

2019 NAPS

NORTH AMERICA PERFORATING SYMPOSIUM

AND SAFETY FORUM

DALLAS - FORT WORTH. AUGUST 5-6, 2019.

2019-NAPS-8.3

AUTHORS: M. Benavides, L. Nguyen, C. Baumann, C. Guedes, S. Aboelnaga, F. Garcia-Osuna, V. Flores, Z. Zaouali, S. Al Rasbi, Schlumberger

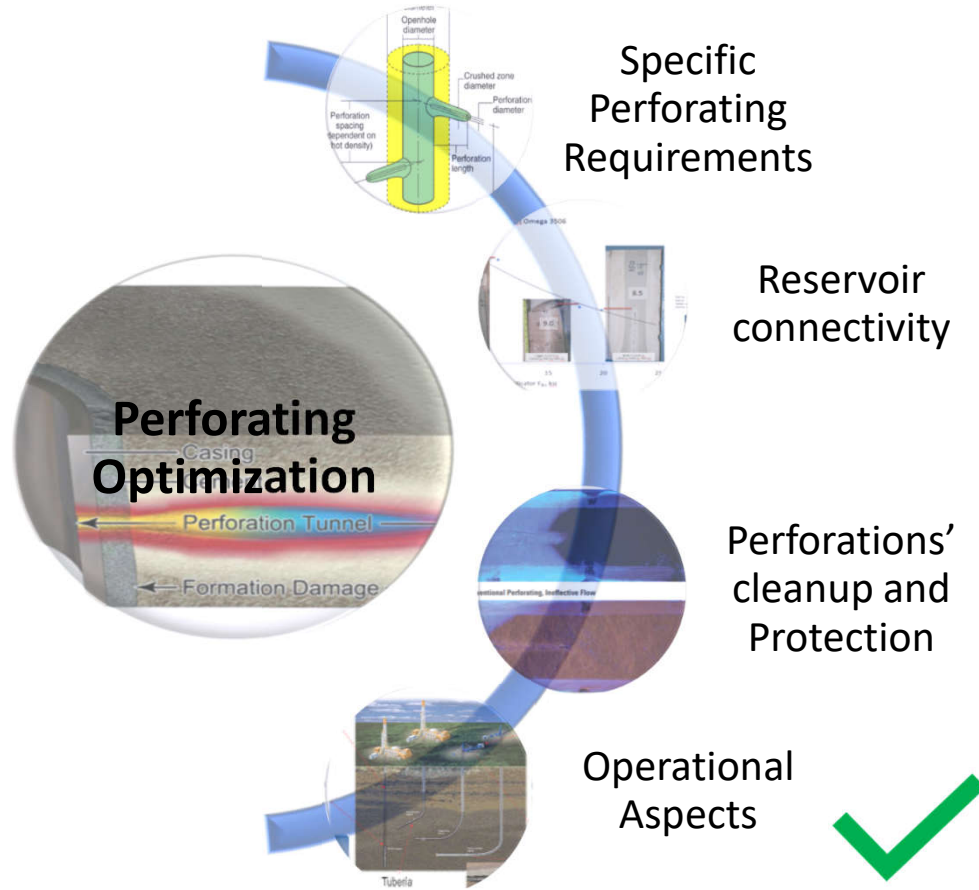
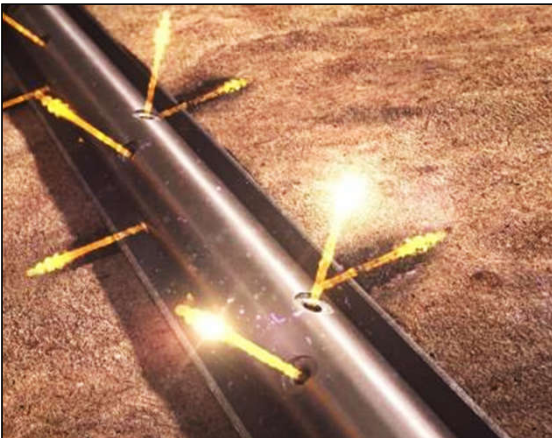
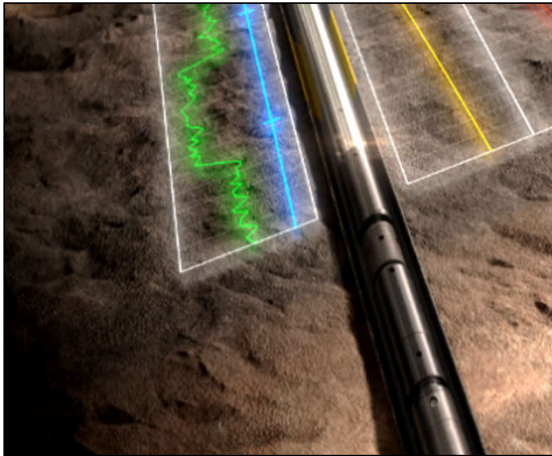
INSTRUMENTED DOCKING PERFORATING GUN SYSTEM

Field experience results

AGENDA

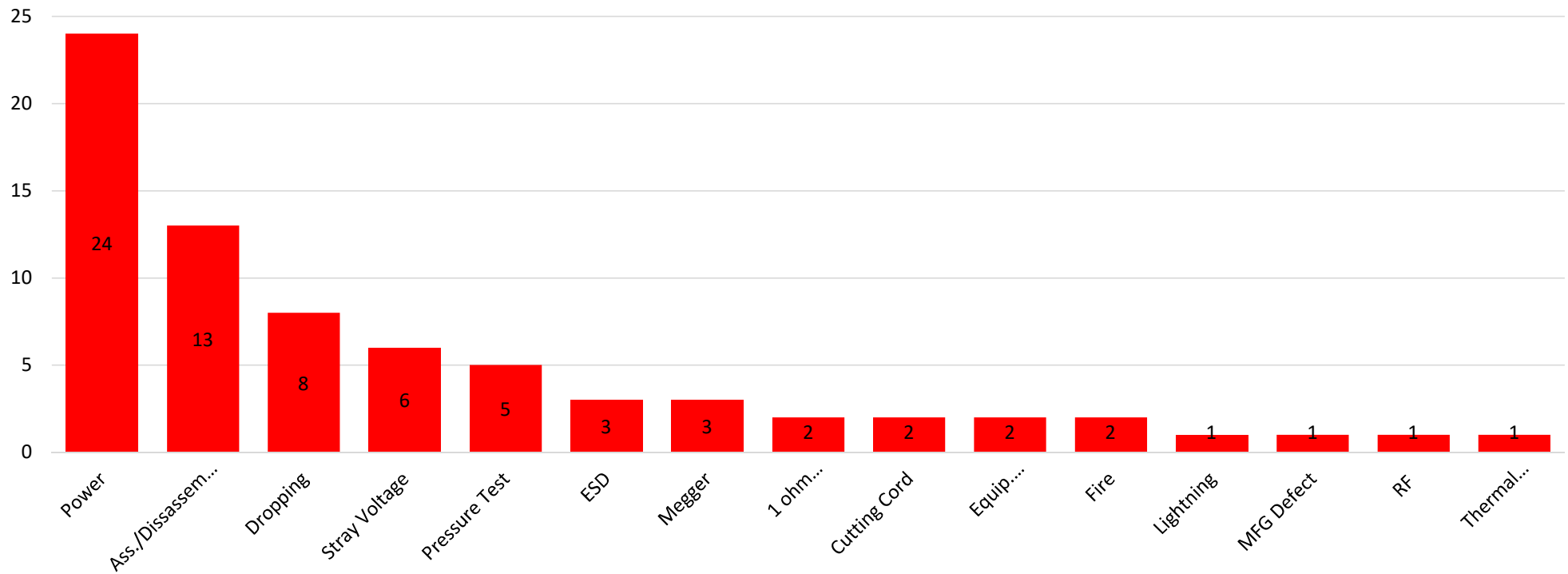
- Perforating Optimization Workflow
- Safety Moment
- A Novel Perforating System
- Field Experiences
- Summary

