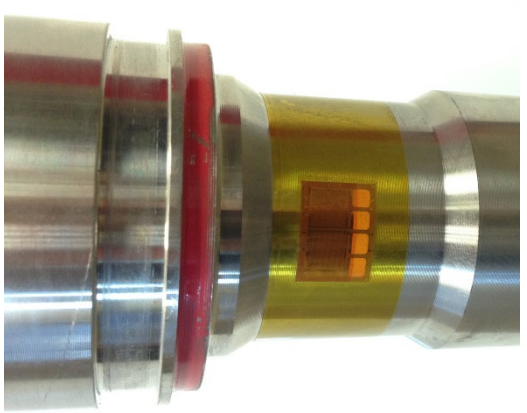
Its Dark Down There, Can We Learn More?

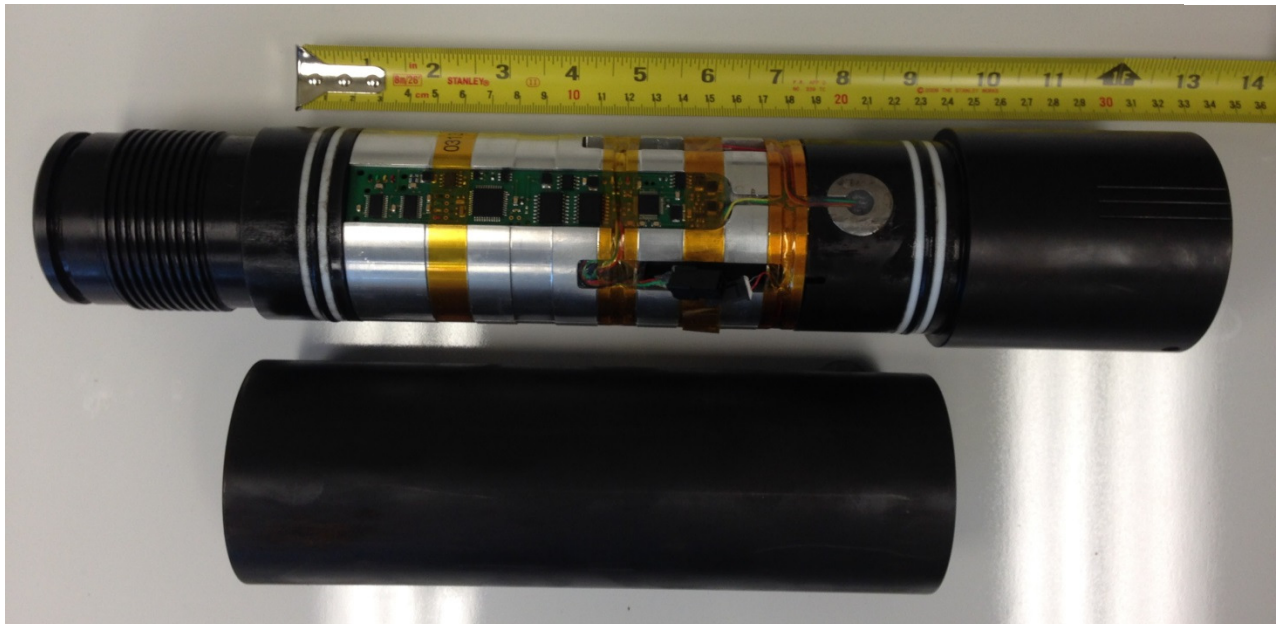
John Ravensbergen
ICOTA Roundtable 2013

NCS energy services

Memory Gauge BHA

- Records Annulus & Tubing Pressure, Temperature and Axial Force





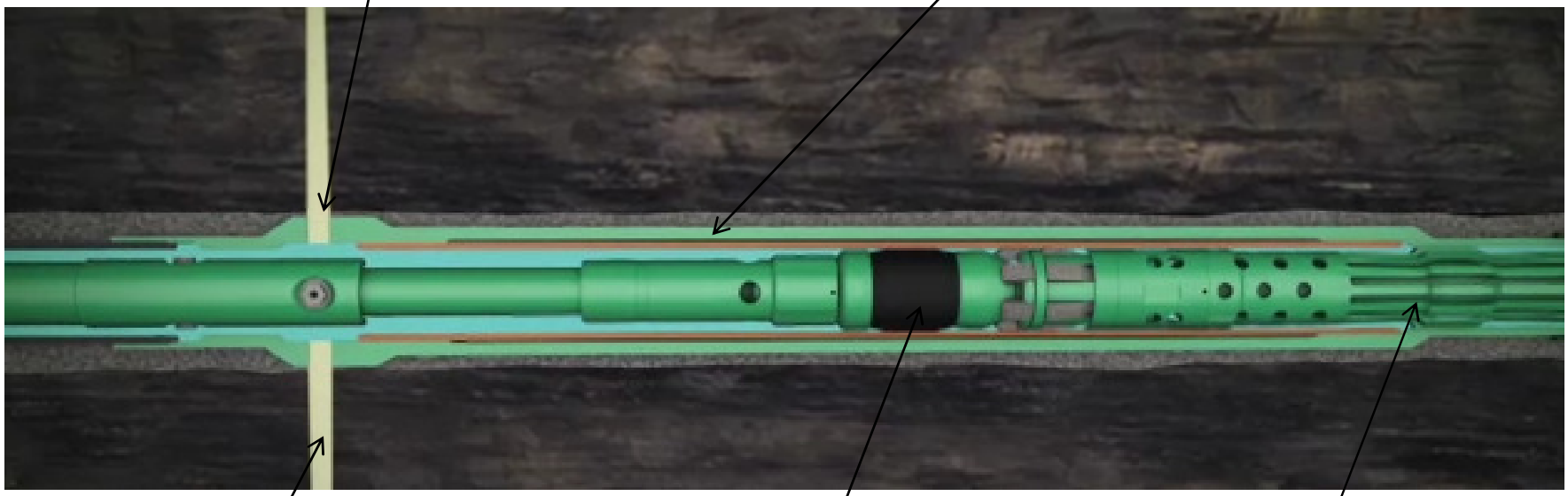
Multi-Stage Fracturing – What can we learn?

- Circulating Bottom Hole Tempeatures
  - Packer performance requirements
- OH Packer Performance
- Forces at BHA versus Surface to unset BHA
- Forces at the BHA versus Surface – getting on depth
- Frac Sleeve shifting pressure & force dynamics
- Pressure Equalization through BHA post frac
- Pressure and forces at the BHA during a screen out

