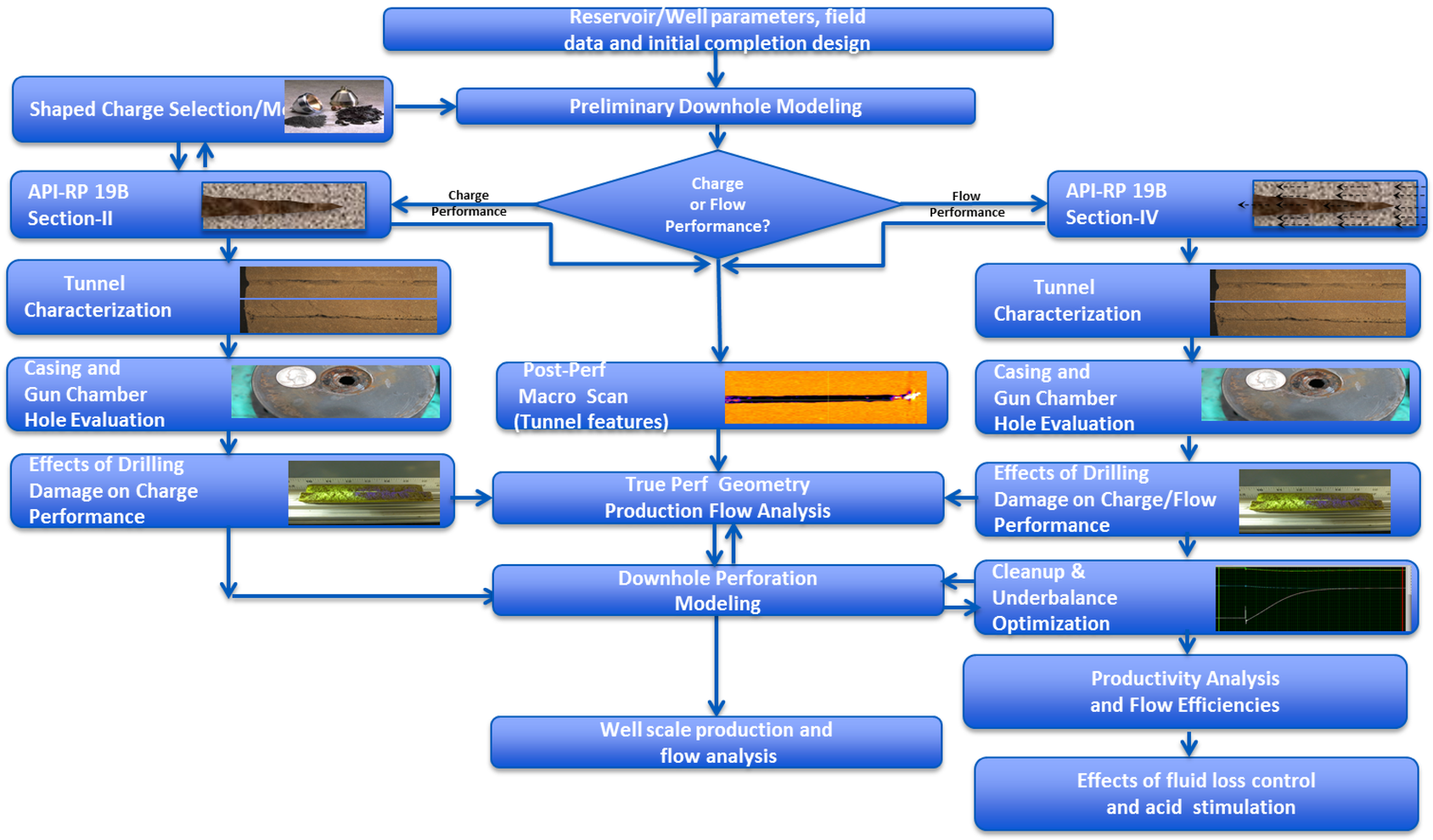
Perforation Flow Laboratory: An Engineering Workflow to Design and Optimize Perforated Completions - Rajani Satti, Baker Hughes