PERFORATING OPTIMIZATION WORKFLOW



SAFETY MOMENT

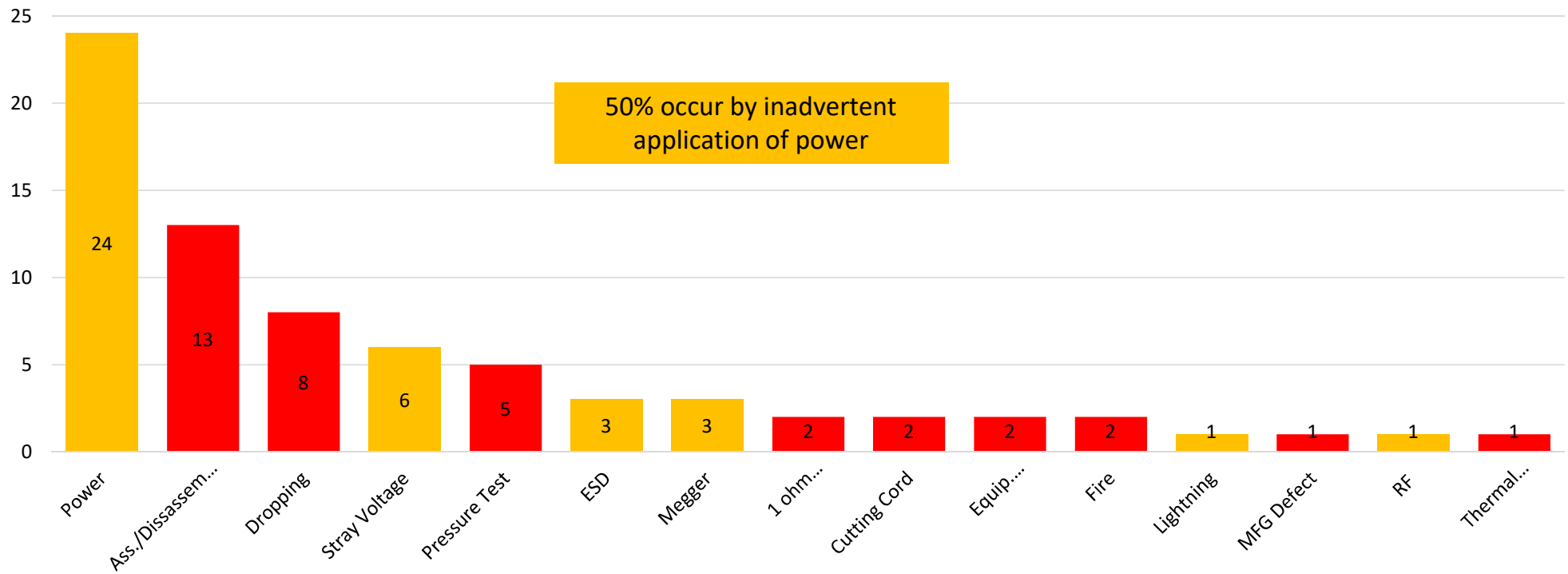
Wellsite Surface Detonation Events



*Data from International Perforating Forum <https://perforators.org/>

SAFETY MOMENT

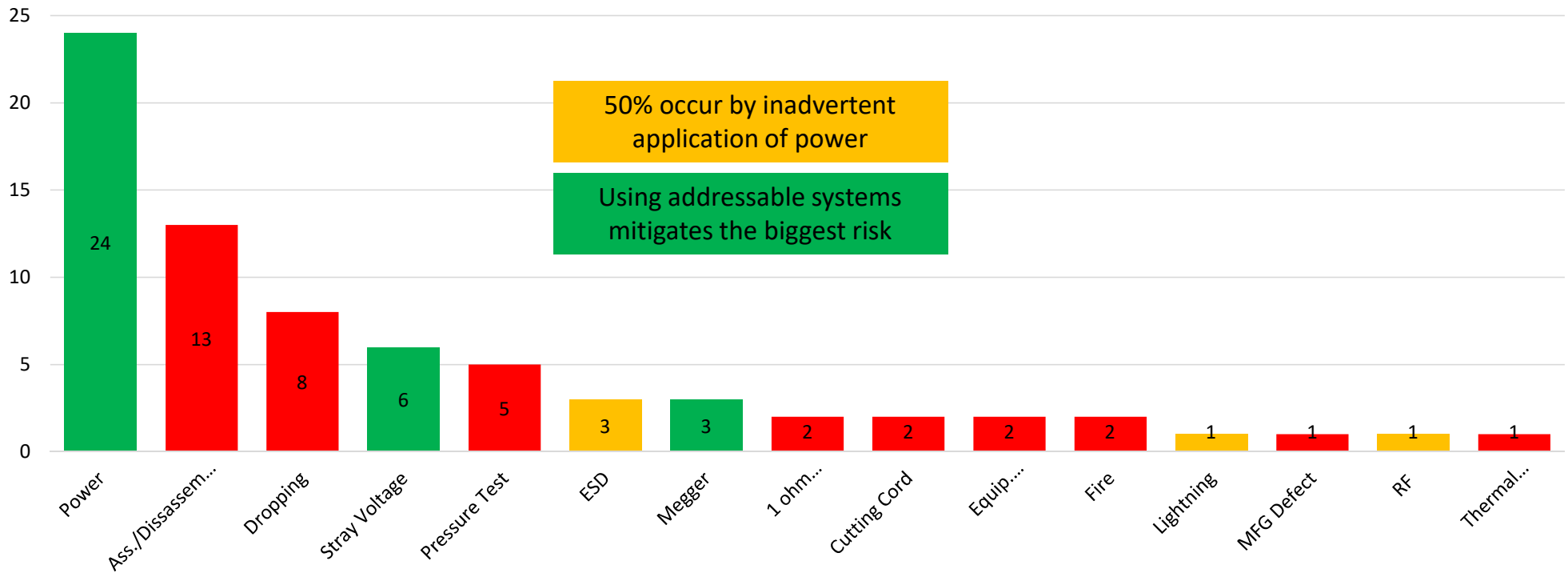
Wellsite Surface Detonation Events



*Data from International Perforating Forum <https://perforators.org/>

Safety Moment

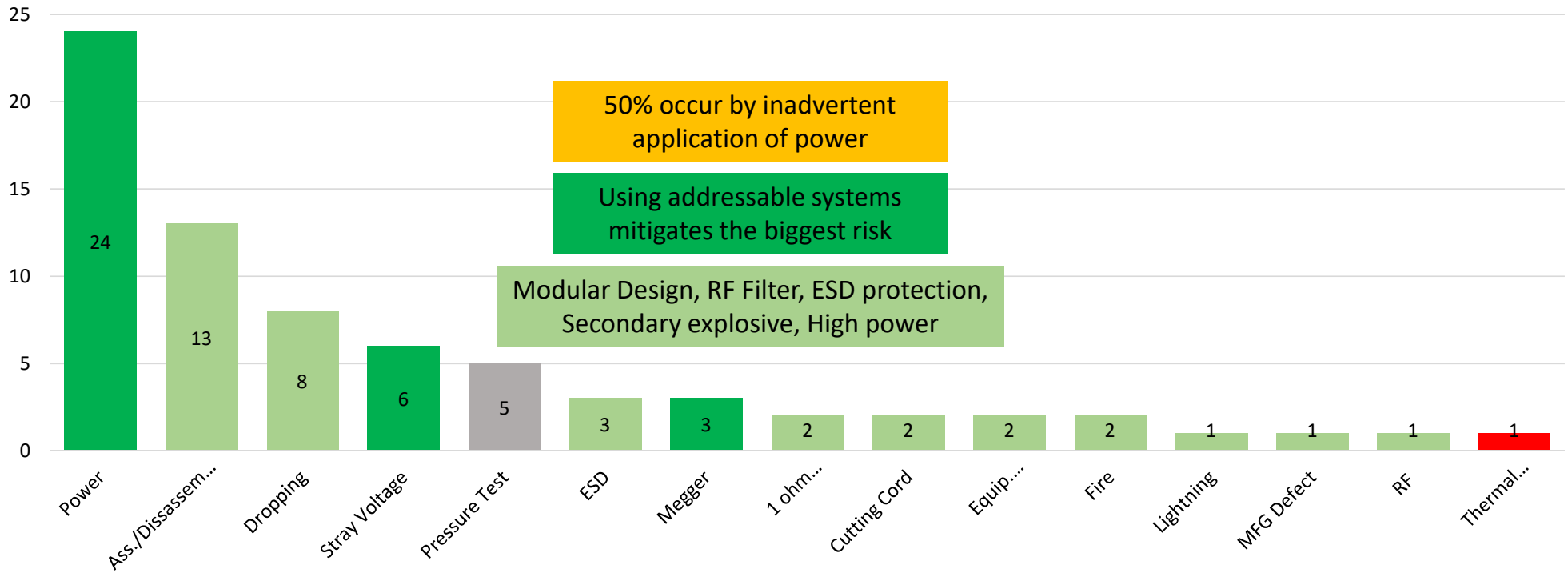
Wellsite Surface Detonation Events



*Data from International Perforating Forum <https://perforators.org/>

SAFETY MOMENT

Wellsite Surface Detonation Events



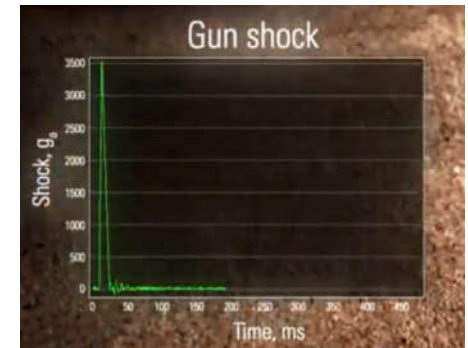
