

Clear Fluid Journey & Lessons Learnt

AADE Fluids - Houston

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Apache

Agenda

01	Safety Moment
02	Clear Fluids system overview
03	Timeline
04	Case examples
05	Lessons learnt and Q&A



Safety moment



Work Authorization



What changed?

Before you begin, take 30 seconds to reassess the job.

- Weather, time of day, crew, or uneven ground
- A damaged tote, sack, or lifting plan
- A change in dust, chemical, or traffic exposure
- Fatigue, late in the tour

When conditions change: stop, reassess, and communicate.

Clear Fluid Mud Overview

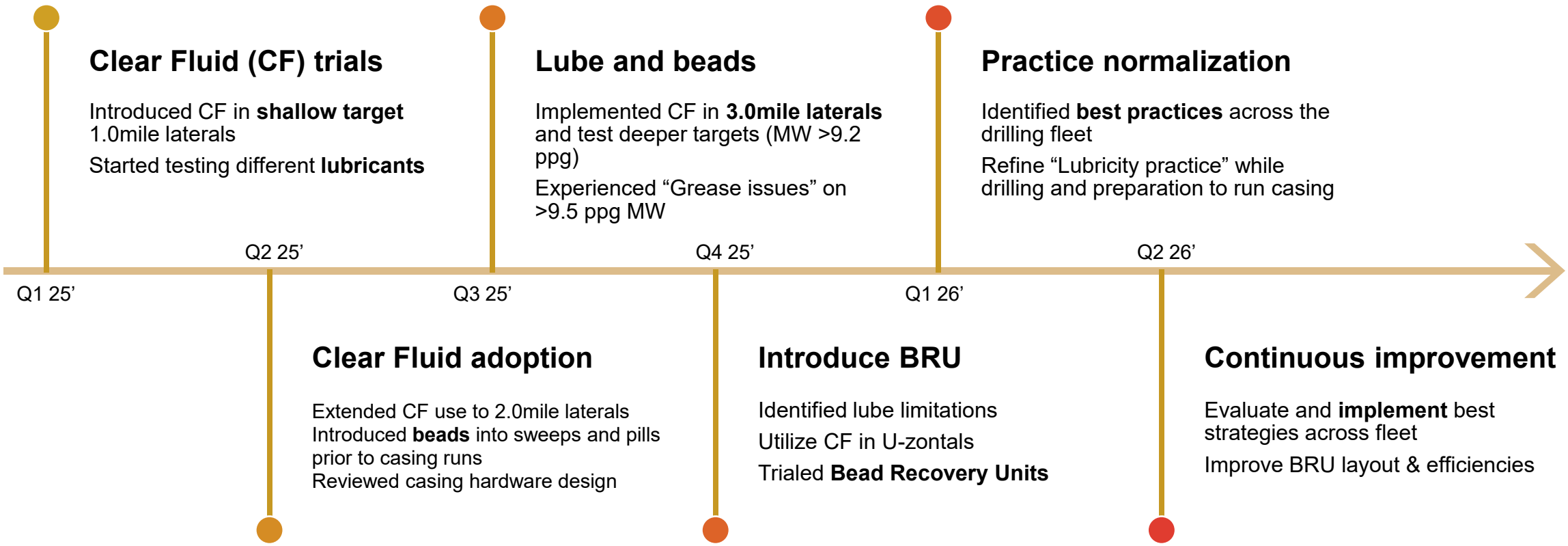
Benefits

- Simple mud systems for lower MWs
- Lower cost per bbl, abundant & environmentally friendly
- Higher ROP, better lateral hole cleaning
  - Low solids
  - Turbulent flow
- Lower maintenance and disposal costs

