

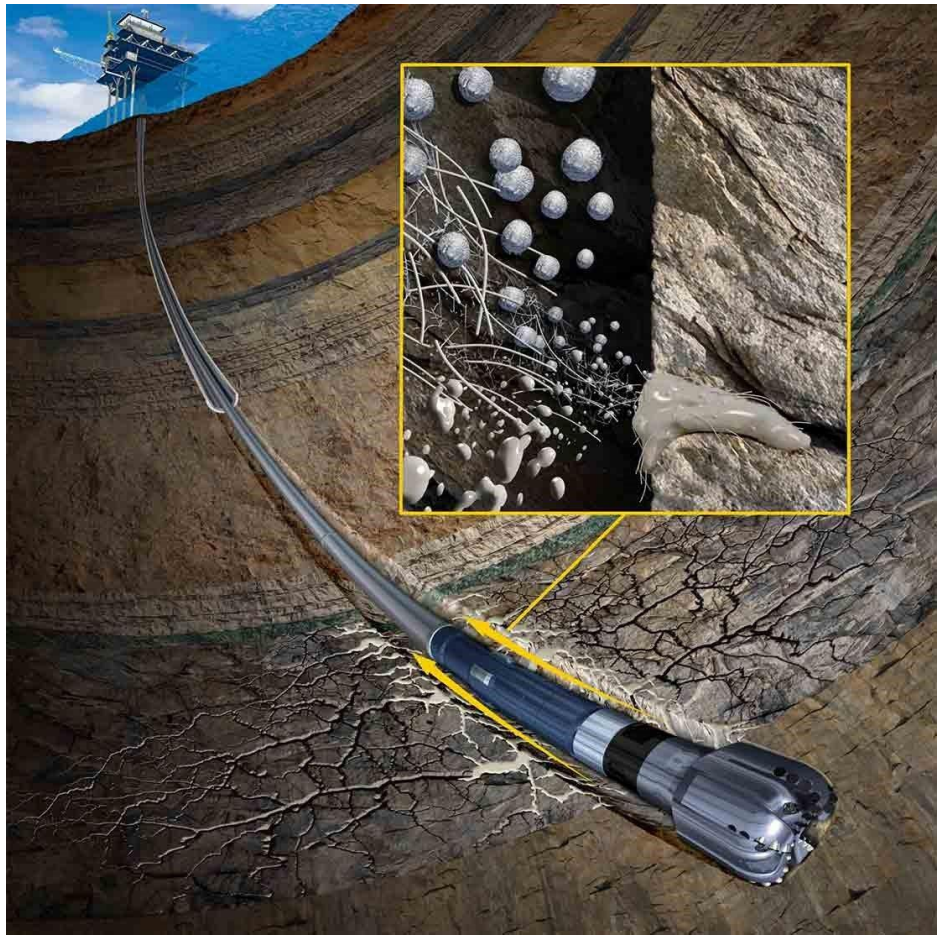
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# Drilling Fluid Automation

Technology • Deployed • Simply

# Drilling Fluid – Essential Functions

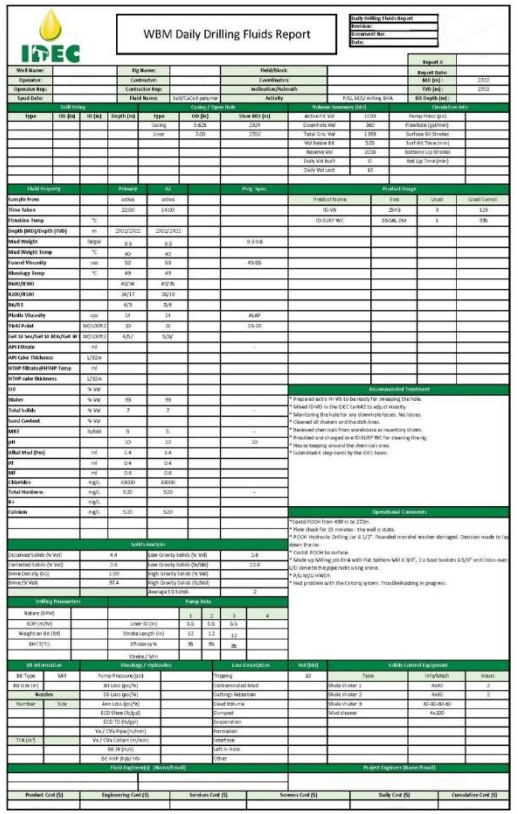
- Particles
  - Transport, Suspension, & Removal
- Cool & Lubricate the Bit & Drill String
- Buoyancy
- Pressure Control
- Formation Interaction
- Thermal Stability
- Last one?
  - Cost Efficient