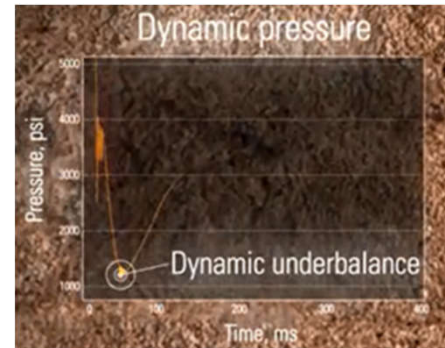
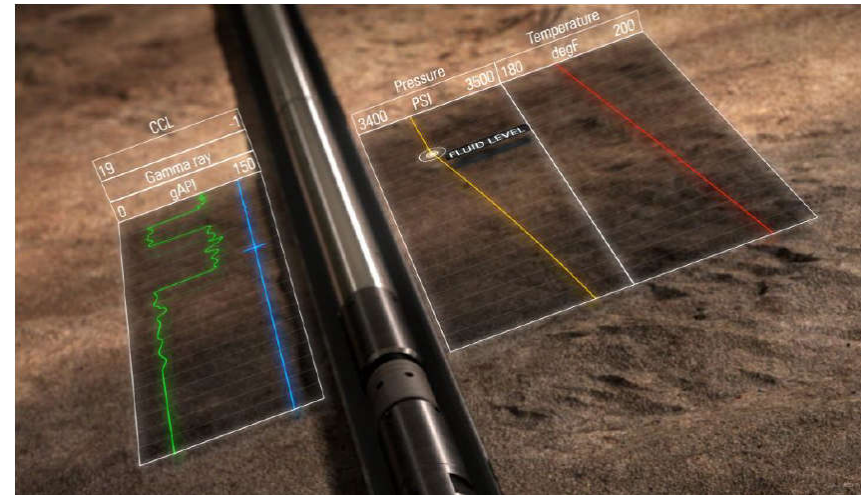
*Data from International Perforating Forum <https://perforators.org/>

A NOVEL PERFORATING SYSTEM

Docking Gun Module



Advanced Measurement Module



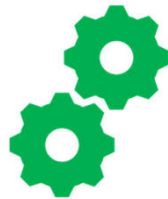
A NOVEL PERFORATING SYSTEM

SAFETY



API RP67
RF Safe
Operations
New Safety
Placard

EFFICIENCY



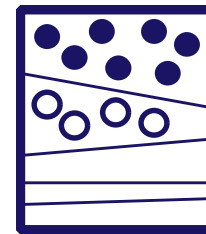
Arm in Advance
Selectivity
Maximized
Payloads

RELIABILITY



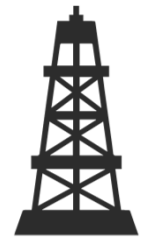
Engineered design
Fewer misruns
Elimination of
port plugs, wiring
and Shock
Absorber