Challenges

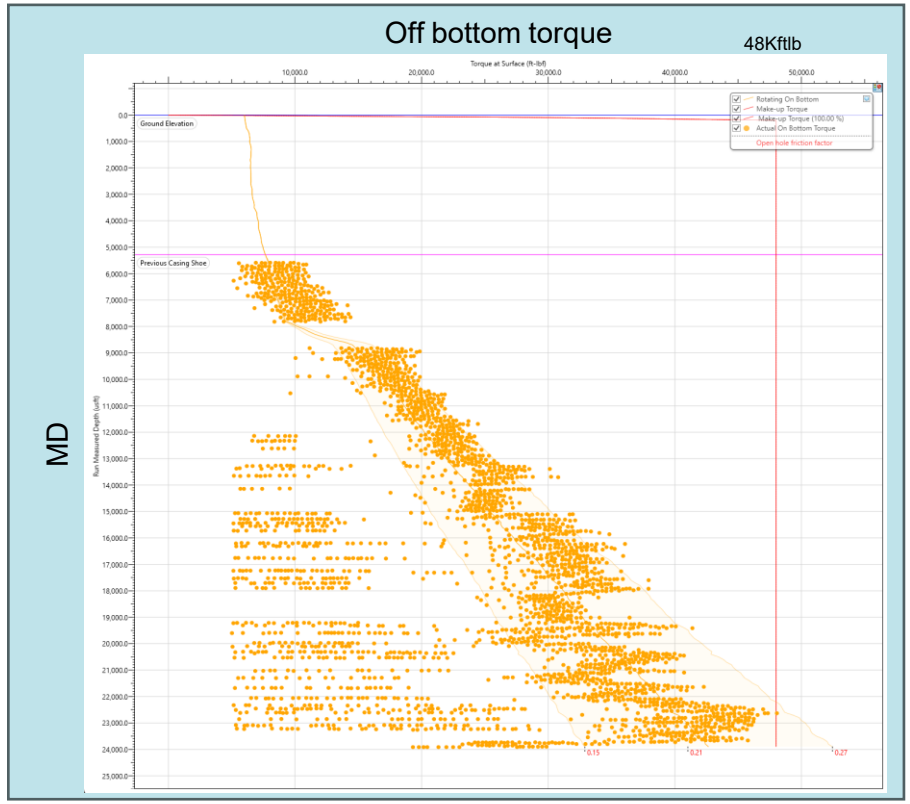
- Torque and drag
  - Equipment upgrades
- Drill pipe wear
- Wellbore instability
- MW limitations

