Torque & Drag Analysis
Chayvo Z-1, 8-½” Open Hole

December 04

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03 December 2004

ExxonMobil Development

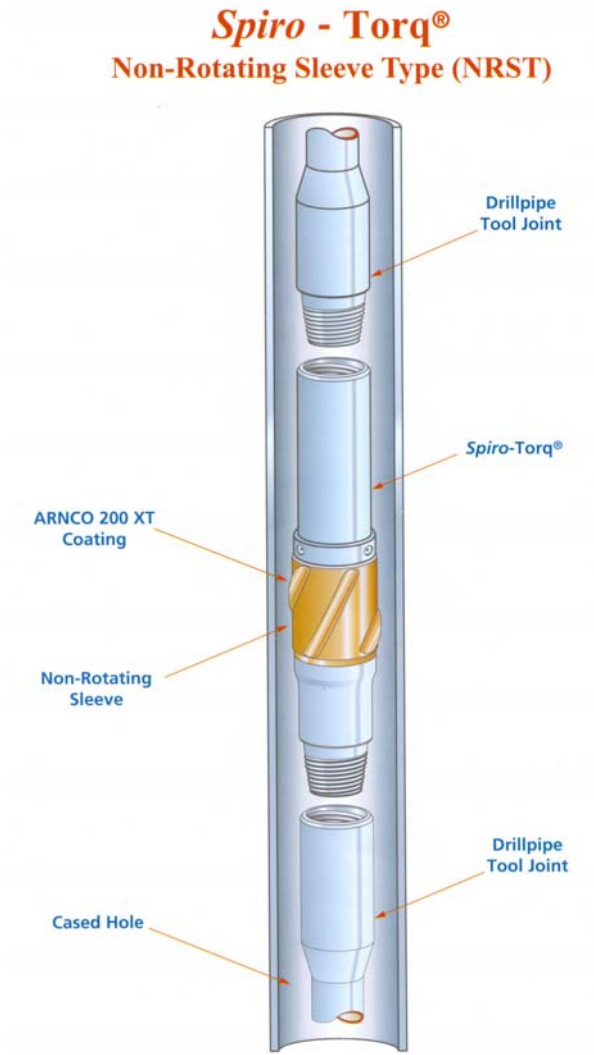
Pilot Test in Chayvo Z-1 Well

8-1/2" Open Hole Section at Chayvo Z1

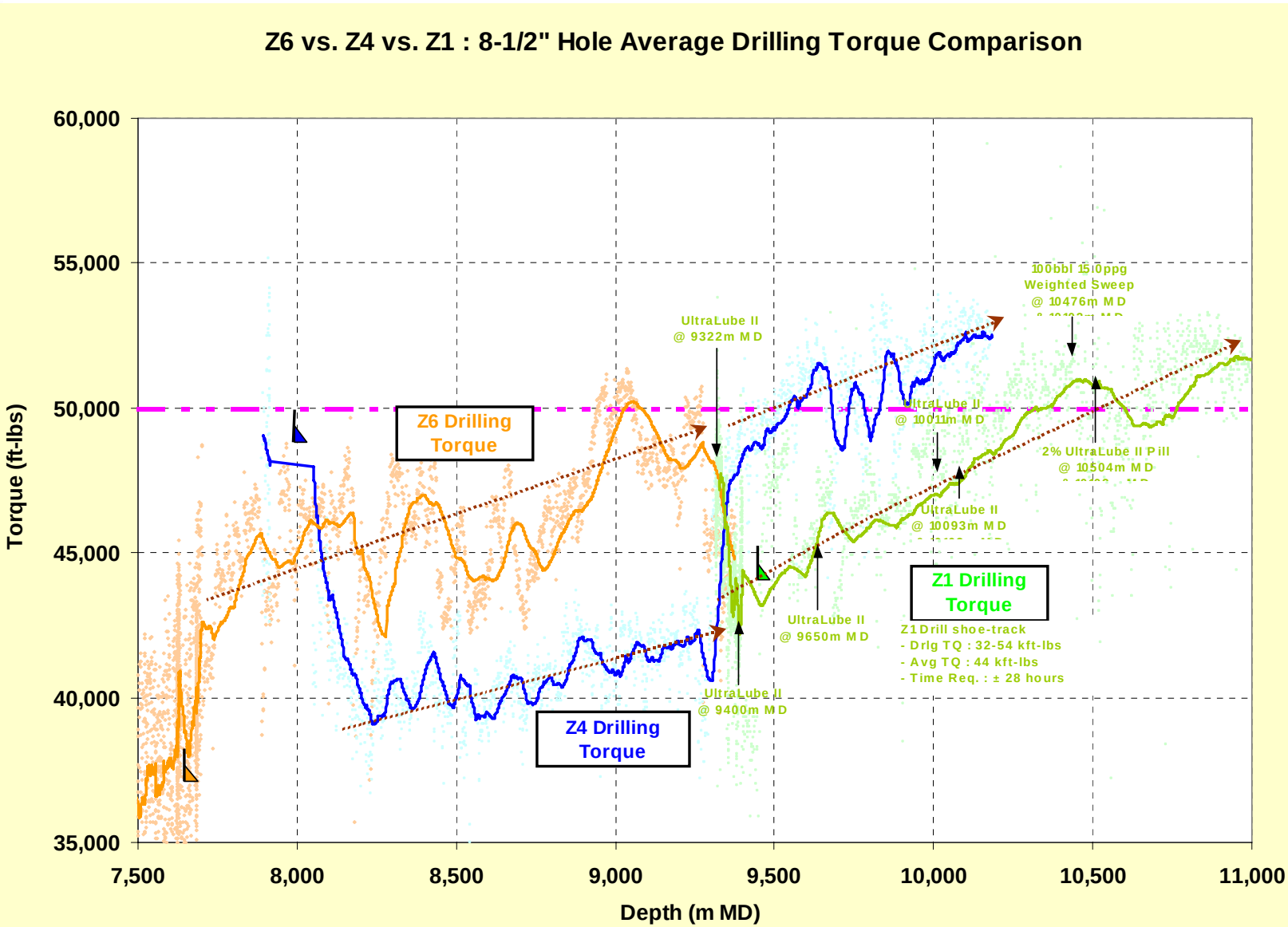
- Drilled 1547m of 8 1/2" hole
- BHA had 403.5 hr BRT, 268 Circ. Hrs
- Spiro-Torque subs in drillstring
  - 151 subs
  - Positioned in the tangent section of the hole
- Added Ultralube II while drilling

• 9322m	80.0 bbl	3%
• 9400m	65.5 bbl	5%
• 9650m	6.5 bbl	5%
• 10012m	6.5 bbl	5%
• 10093m	6.5 bbl	5%
• 10112m	6.5 bbl	5%