PRODUCTIVITY



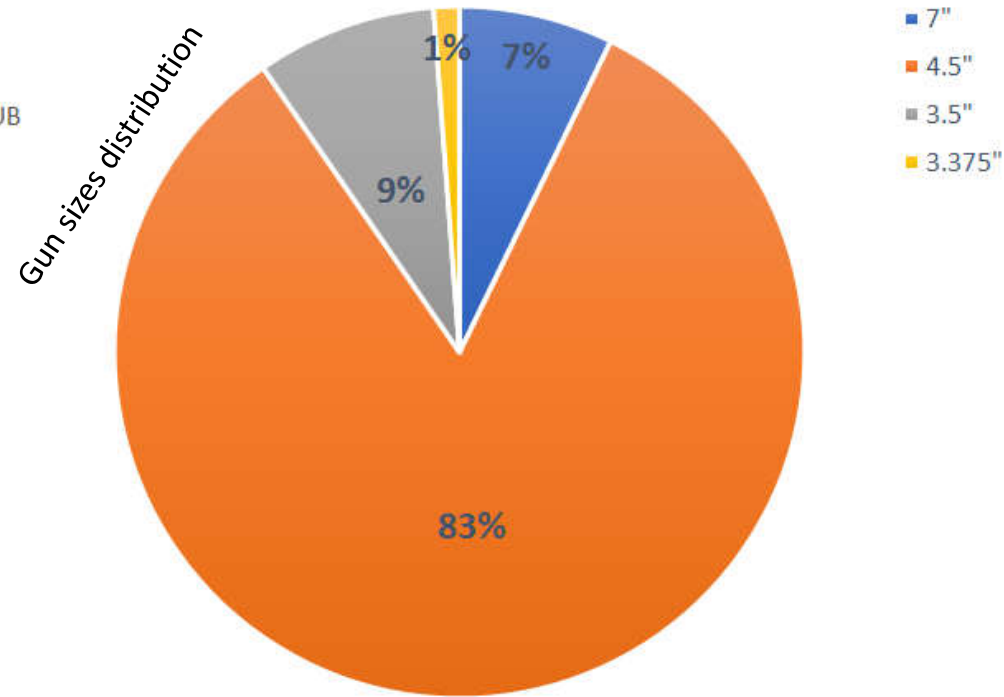
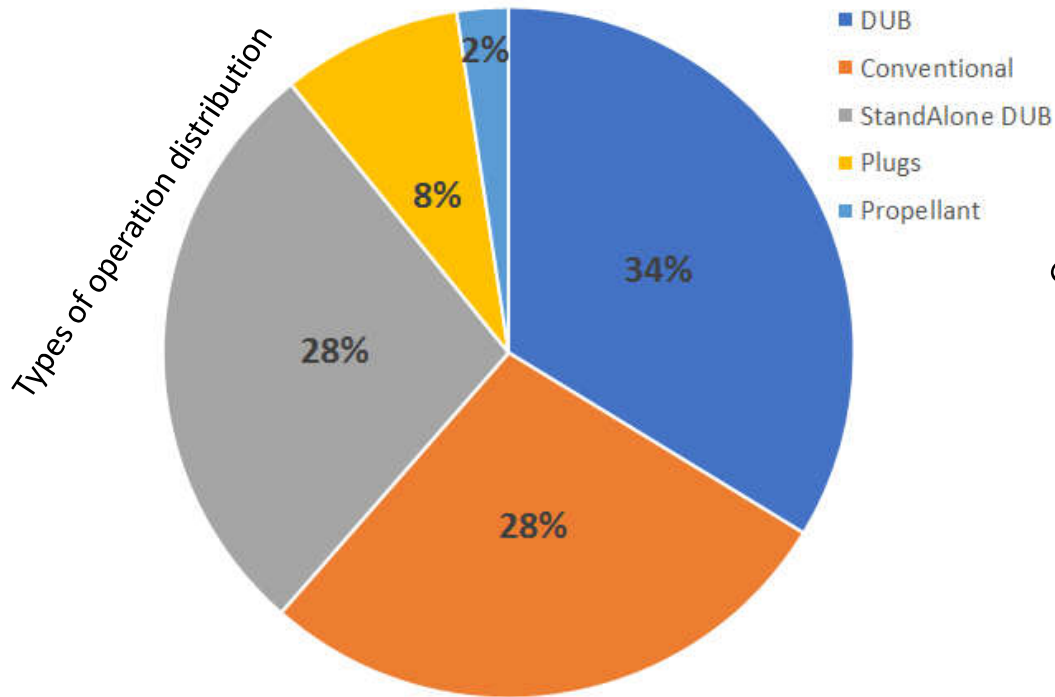
Fast Pressure
Gauge
Gun Shock
Fluid Level
Hydrostatic
Pressure