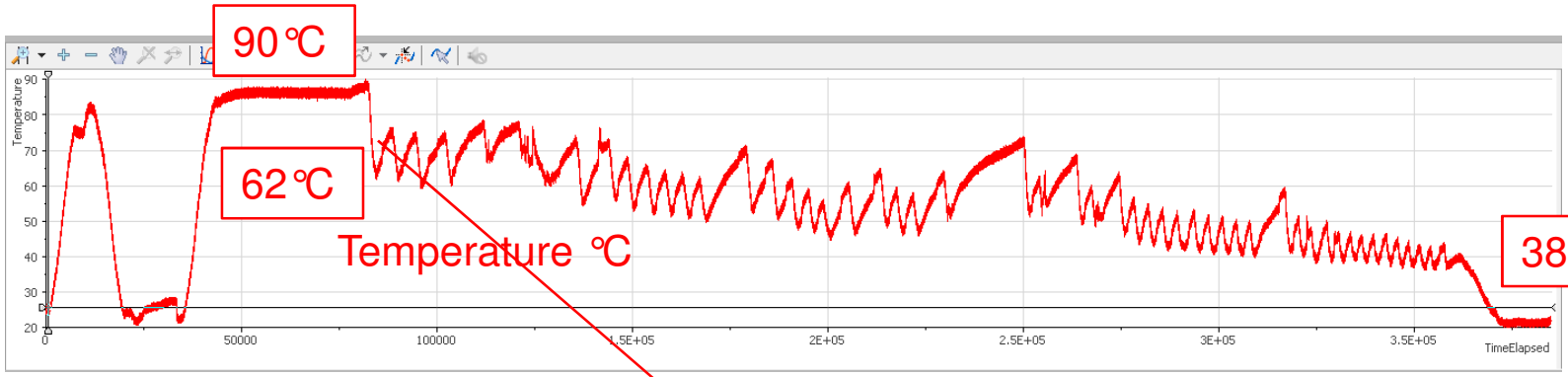
Memory Gauge - Specs

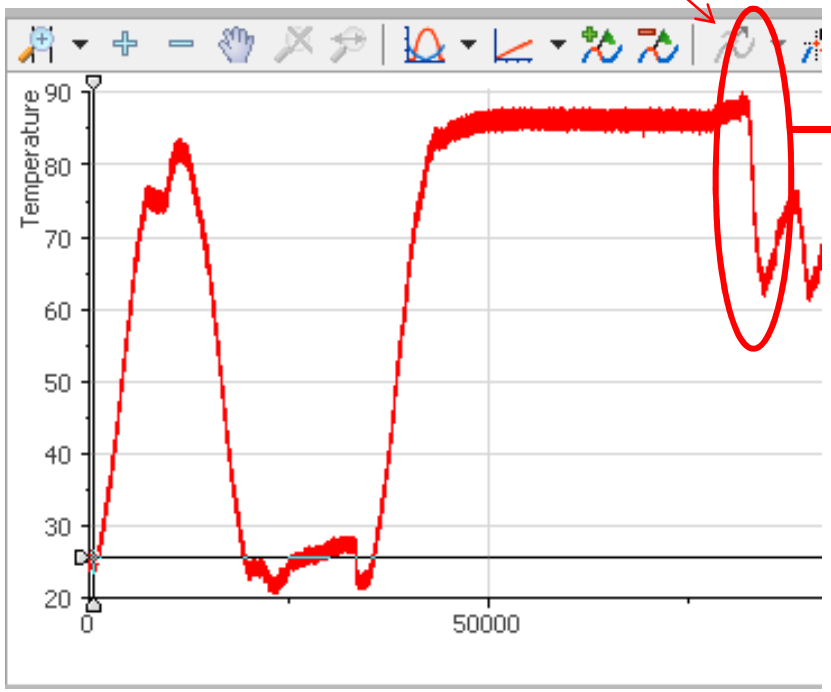
- Pressures: 0-90 MPa
- Temperature: -40 to 125℃
- Force: -18,000 to +18,000 daN
- Sample Rate: 10 per second
- Max. recording time: 108 hrs
- Slim & compact design

