

Product Development Life Cycle of Fluid Additives

Oil and Gas Company's Performance Needs

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May 18, 2017

Bio

- Oxy - Drilling Fluids Specialist – 5 yrs
- Baker Hughes Drilling Fluids – 18 yrs
- US Navy – Nuclear Submarine Officer – 8 yrs
- BS Degree in Chemical Engineering – Colorado School of Mines

Outline

- Oil & Gas Company's (O&G) Goals
- Drilling Goals
- Drilling Performance
- Performance Need
- Collaboration
- Mud Vendor
- Product Example
- Product/System Selection

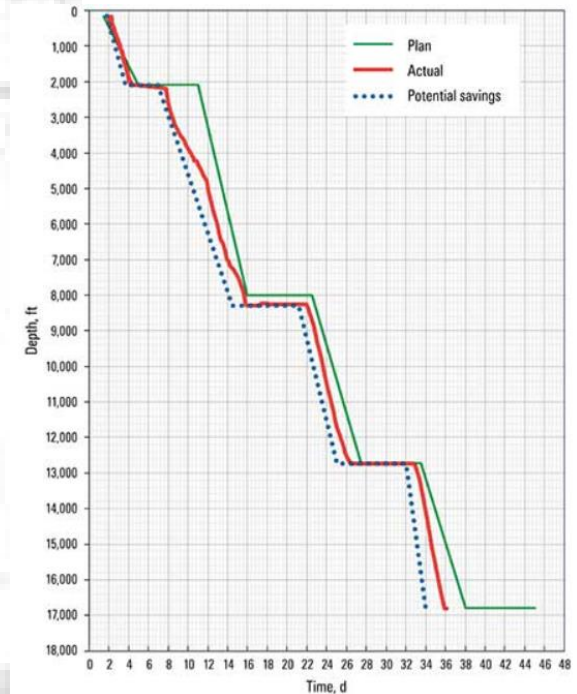
O&G's Goals

- Grow and meet economic expectations
- Deliver continuous improvement in HES performance
- **Drive growth in daily production** and proven reserves



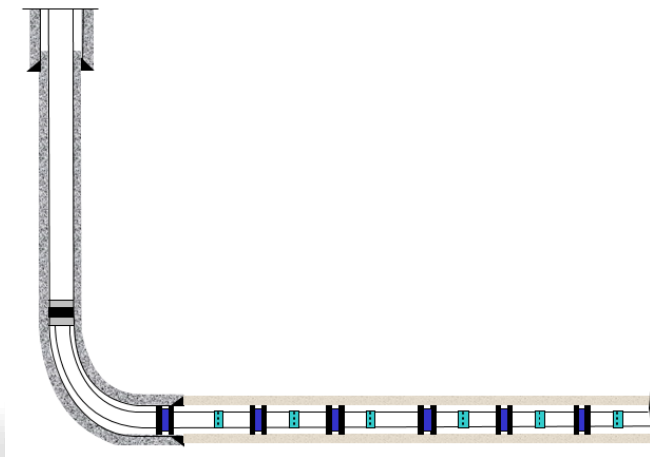
Drilling Goals

- Meet production objectives
- Deliver a quality wellbore
- Hit target
- Minimize reservoir damage
- Improve efficiency - Reduce days/well
 - Minimize Non-Productive Time (NPT)
 - Minimize “Flat” time
 - Increase average ROP
- Reduce drilling costs
 - Service costs
 - Product / Equipment costs
- HSE / Regulatory Compliance



Drilling Performance

- Deliver a quality wellbore
- Minimize reservoir damage
- Reduce service costs
- Reduce product / equipment costs
- Increase average ROP



Drilling Performance - Increase Avg ROP

Planning

- Well Design
- BHA Design
 - Bit Technology
 - Motor Technology
- Drilling Fluid
 - Properties (MW, Rheology, Inhibition, COF)
- Hydraulics

Environment

- Rock Properties / Pressures / Temperatures

Execution

- Weight on Bit (WOB)
- RPM
- Drilling Dynamics

Performance Need

Increase average ROP via Drilling Fluid

Performance need communicated (not product)

- O&G to Mud Vendor
- O&G may have internal R&D/lab
- Mud Vendor to O&G

Meet Together - Collaborate

- Explore/understand operational details and issues
 - Examples - high torque or weight transfer issues

Increase average ROP via Drilling Fluid

- What is causing the issue?
- Is this a mud related issue?
- What mud products/systems would mitigate issue?
 - Better hole cleaning
 - Improved wellbore stability
 - Lower coefficient of friction (COF)
 - Eliminate bit balling



