TrenchFoot™ Engineered Wet Shoe System

Gas-tight 338 ULTRA MAG 2.0 float valve qualified as independent mechanical barrier

- Rated 10 bpm for 36 hours, 15,000 psi @ 400°F – GAS TIGHT
- Each valve is gas tested and verified bubble tight during production
- Hundreds of successful installations across North & South America

“Major Operator” conventional shoe track
- Length: 180 ft
  - Configuration: float shoe + full joint + full joint + float collar + full joint + pup joint + toe valve + pup joint + pup joint + toe valve + pup joint
  - Inaccessible Completable Reservoir: 80’ (100’ completion hardline)
  - Must drill to lease line (100’ unnecessary drilled depth)

Citadel Trench Foot wet shoe system
- Length: 4 to 8 ft
  - 100% access to completable reservoir
- Optimized BHA:
  - Replaces toe valve(s) at $6k to $30k
  - A single casing connection eliminates $3k to $12k in premium accessory threads
  - Eliminates 100+ ft of hardest lateral to drill – could eliminate a bit trip
- Total AFE Savings: $8k to $40k per well
  - = cost of toe valve(s) + accessory threads + casing + rig time – TrenchFoot system cost
- Pressure Testable System
  - Testable up to 15 ksi
  - Testable during toe prep or immediately at the conclusion of cementing
  - Redundant test mechanisms
  - Customized to application specific requirements

SPE-201264-MS – “Qualification and Deployment of Float Equipment as an Independent Mechanical Barrier in Unconventional Wells”

- Total AFE savings = $8,000 to $40,000
- Total EUR uplift = $250K to $1MM

Typical Permian injection rates: 18-20 bpm @ 6000 psi
Typical Haynesville injection rates: 15 bpm @ 10000 psi

**Map: “Major Operator” conventional shoe track (180’ long) and Citadel Trench Foot wet shoe system (4-8’ long)**

- Permian
- Haynesville
- Eagle Ford
- Duvernay
- Vaca Muerta
- Rockies
- Marcellus/Utica