Clear Fluid System Evolution

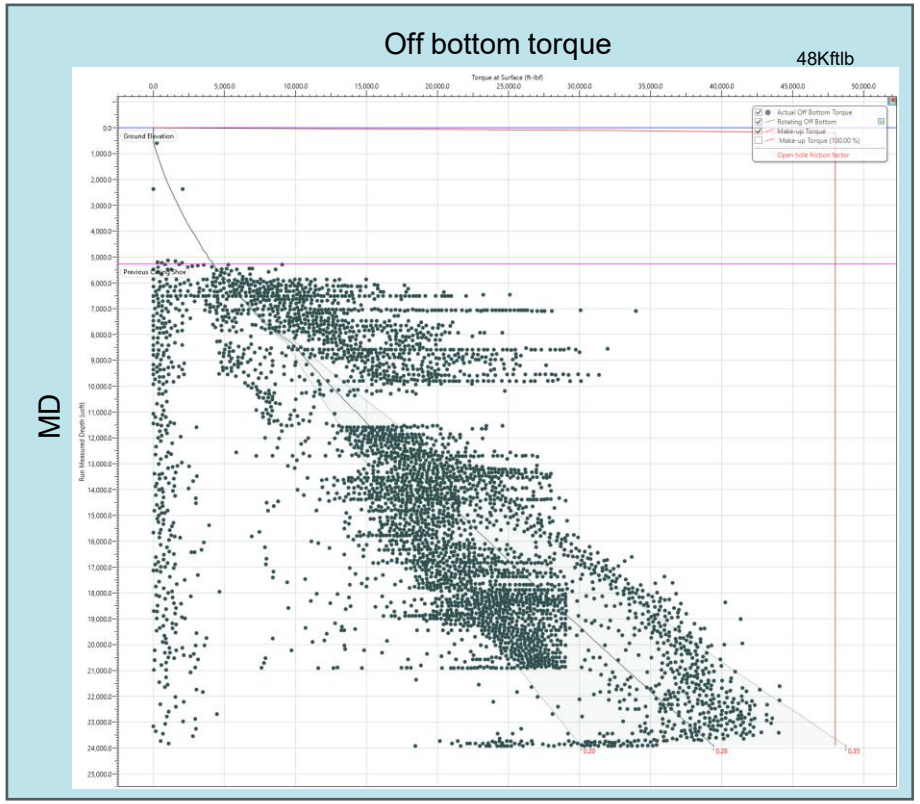


Case 1: OBM vs Clear Fluid – 3.0m lateral

OBM



Clear Fluid

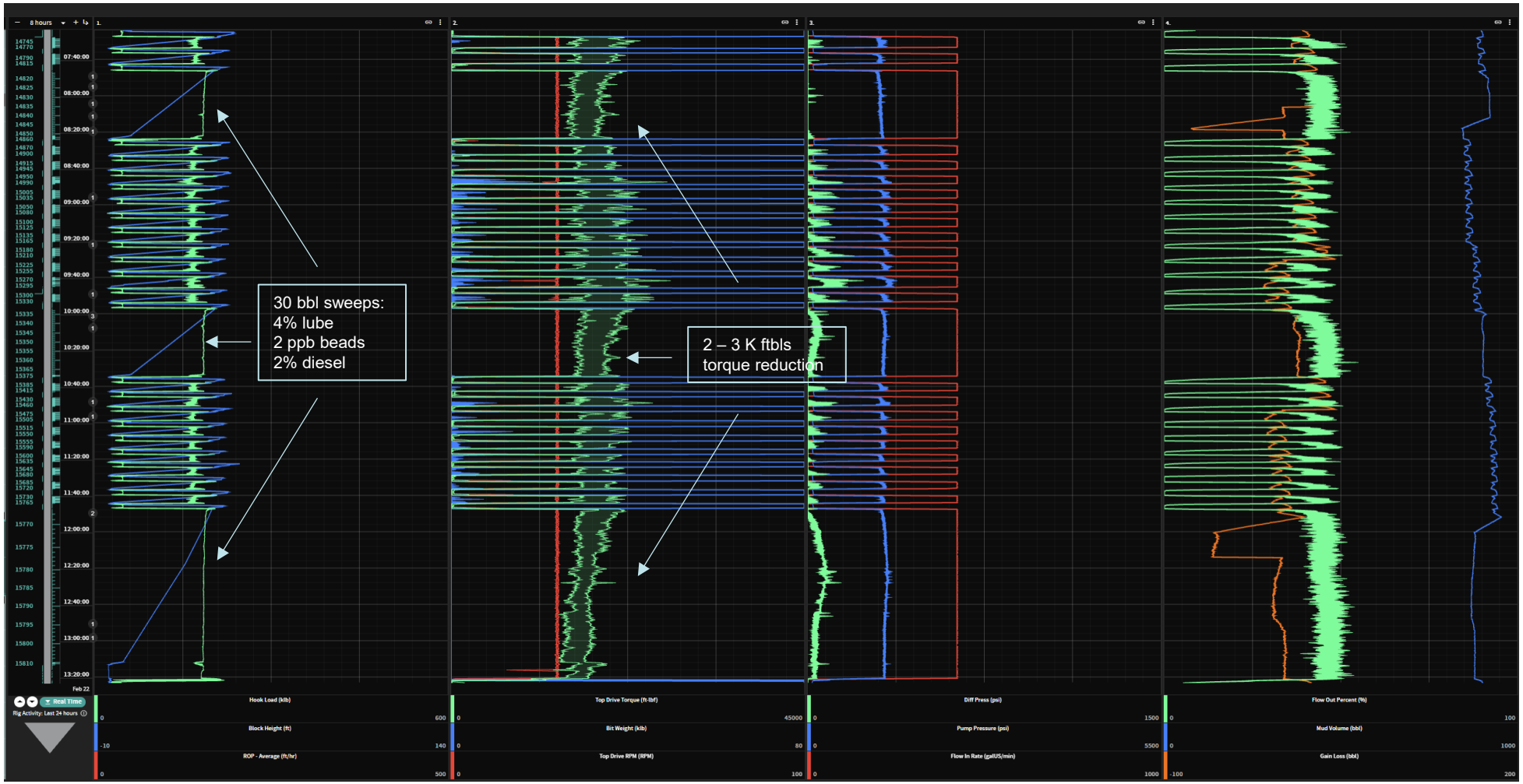


Well geometry

Metric	OBM	C F + lube
Tortuosity Index (°/1,000 ft)	18.99	20.01
Cumulative DLS (°)	452	476.4
Avg DLS (°/100 ft)	1.77	1.91
Max DLS (°/100 ft)	16.62	16.11
Cum DLS — Vertical	78.8	106.4
Cum DLS — Curve	58	76.3
Cum DLS — Lateral	315.2	293.7
BTM TD	23,913	23,922

- CF well OBT in line with OBM
- CF avg FF 0.28
- OBM avg FF 0.21 (25% lower)