COST PER BARREL



Rig-Time Savings
Reduced Police
Escorts
More Interventions

FIELD EXPERIENCES – Operational Statistics Ecuador



151

Total # of runs

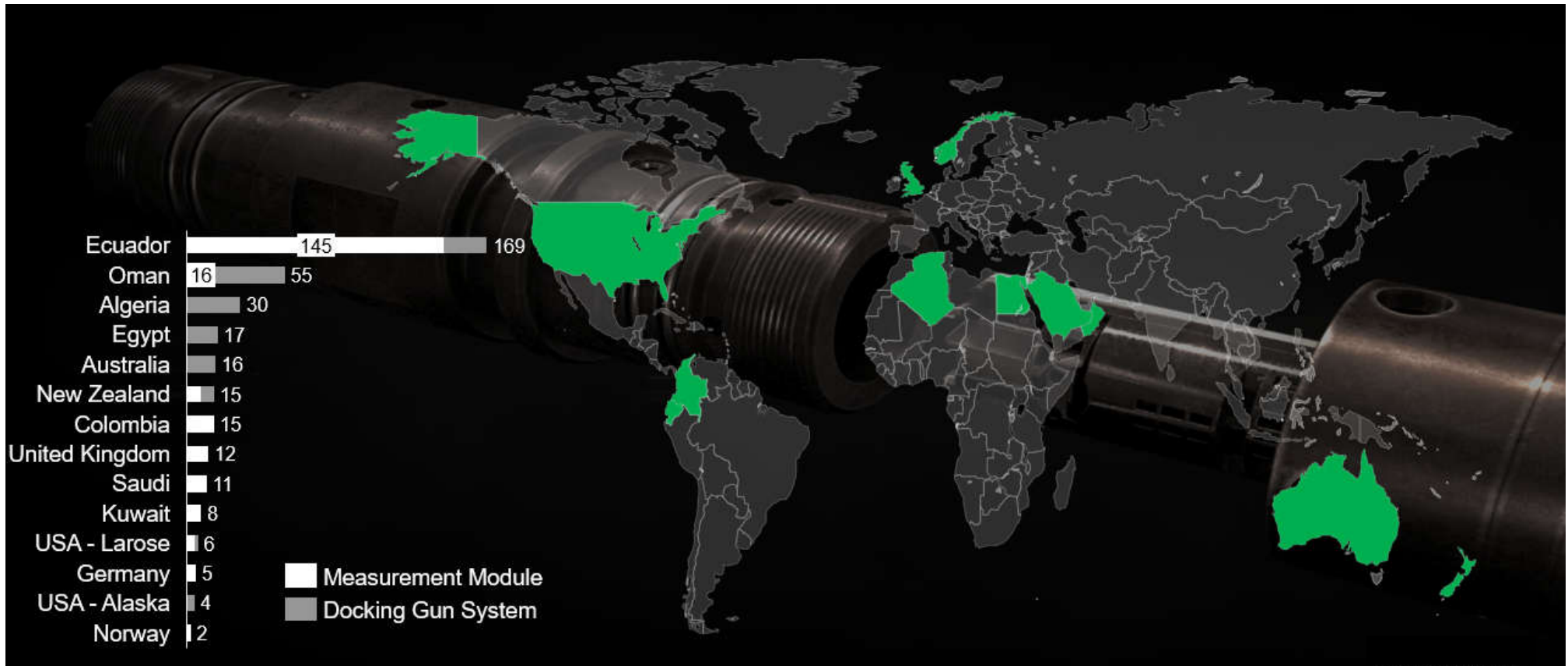
7

Maximum # of runs per job

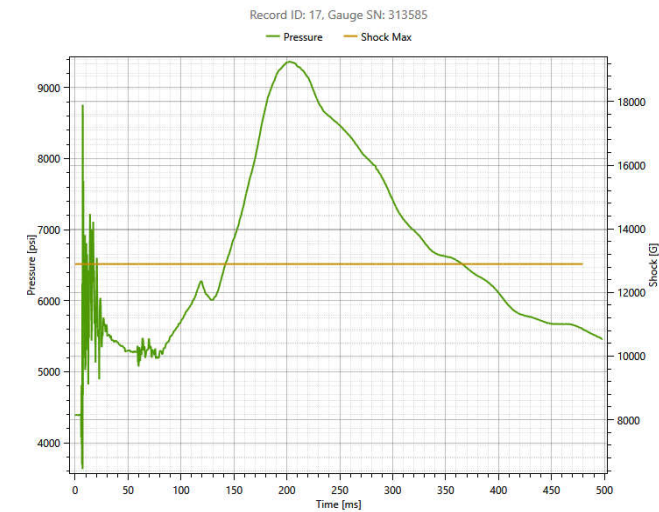
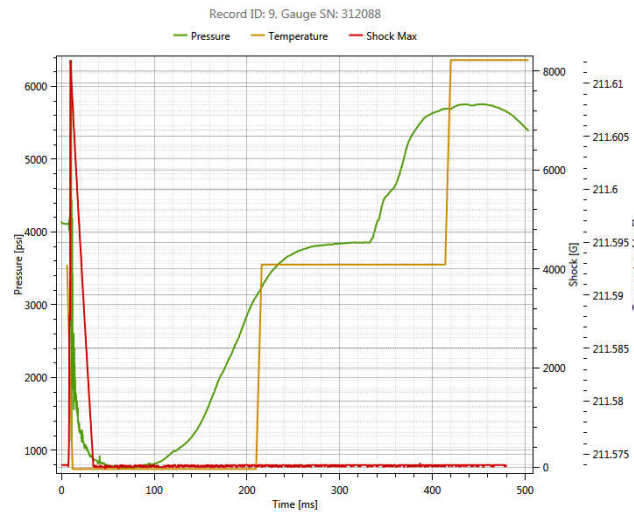
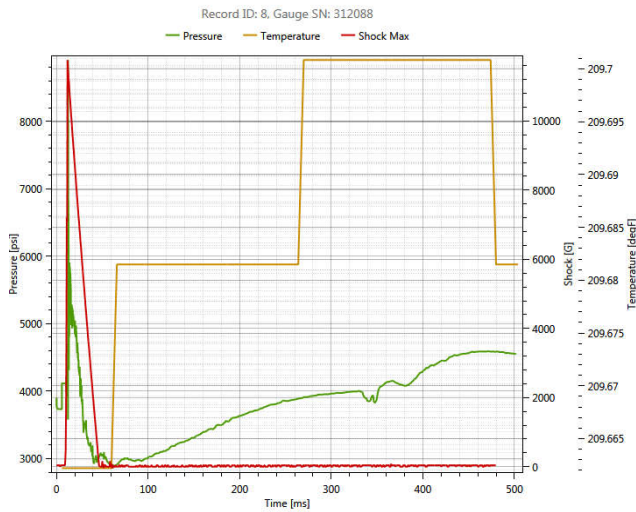
1,980

