

2019 NAPS

NORTH AMERICA PERFORATING SYMPOSIUM

AND SAFETY FORUM

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

2019-NAPS-5.3

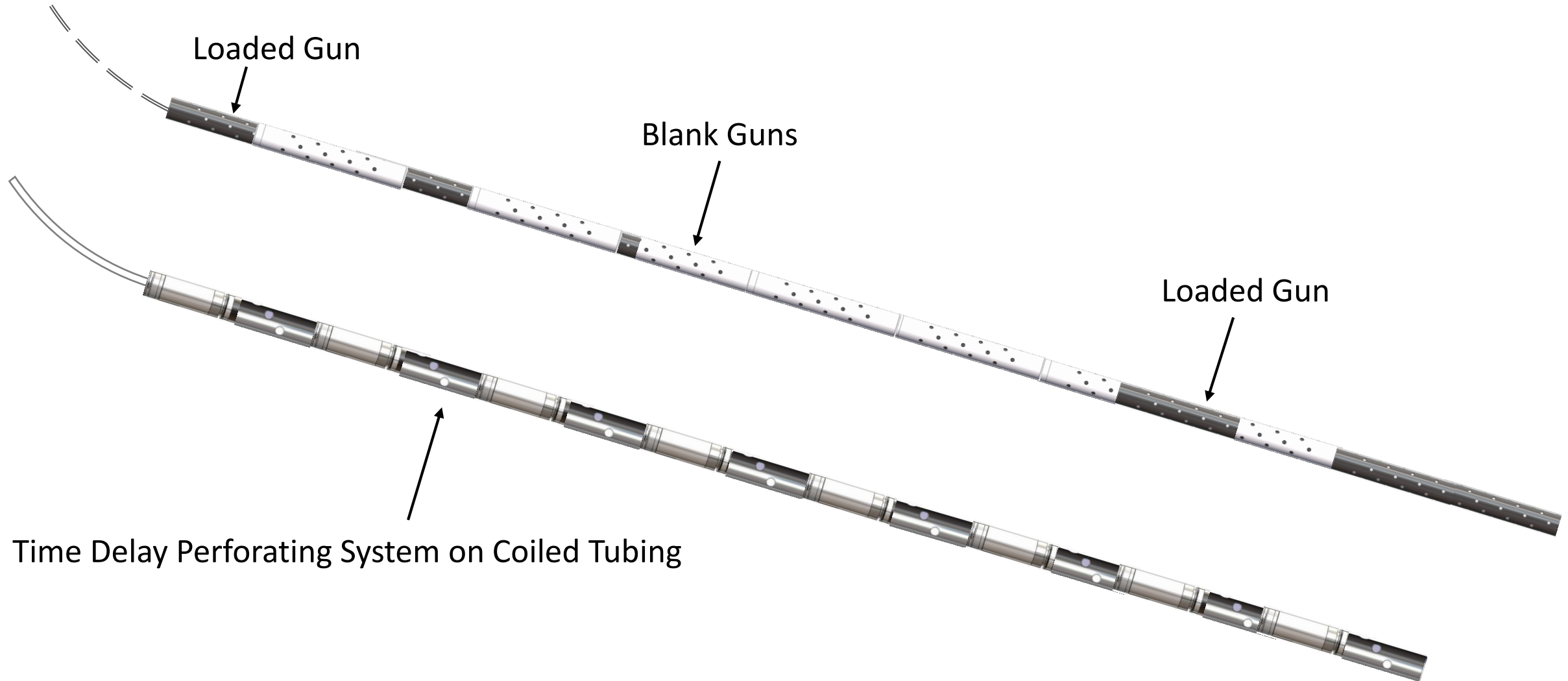
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New Method for Tubing Conveyed Perforating Long Intervals with Improved Reliability

New Method for Tubing Conveyed Perforating (TCP)

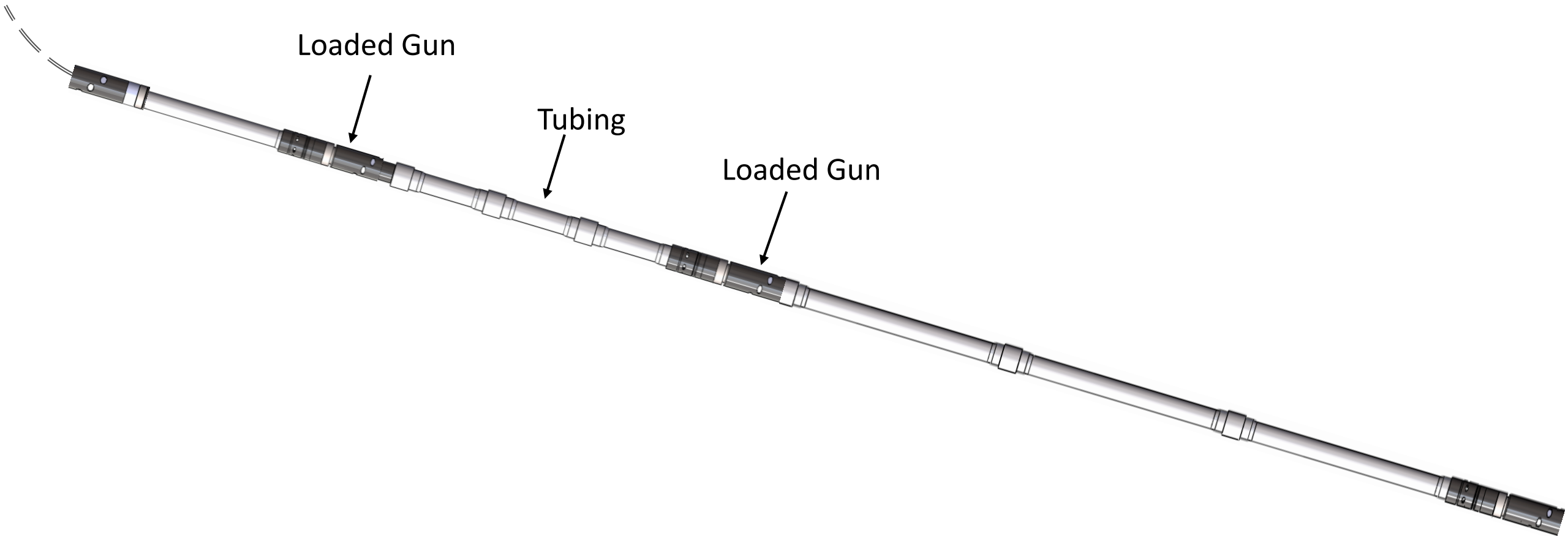
- Enables perforation of multiple clusters in Horizontal Wells with existing perforations
- Eliminates need for blank spacer guns on long intervals in Vertical or Horizontal Wells