Case 1: Lube + Bead Sweeps Treatments

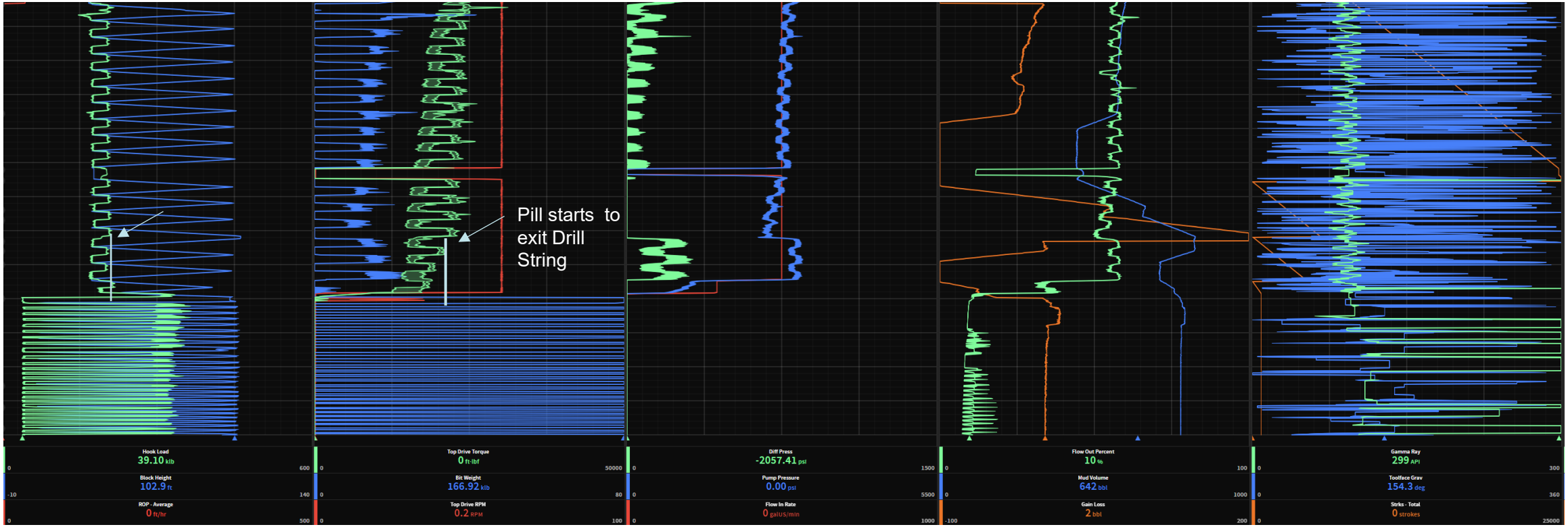


Rig State: washing and reaming production casing in the hole @ 15,000’ MD

Hook Load in green
Block position in blue

Torque in green

Case 2: Spotting Casing Pill at TD



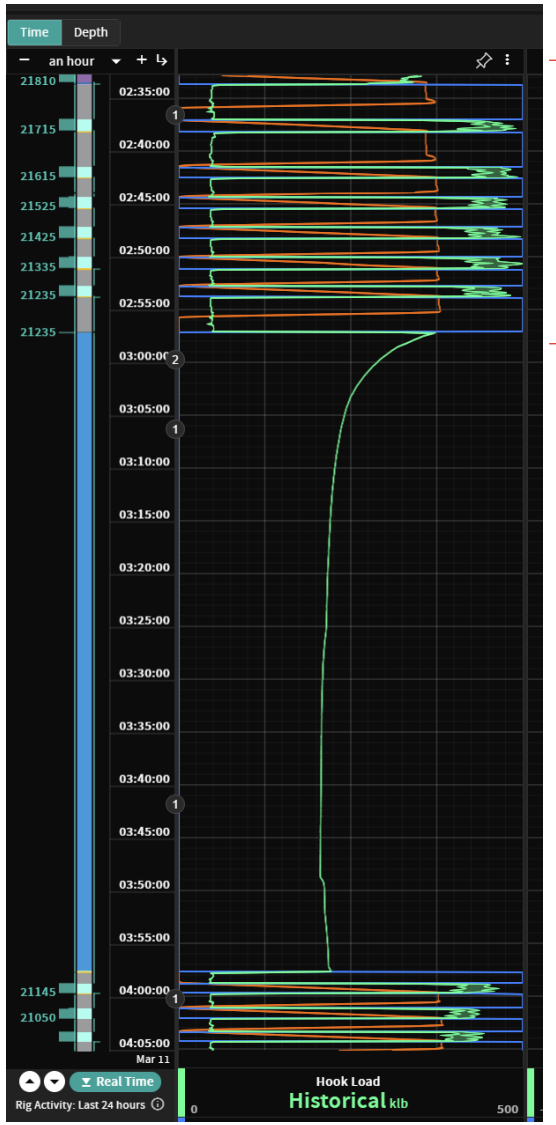
- TD @ 18,950’ MD
- 2 mile lateral in the JM target
- SMB
- Finished Clean Up Cycle