Heaviest Tool string

Field Experiences – REST OF THE WORLD

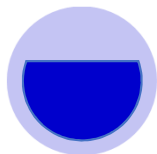


ADVANCED MEASUREMENTS MODULE – Dynamic measurements WHILE perforating



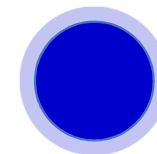
Conventional Perforating

Peak Shock: 12,000G
 Max. Pressure: 7,000 psi
 Min. Pressure: 3,000 psi



Stand Alone Dynamic Underbalance

Peak Shock: 8,800G
 Max. Pressure: 4,000 psi
 Min. Pressure: 800 psi

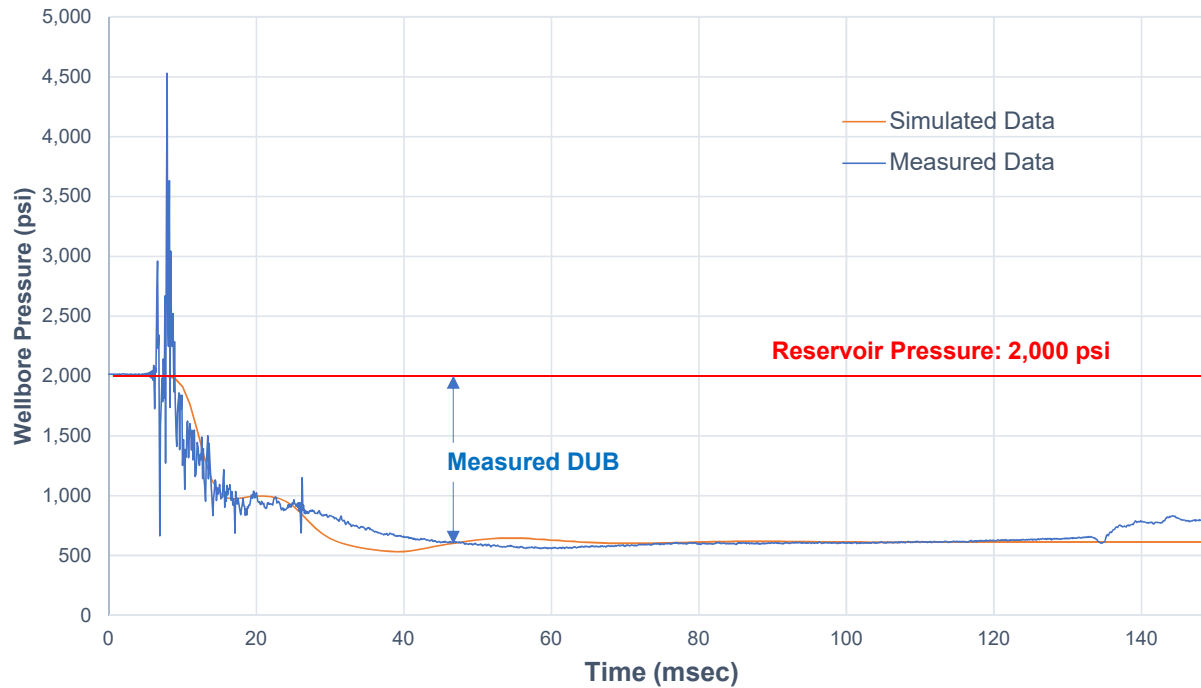


Perforating assisted propellant

Peak Shock: 13,000G
 Max. Pressure: 10,000 psi
 Min Pressure: 5,200 psi

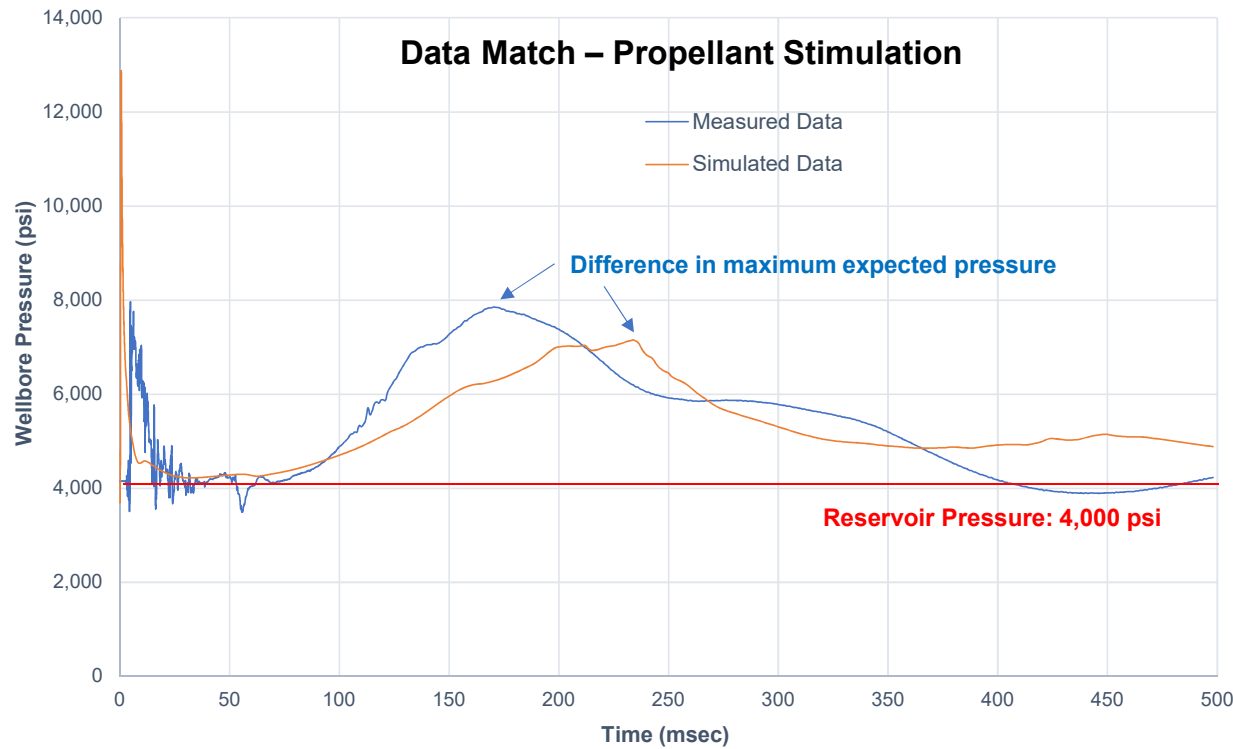
ADVANCED MEASUREMENTS MODULE – Dynamic measurements MATCH with simulations

Data Match – Standalone DUB



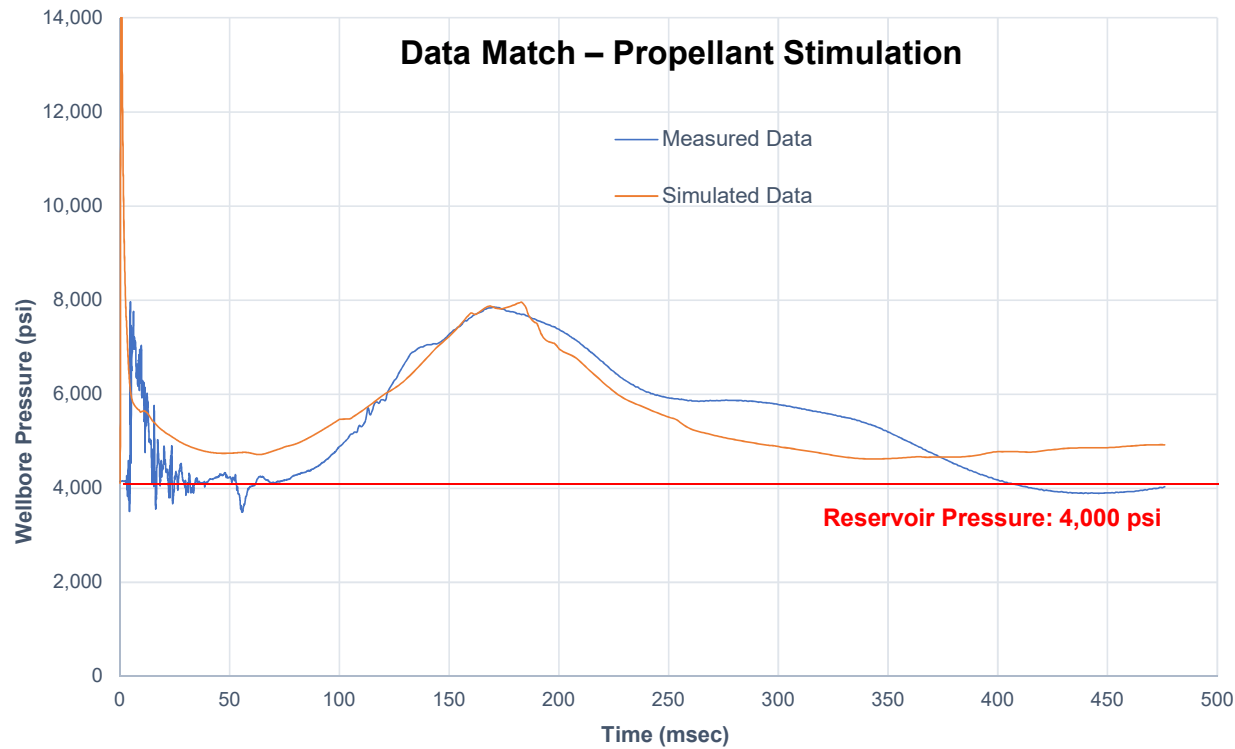
Real time dynamic underbalance measurements are compared with the simulation results getting a confirmation of a dynamic underbalance in the order of -1,400 psi