Historical Methodology for Horizontal Re-completes



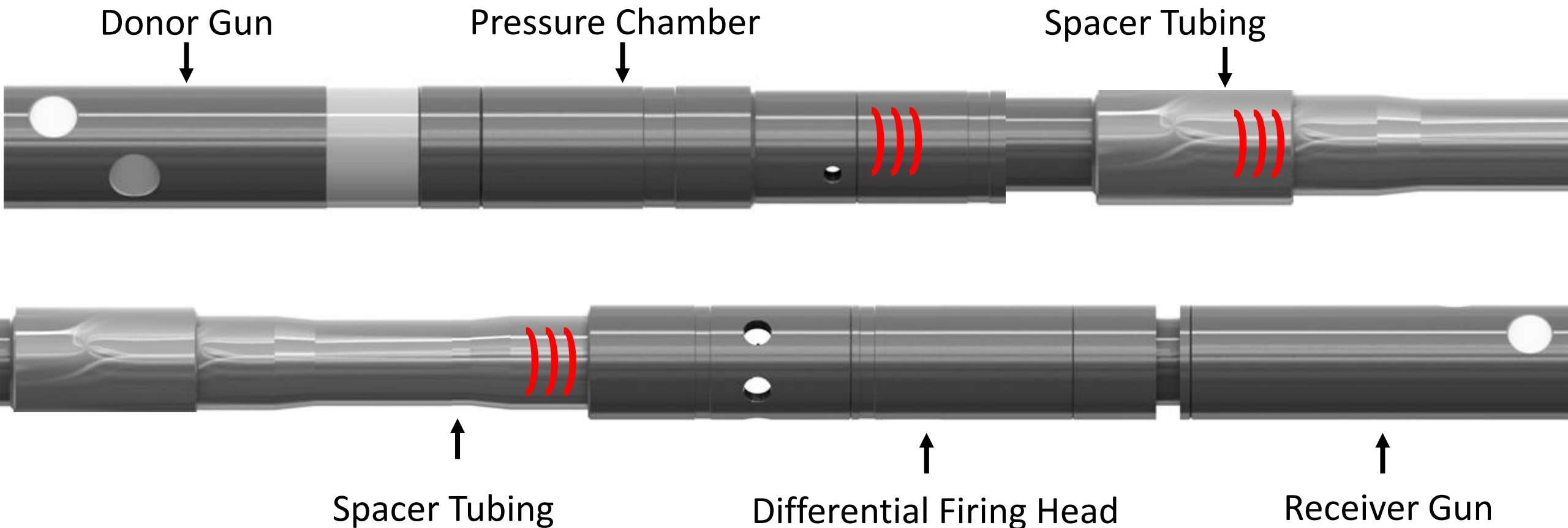
Time Delay Perforating System on Coiled Tubing

New Pressure Pulsed Perforating Technology



Pressure Pulsed Perforating

System Operation



Pressure Pulsed Perforating



Field Test Results

- Field Tests – North Dakota
 - 100% Success on 4 Wells
 - 21,000 foot Horizontal Wells in Bakken formation
 - 4,400 PSI hydrostatic pressure
 - Toe stage perforated after sliding sleeve failure
 - Well #1
 - 3 Successful transfers
 - Well #2-4
 - 6 Successful transfers

Field Trial Results

- Field Trial – Permian Basin
 - 100% Success
 - Horizontal Well –Bottom shot @ 14,208'
 - 5,400 PSI hydrostatic pressure
 - 11 Successful transfers in a single run
 - Over 200 existing perforations in Well

Field Trial Results

- Field Trial - California
 - 100% Success
 - Vertical Well
 - 4 Runs in various hydrostatic pressures
 - 15 Successful transfers
 - Maximum of 9 transfers in one run
 - Various transfer intervals

Benefits - Horizontal Wells with existing perforations

- Perforate all clusters in one trip
- All guns are properly positioned when first gun fires
- Improved efficiencies
 - Time (cost) savings for deployment and retrieval
 - Eliminates need to mobilize coiled tubing
 - Eliminates need for time delay fuses

Benefits- Long blank intervals

- Improved operational efficiencies
 - Faster deployment and retrieval of perforating guns
 - Fewer man hours to prepare blank guns
 - Less weight and volume to transport to and from location
 - Fewer man hours to clean up blank guns after the job
- Lower costs
 - Time savings
 - Tubing spacers replace costly blank guns
 - Improved reliability eliminates stop fires

Conclusions

- 100% Success in Field Tests and Field Trials
- Successfully shot multiple clusters in Horizontal Wells with existing perforations
- Eliminates need for blank spacer guns on long intervals in Vertical or Horizontal Wells

QUESTIONS?
THANK YOU

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