NCS Mongoose in Frac Sleeve



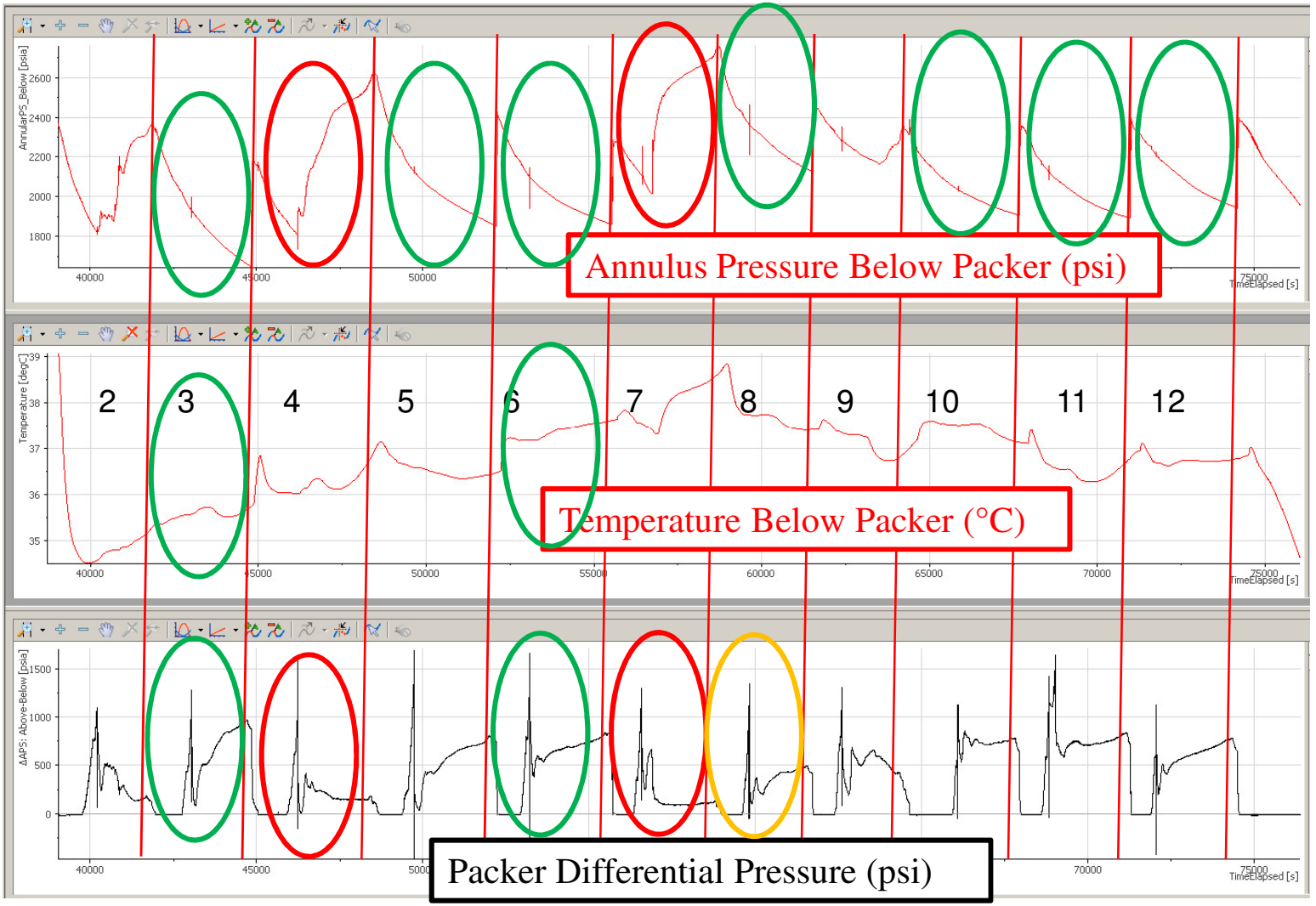
Temperature Profile





28 ℃ Drop
½ hour @ 1 m^3/min

OH Packer Performance

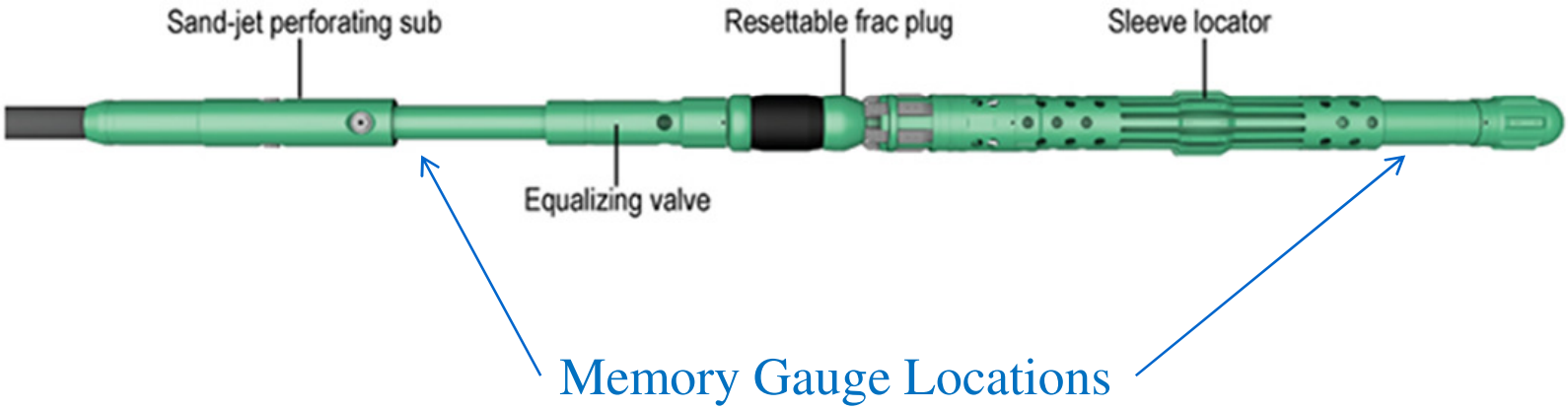