ADVANCED MEASUREMENTS MODULE – Dynamic measurements for productivity estimations



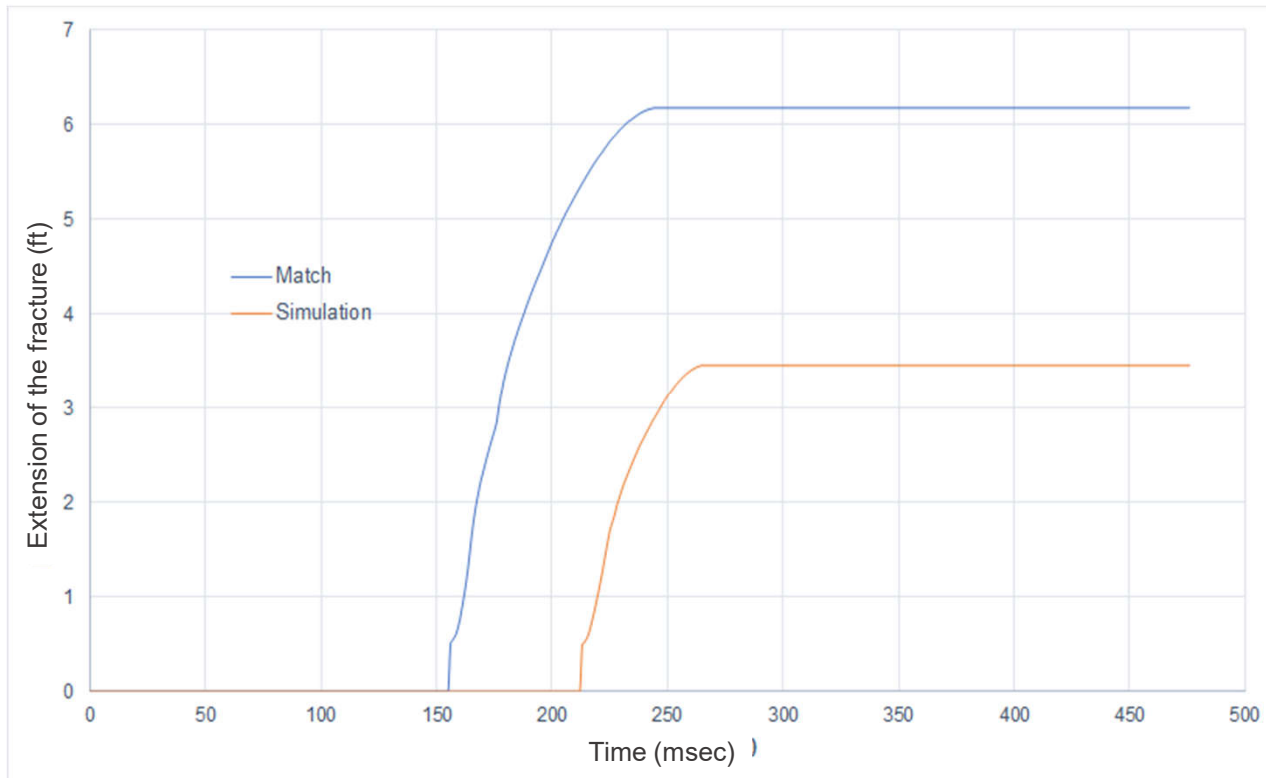
Differences were found between the simulated values and the measured data

ADVANCED MEASUREMENTS MODULE – Dynamic measurements for productivity estimations



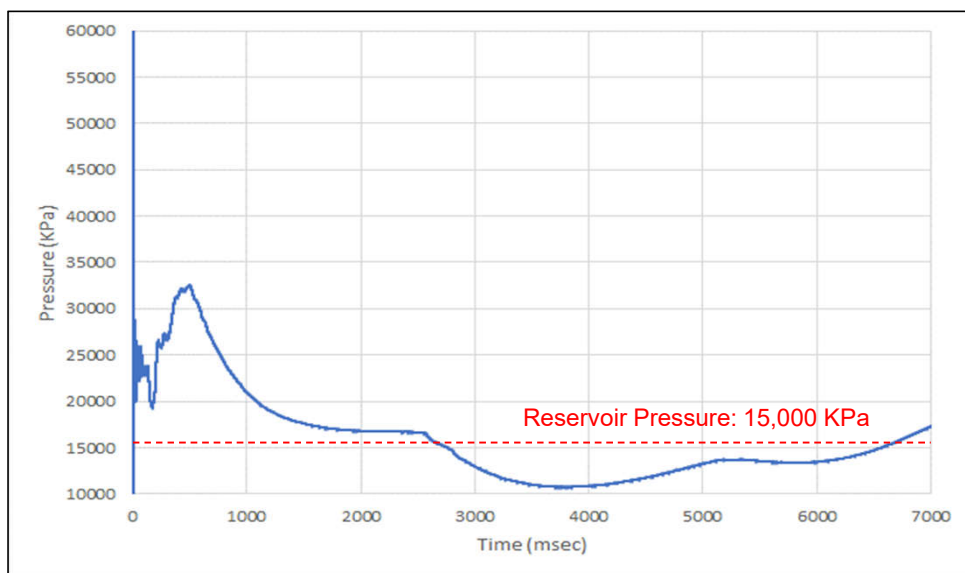
Simulation was re-run adjusting the real opened interval (23 ft instead of 14 ft) and the revised formation permeability (From 30 mD to 25 md)

ADVANCED MEASUREMENTS MODULE – Dynamic measurements for productivity estimations



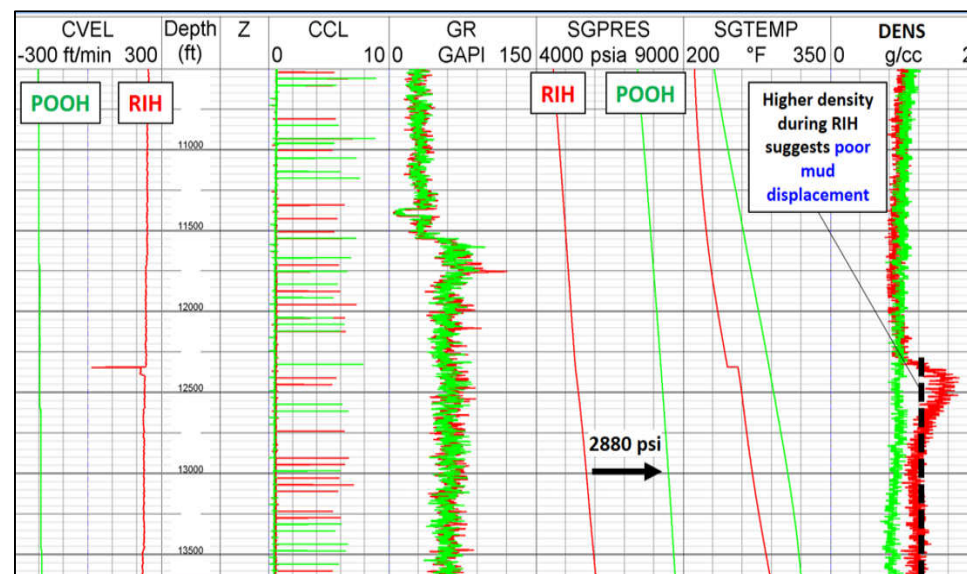
With the adjusted parameters the fracture length was simulated again: 3.5 ft to 6 ft and the productivity results were adjusted