# Current Practices

- Mud Reports



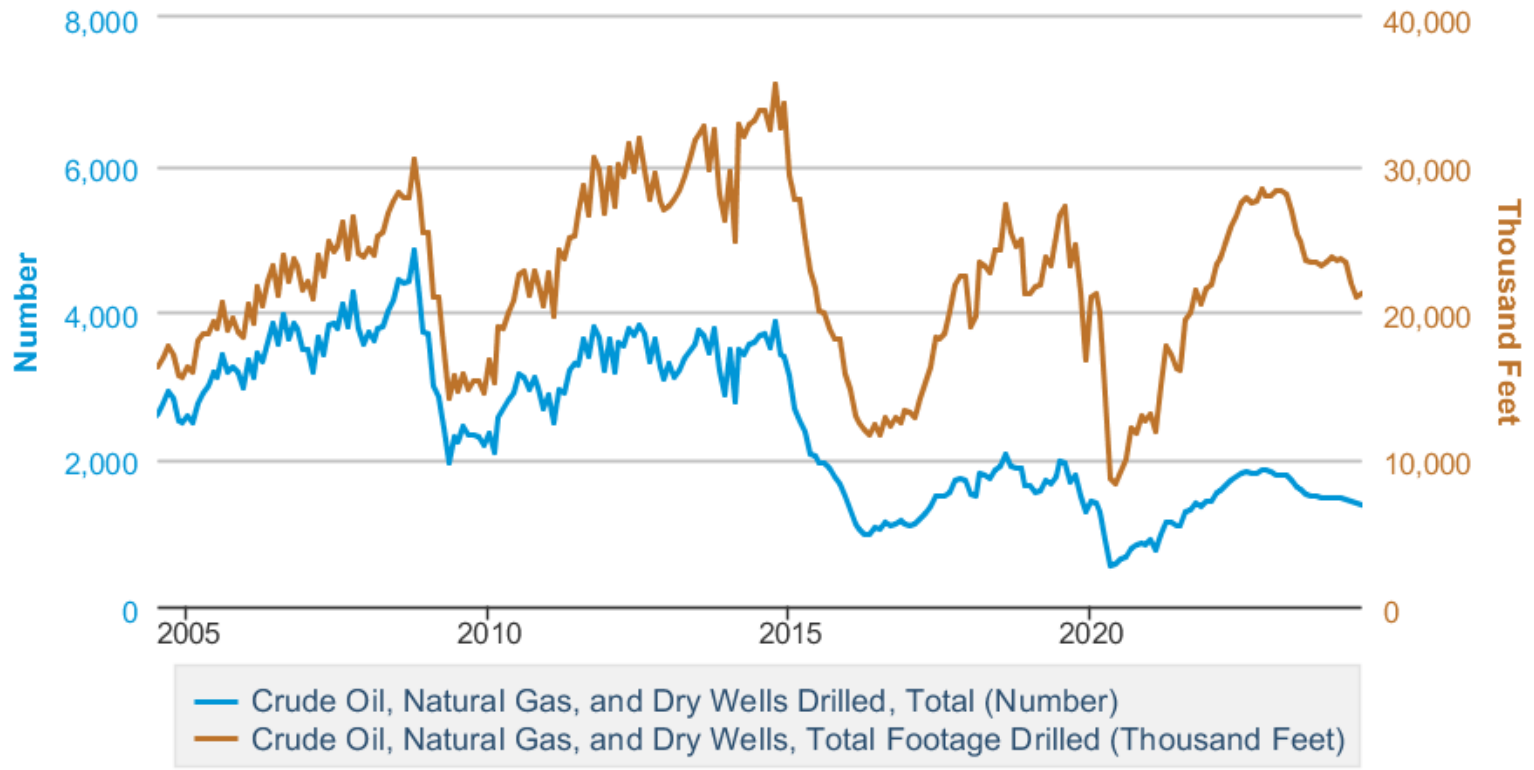

- Mud Samples
  - Density & Funnel Viscosity






# Historical Perspective

**Table 5.2 Crude Oil and Natural Gas Exploratory and Development Wells**




- July 2004
  - 6,263’ avg ft/well
  - 1,213 rigs
  - 448 avg ft/day
- July 2024
  - 15,292 avg ft/well
  - 586 rigs
  - 1213 avg ft/day

eia Data source: U.S. Energy Information Administration

# Drilling Fluid Data

- How is the data collected?
- How often are we collecting data?
- Where is the data stored?
- How is the data utilized?
- How accurate is the data?

- **Can we improve upon it?**



# Real-time Data Collection

- Automated mud rheology
  - Consistent & accurate measurements
  - Data is available 24/7
  - Real-time decision making
  - Promotes collaboration (Petty et al, 2023)
  - Development of KPI’s
  - Notifications & alarms
  - Increased efficiency (Petty et al, 2023)



# Case study – West Texas

- Efficiency Gains
  - 16% reduction in overall costs
  - Reduction of 1 million gallons of diesel
  - KPI's led to performance gains in mud costs and dilution rates

- Performance Gains
  - Enhanced hole cleaning
  - Increased borehole stability
  - Reduced downhole tool failures
  - Consistent NAF properties



# Challenges & Limitations

- Sensors
  - Reliability
  - Hazard ratings
  - Design limitations
- Change
  - #1 complaint – it's different
  - Training & reliance
- Action
  - Who is watching the data?
  - What decisions are they making?
  - Is more data better?
    - Quality vs. Quantity



# Automated Rheology - What's Next?

- New data sources
  - Solids Control
  - MPD
  - AI/ML Data Models
- New applications
  - Synthetics
  - MMO/MMH
- Sensor development



# Questions?