IPS-14-10

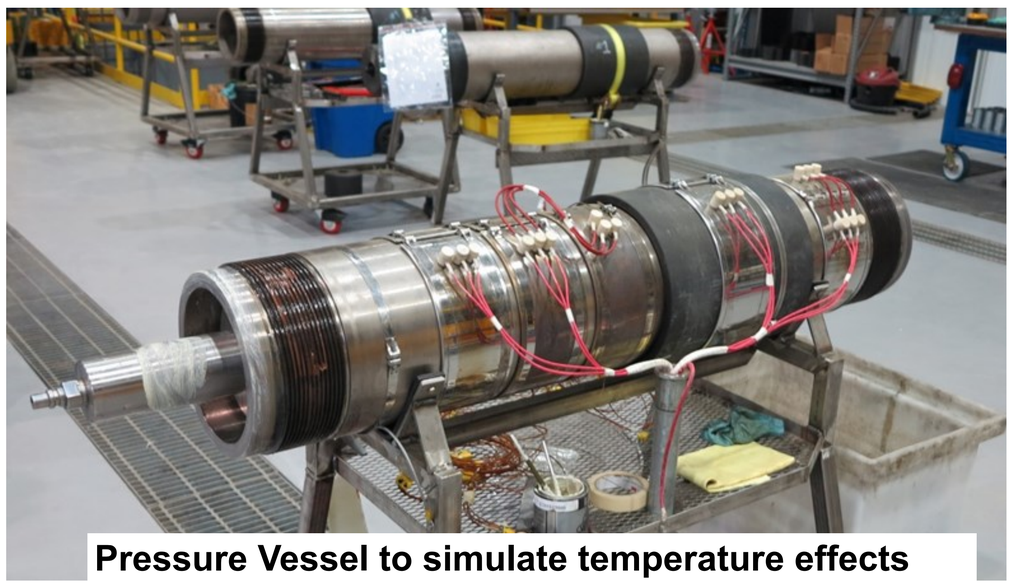
BAKER HUGHES

DESIGN WORKFLOW

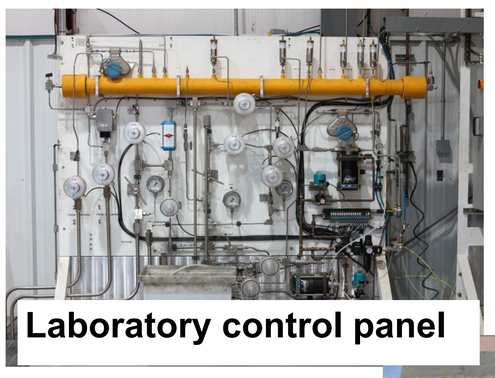


TESTING CAPABILITIES

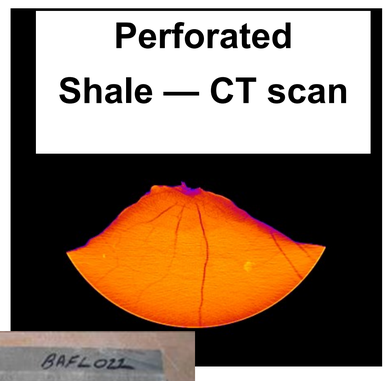
	Section-II	Section-II Modified	Section IV
Target	Analog Rock	Analog Rock	Analog Rock
Confining Pressure	25000	15000	15000
Fluid	Saturation fluid (OMS)	OMS/Brine	OMS/Brine
Wellbore Pressure	25000	10000	10000
Pore Pressure	25000	10000	10000
Temperature	350F (OMS) / 500F (Brine)	350F/500F	350F/500F
Pre-shot Flow	Not Applicable	Applicable	Applicable
Post-shot Flow	Not Applicable	Not Applicable	Applicable



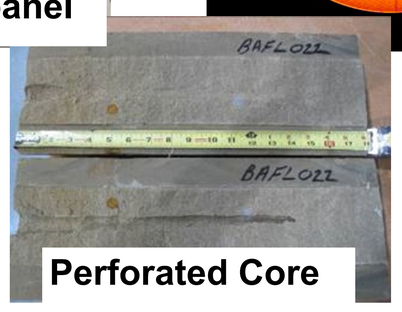
Pressure Vessel to simulate temperature effects