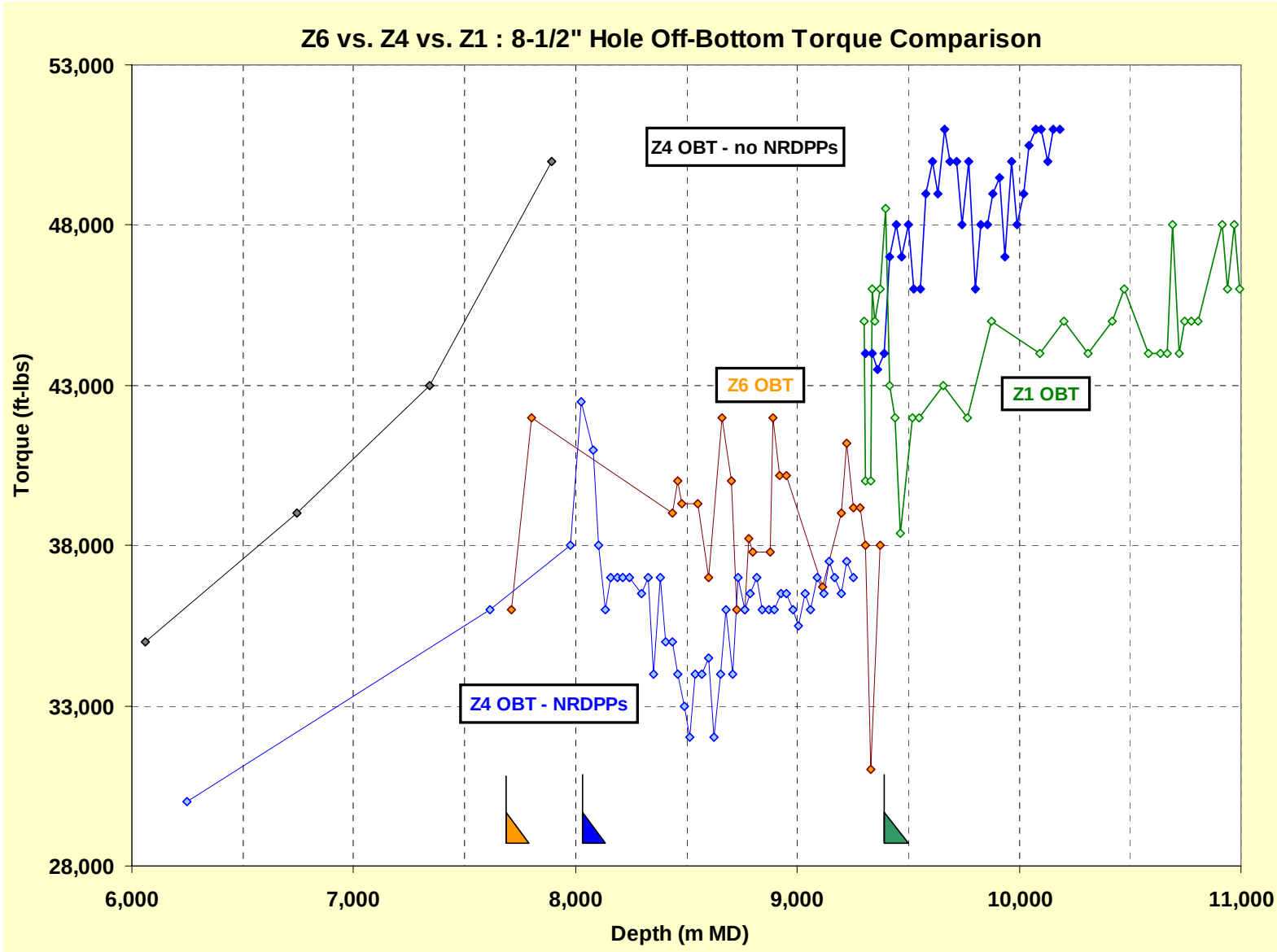
- Total consumption 12,375 gal x 32.72 $/gal = $ 405 k
- Per meter consumption: 8 gal/m or 261 $/m