Over-Pull Example

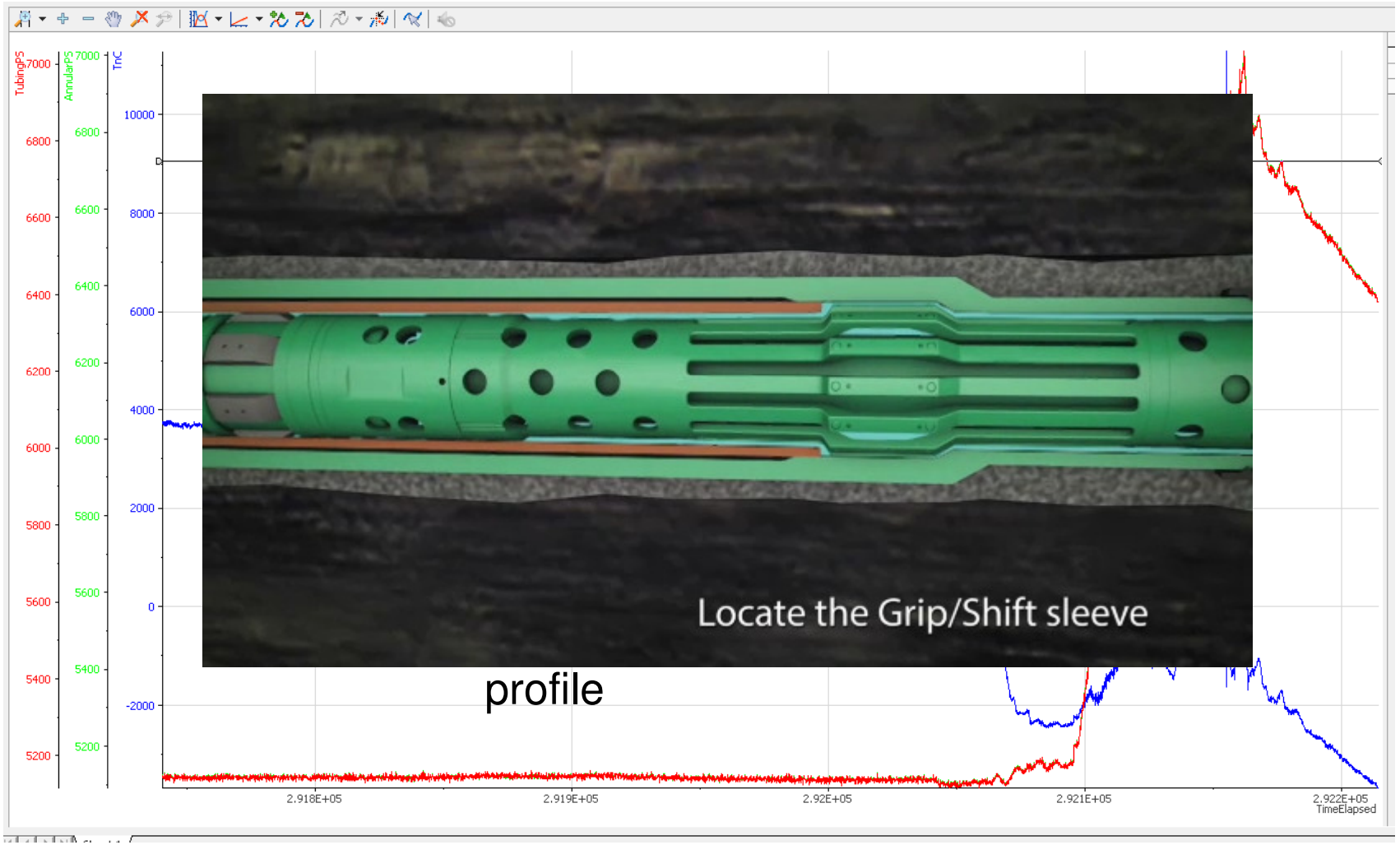
Max Pull off Zone (surface) = 29,000 daN
Avg. POOH (surface) = 15,000 daN
Max. Over-pull at BHA = 12,000 daN