Mud Vendor

Increase average ROP via
Drilling Fluid

Use existing product/system

- Case histories

Develop product/system

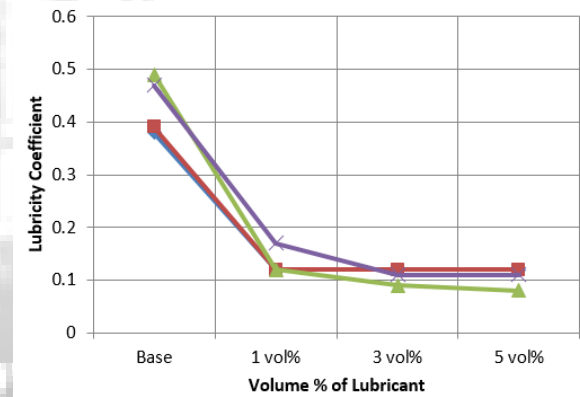
- Start the product development process



Product Example

O&G Performance Issue/Need

- High torque in 10,000 ft lateral sections in North Dakota wells
- Collaborate with Mud Vendor
- Identify potential product/system options
- Identify critical product/system parameters
- Lubricant
 - Use in produced brine (NaCl)
 - Brine has high hardness > 25,000 mg/l
 - Possible high alkalinity
 - Cold ambient temperatures < -18 F
 - Low cost

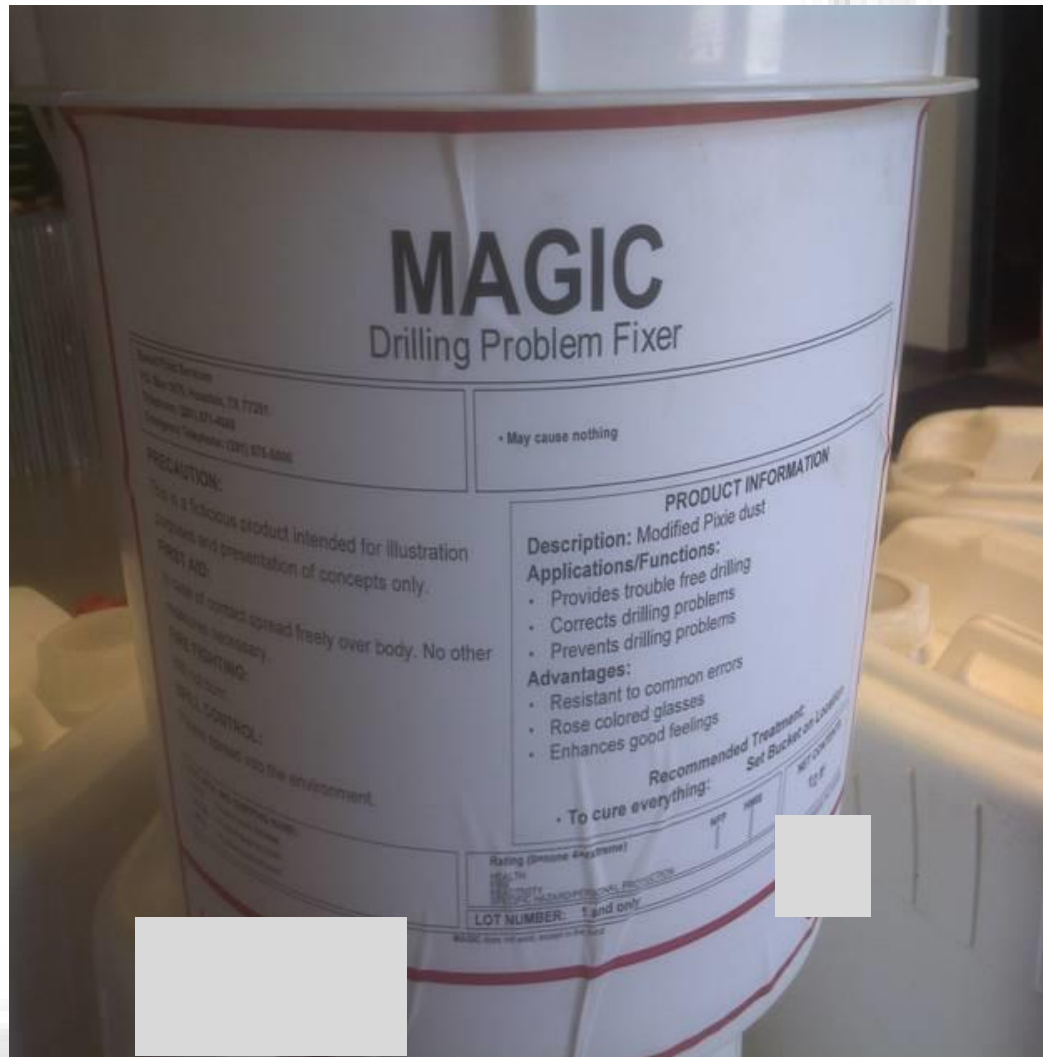


Product/System Selection

- Development Strategy
- Lab Testing
- Performance Testing
- Contamination Testing
- Environmental Testing
- Lab Trial
- Sourcing
- Cost Effective
- Scale-Up
- Field Trial / Pilot
- Ease of Use
- Evaluation
- Success – Market Launch



If all else fails....



Thanks!