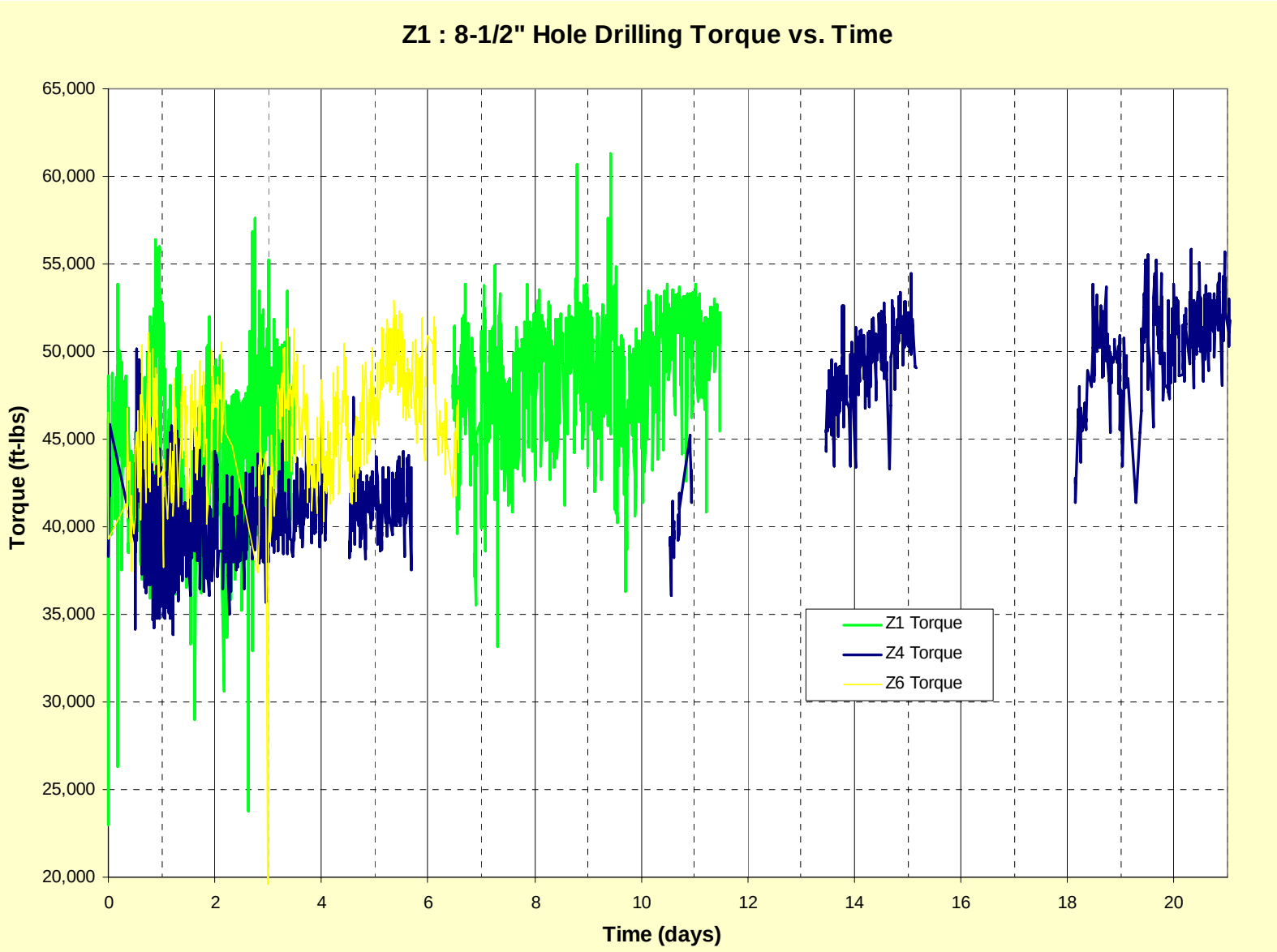
Drilling Torque Comparison



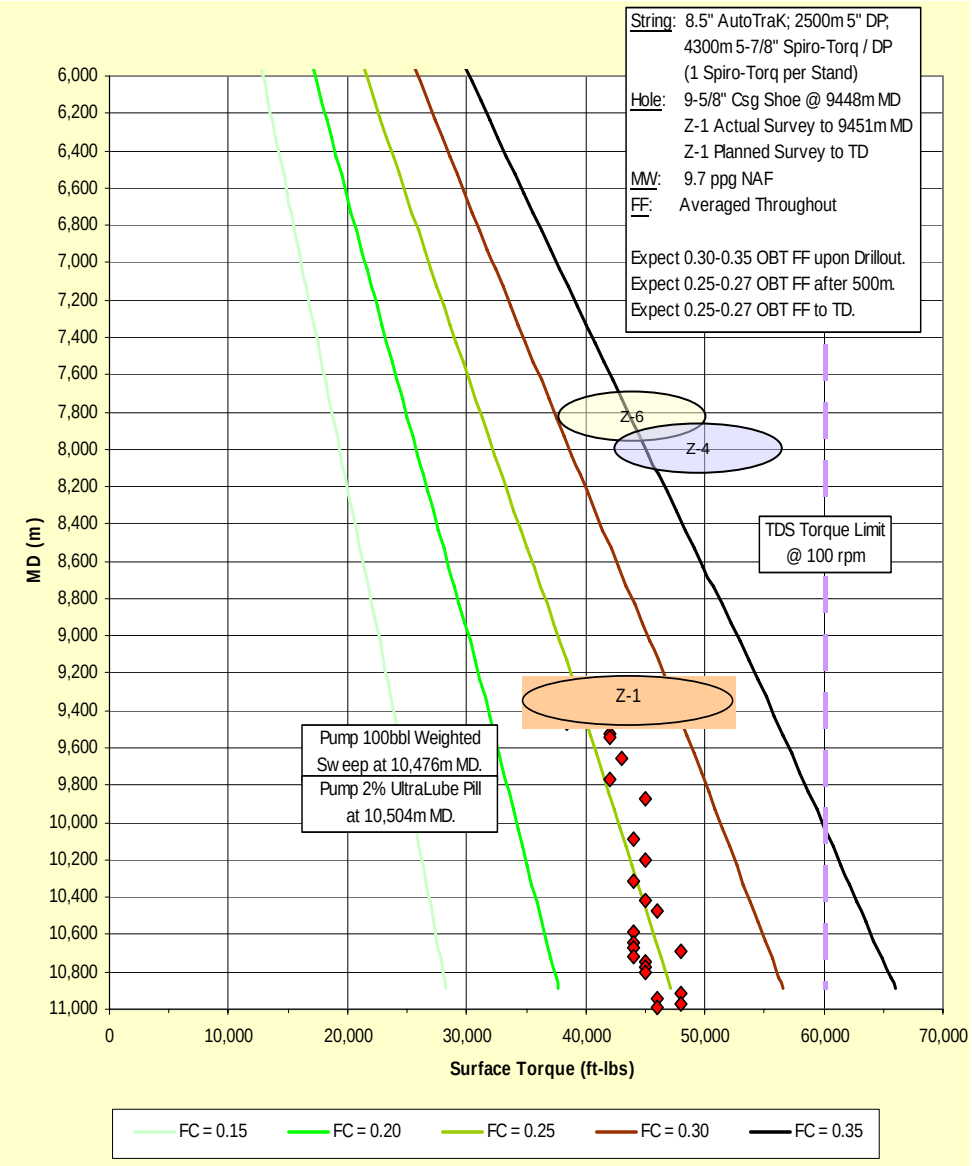
Off-Bottom-Torque Comparison



Torque vs. Time Comparison



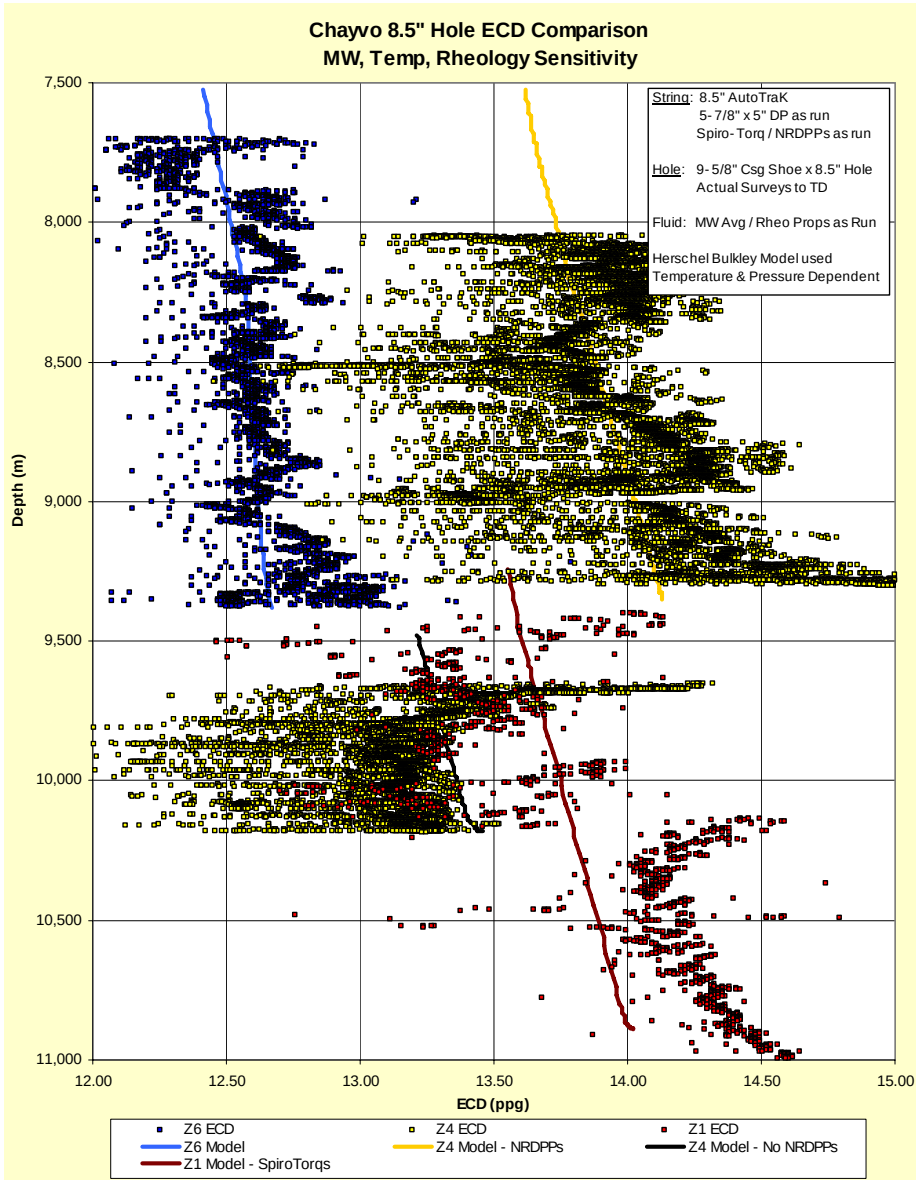
Drill-Out Torque Comparison



Observations

- Drill-out torque in Z1 seems to be on lower level than Z6 and Z4, although being significantly deeper (+1500m)
- Torque range while starting to drill out seems higher compared to Z6, and Z4
- Indication that Spiro-Torqs had effect on torque in well

8 1/2” Hole ECD Comparison for Chayvo wells



Observations

- All three wells had same mudweight of 9.8 ppg
- Z4 with NRDPPs (220 pieces) is significantly higher than Z6
- Z4 w/o NRDPPs continues Z-6 trend
- Z1 with Spiro-Torqs lower than Z4 with NRDPPs, but higher the Z6 and Z4 w/o NRDPPs