- Spot 400 bbls (4% lube/ 5 ppb bead/ 5ppb graphite)
- Experience lower torque and hook load as pill exits the bit
- Torque reduction @ 4Kftlb ~ 18%
- HL reduction @ 8Klbs ~ 4%

Case 3: Spotting Casing Pill off Bottom

Beads in system, spotted bead pill to TOOH and run production casing





470K HL before spotting bead pill

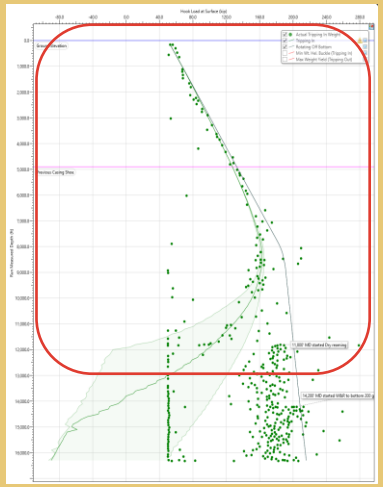
Pumping & Spotting Bead Pill

10% reduction in Hook L

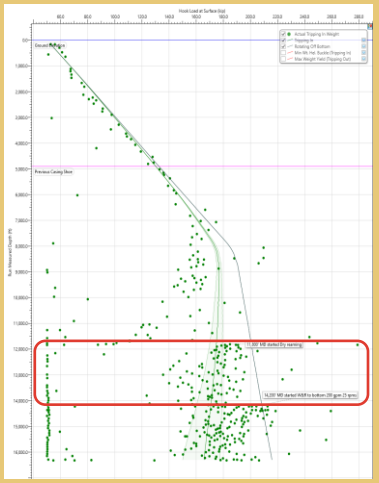
420K HL after spotting bead pill

Case 4: Casing design | Floating Casing Comparison

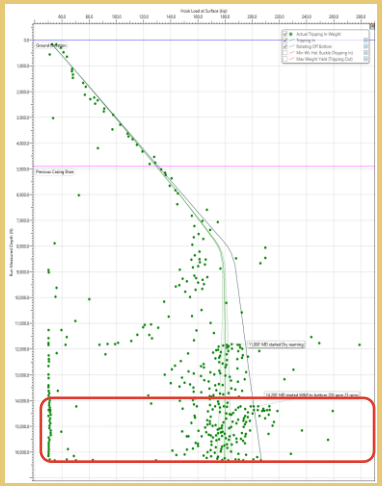
Well # 1 – 1.5 mile lateral / Dean
Non floating



TIH @ 40 fpm



Reaming @ 20RPM – 16 fpm



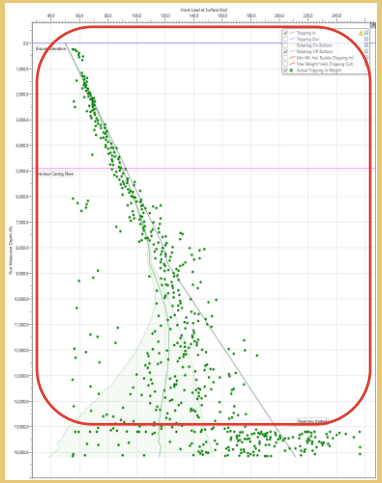
W&R @ 27RPM – 12 fpm – 200gpm

FF 0.4 – 0.6

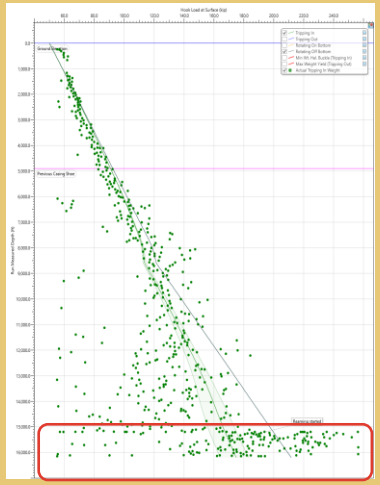
TOOH notes

- Pulled tight coming off bottom, > 220 Kbls overpull
- Back reamed to 12,800’ (3,900’) and spot 200 bbls 4% lube, 4ppb bead
- 12,800’ TOOH on elevators