Laboratory control panel

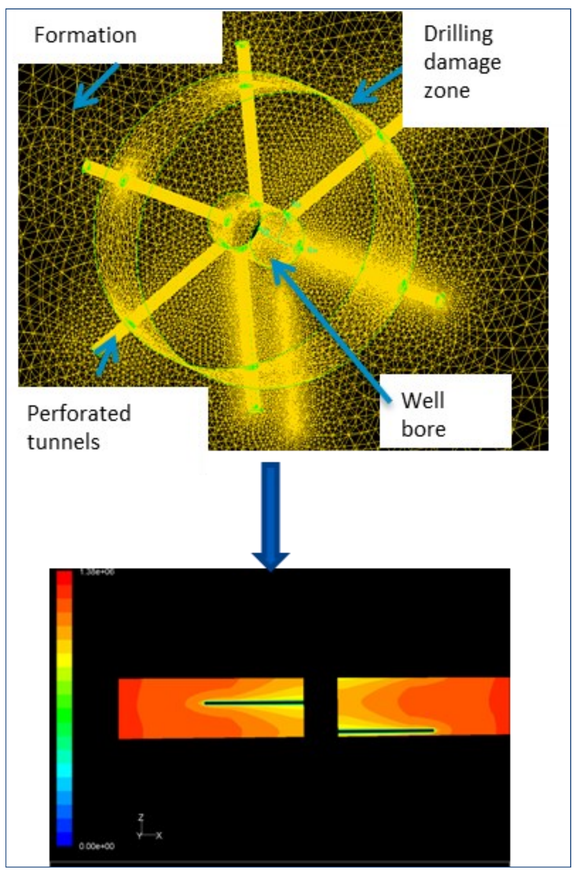


Perforated Shale — CT scan

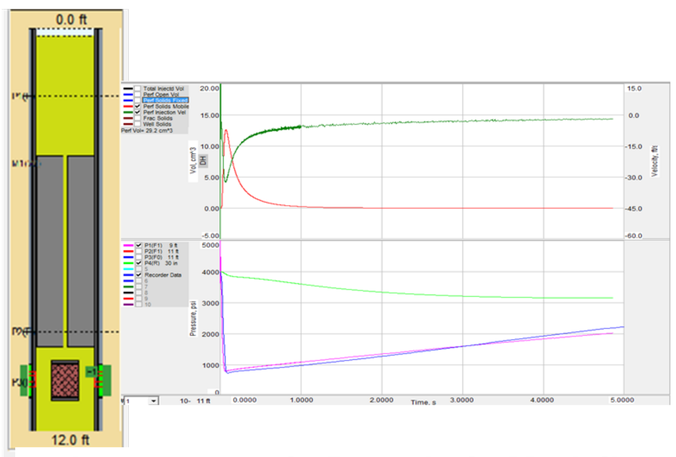


Perforated Core

MODELING CAPABILITIES



Production Flow modeling around perforations



Laboratory scale Downhole Modeling to complement Section-IV testing

The Challenge

- Difficulty to assess performance of perforating systems in harsh and complex downhole environments
- Simulation tools : Perforation flow laboratories and predictive models

Integrated Experimental and Modeling Approach

- Understand physical mechanisms in Shaped Charge Perforating
- Develop and validate predictive dynamic Downhole models
- Critical approach for complex well completions

Experimental Capabilities

- API-19B RP Section-II and Section-IV testing capabilities
- Rock testing at downhole conditions (sandstones/carbonates/shales)
- Advanced interpretation techniques involving productivity, petrophysics, CT scanning, particle analysis etc.

Modeling Applications

- Section-IV testing based dynamic modeling platform
- Shaped charge design modeling
- CFD/Nodal analysis tools for productivity optimization.

Looking Beyond Perforating

- Influence of Drilling Damage
- Effect of fluid-loss control pills
- Acid Stimulation