- In summary, the Spiro-Torqs do not pose a significant hydraulic risk for the Chayvo wellbore integrity

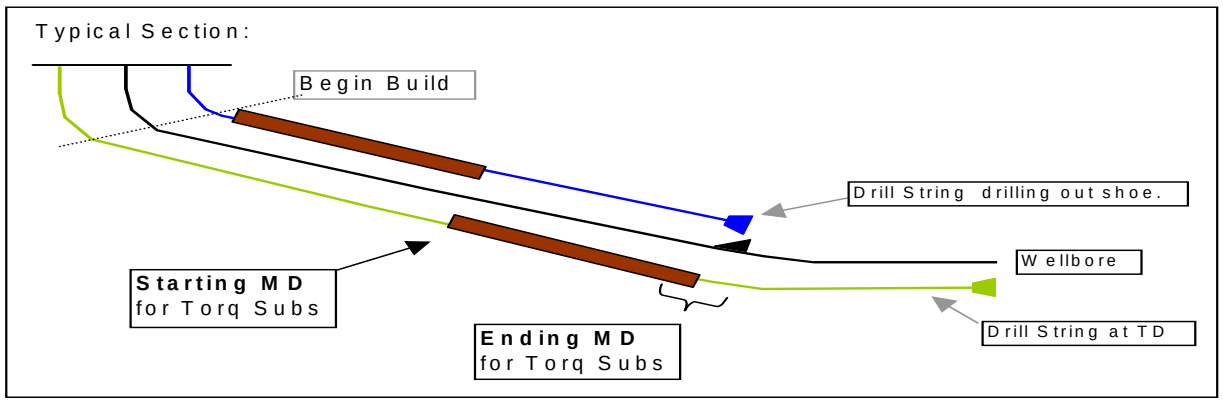
Conclusions

Discussions with Drilltech

- Drilltech Engineer onsite in Chayvo evaluating condition of tools
- No wear on sleeves
- No break-in period for subs
- Currently looking at results from Z1 well to come up with recommendations

Conclusions

- Combined effect of Spiro-Torq and Ultralube II achieved 10-12% reduction in torque
- It is not possible to separate the contributions of the lubricant and the mechanical tools
- More data points with Spiro-Torqs - without the presence of lubricant - are needed
- Z2 is longer well than Z1 (total planned MD @ 11,112m), with potential for more length. To get to TD, we will need all the torque reduction we can possibly get



Forward Plan

Recommendation

- Discussions with Drilltech, Drilling Technical (Elks)
- Put as many subs as possible in the drillstring to achieve maximum effect
  - Current Z-2 Torque Sub Placement Plan calls for 3295m of DP with ±114 torque subs
  - ~250 subs on location
- Put additional subs in the built section (1.5 deg/100' BUR)
  - Largest impact because of higher sideload forces
  - Early impact while drilling out cement (erratic torque)
  - Short duration as subs move into tangent section while drilling 8-½" hole
- Try to get as much data as possible without compromising integrity of LWD/MWD tools
- Evaluate effect of Baralube Gold Seal liquid lubricant