Well # 2 – 1.5 mile lateral / Dean
Floating



TIH @ 80 fpm



Reaming @ 30RPM – 35 fpm

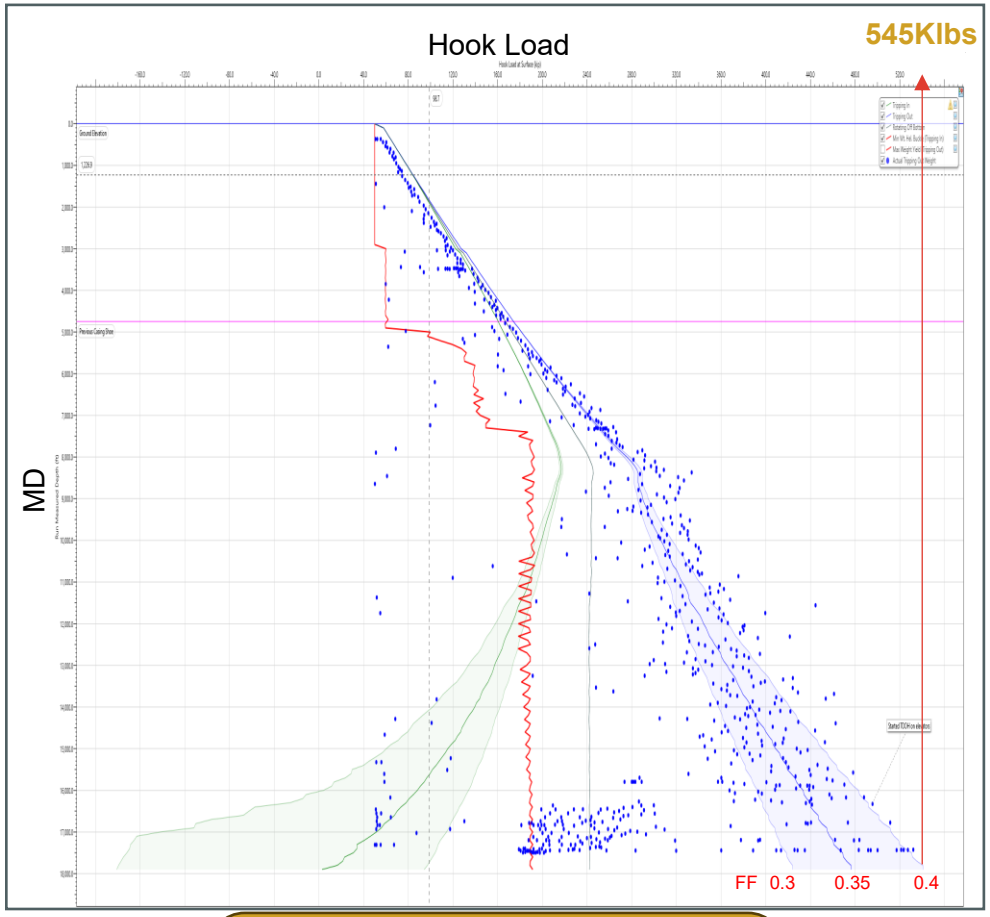
FF 0.35 – 0.55

TOOH notes

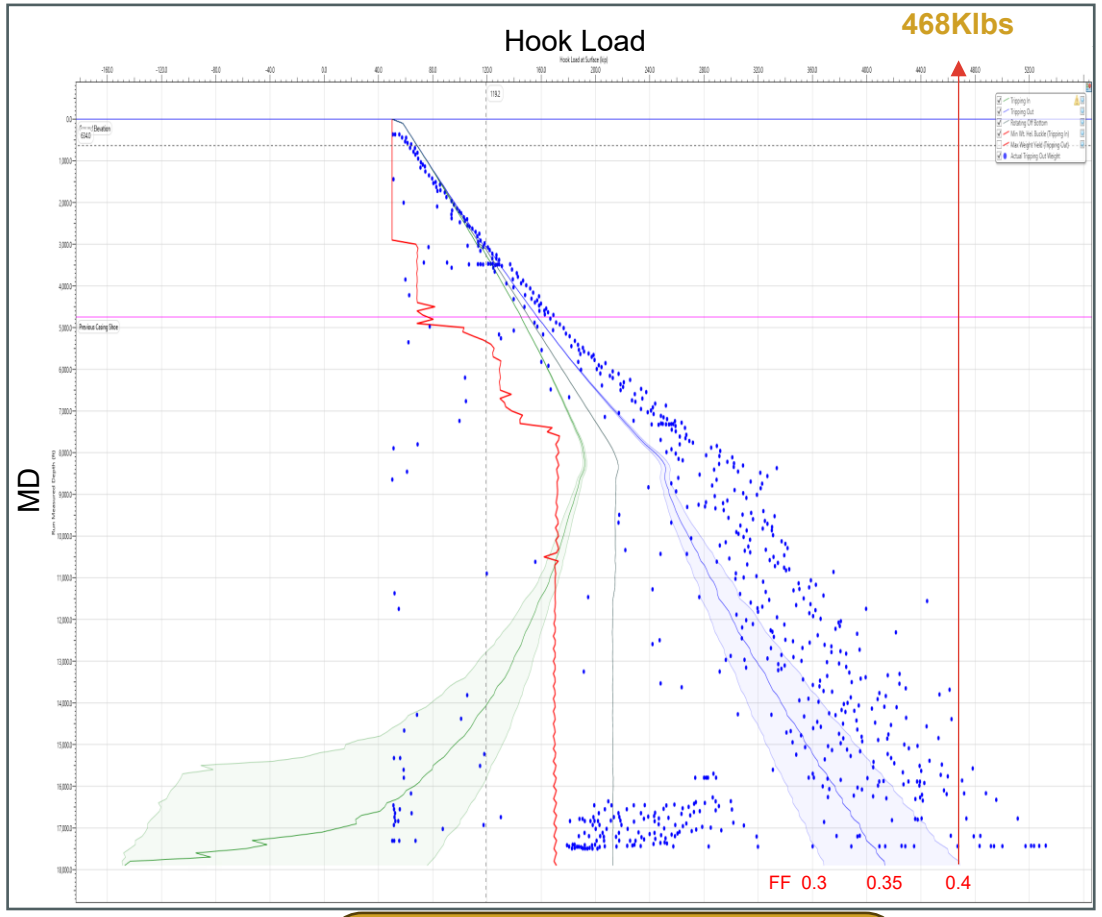
- Pulled tight coming off bottom, > 220 Kbls overpull
- Back reamed to 15,190’ (1000’) and spot 300 bbls 4% lube, 4ppb bead, Back reamed again displacing pill to vertical hole
- 14,200’ TOOH on elevators

Floating casing **saved ~ 9 hrs** of rig time, reduced casing reaming distance by 80%

Case 5: DP comparison | TOOH 5” DP vs 5.5” DP



Utilizing 5.5” DP added ~75 Klbs to TOOH



5.5” DP – 620Klb max tension
90% ~ 558Klb
FF csd 0.15 / OH 0.3 - 0.4
Rig B

Drill Pipe Impact on TOOH

Rig	DP Size	Approx. Added Drag	Wells (2-mile)	TOOH on Elevators	BR Required	Elevator Rate
Rig A	5"	Baseline	8	7	1	**88%**
Rig B	5.5"	**+75 klbs**	11	6	5	**55%**

5” DP – 560Klb max tension
90% ~ 504Klb
FF 0.15 csd / OH 0.3 - 0.4
Rig A

Lessons Learnt



- Active system:
  - Start with beads 1 – 3 ppb and combine with Bead Recover Unit
  - Add lubricant later in the well as required by lateral length and target
- Sweeps and pills:
  - Preferred to spot 300 – 400 bbls on bottom
  - Typical treatment: 4% lubricant / 4 ppb beads / 4 ppb graphite
- Lubricant selection and foam control
  - Select lubricant based on brine type and system chloride content
  - Confirm lubricity performance and foam risk by product
  - Treat foam with diesel/conditioner; refresh the system when more cost-effective
- Additional mechanical vibration might be needed (dual AG, 2nd Shock Sub)
- Casing floatation recommended for all wells, and in some cases specific centralization



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