ADVANCED MEASUREMENTS MODULE – Wellbore conditions verification

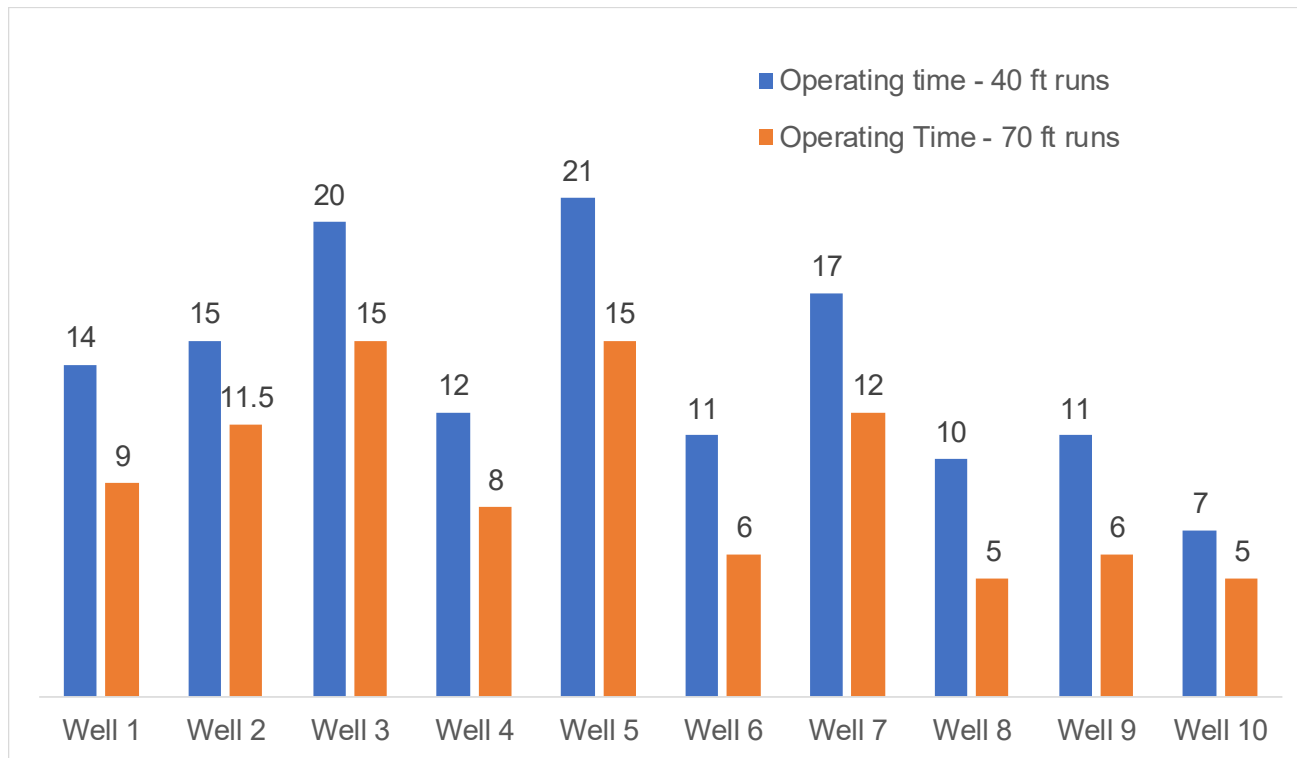


In Oman, real time BHP measurements were used to ensure enough confinement pressure before propellant stimulation in low reservoir pressure wells

In Saudi, pressure measurements while running in hole showed poor mud displacement in front of the interest zone and allowed the operator to improve its procedures minimizing formation damage risk



DOCKING GUN SYSTEM – Enabling extreme wireline deployments in brownfields



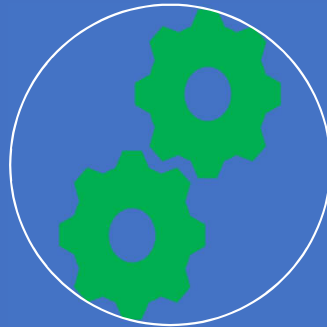
Extreme wireline deployments in offshore environments have reached world record. In brownfields where the rigs, location and budgets are smaller, the docking gun system enabled the ability of conveying 4 ½” gun strings longer than 40 ft (Up to 70 ft) and brought 33% time savings in a 10 well campaign in Ecuador

SUMMARY



Safety

- More than 300 runs worldwide in various types of locations



Efficiency

- Time reductions in the order of 33% in brownfield applications



Reliability

- No misruns
- Operations up to 350 degF, 20kpsi
- No shock absorber
- Tractor and electrical coil tubing



Productivity

- Real time verification of wellbore conditions for propellant stimulation, completion fluid displacement control, simulations' validations and productivity estimations



QUESTIONS?
THANK YOU

2019 NAPS

NORTH AMERICA PERFORATING SYMPOSIUM

AND SAFETY FORUM

DALLAS - FORT WORTH. AUGUST 5-6, 2019.

2019-NAPS-8.3

AUTHORS: M. Benavides, L. Nguyen, C. Baumann, C. Guedes, S. Aboelnaga, F. Garcia-Osuna, V. Flores, Z. Zaouali, S. Al Rasbi, Schlumberger

REFERENCES

- SPE-194239-MS, Novel Perforating System with Integrated Real Time Downhole Measurements (March 2019)
- SPE-194266-MS, Under Pressure Perforating Deployment System leads to a six-fold Reduction in Wireline Runs and a three-fold Reduction (March 2019)
- SPE-194281 – MS, Perforating Conveyance Technology Achieves a World Record in Maximizing Operational Efficiency (March 2019)
- SPE-189929-MS, Next-Generation Release Device: Strong, Safer, Efficient and Rigorously Qualified (March 2018)
- SPE 184763-MS, The 30,000 lbs Extreme Pull Wireline Conveyance System And The Highest Pull Ever Help Gulf Of Mexico Operator Save 5 MUSD By Avoiding Drill Pipe Conveyance And Tool Fishing Operations In The Most Challenging Deepwater Well (March 2017)
- SPE-184811-MS, Wireline-Deployed Perforating: Maximizing Efficiency Without Killing the Well (March 2017)
- IBP2181-16, Improving Perforating Efficiency (October 2016)
- IADC/SPE-180668-MS, Expanding the Reach of Wireline Perforating (August 2016)
- SPE 178890-MS, New Wireline Extreme Pull Systems Reduce Gulf of Mexico Deepwater Fishing Incidents Saving Operators 12 Days of Deepwater Rig Time and USD 9 Million (March 2016)
- SPE- 168281-MS, High Tension Electrically Controlled Release Device Improves Reliability of Stuck Tool Release in the Gulf of Thailand (March 2014)
- SPE – 164762-MS, Polymer-Locked, Crush-Free Wireline Composite Cables Reduce Tool Sticking and HSE Risk in Emerging Deepwater Reservoirs (October 2012)