Over-Pull Example

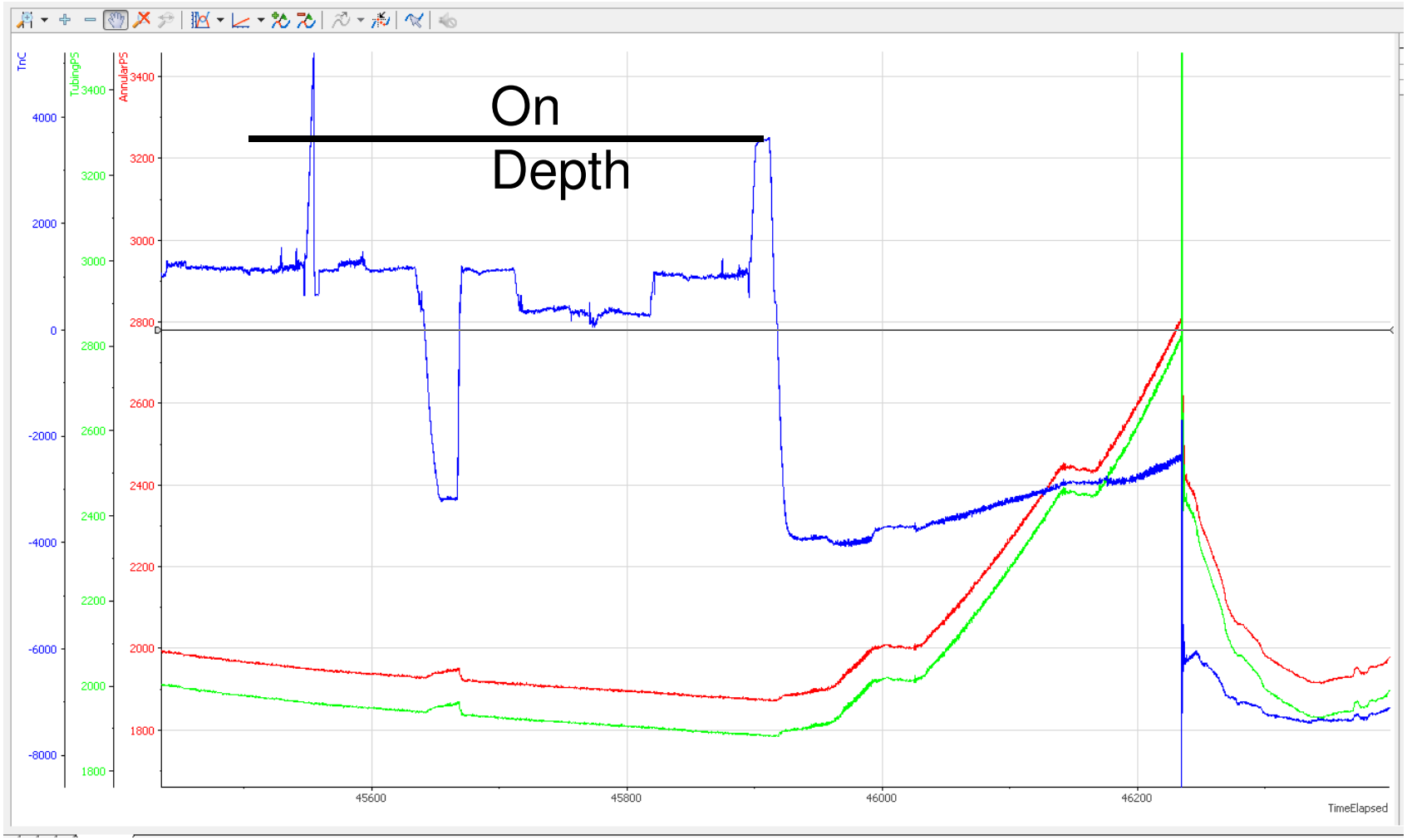
Therefore stuck on the bull nose



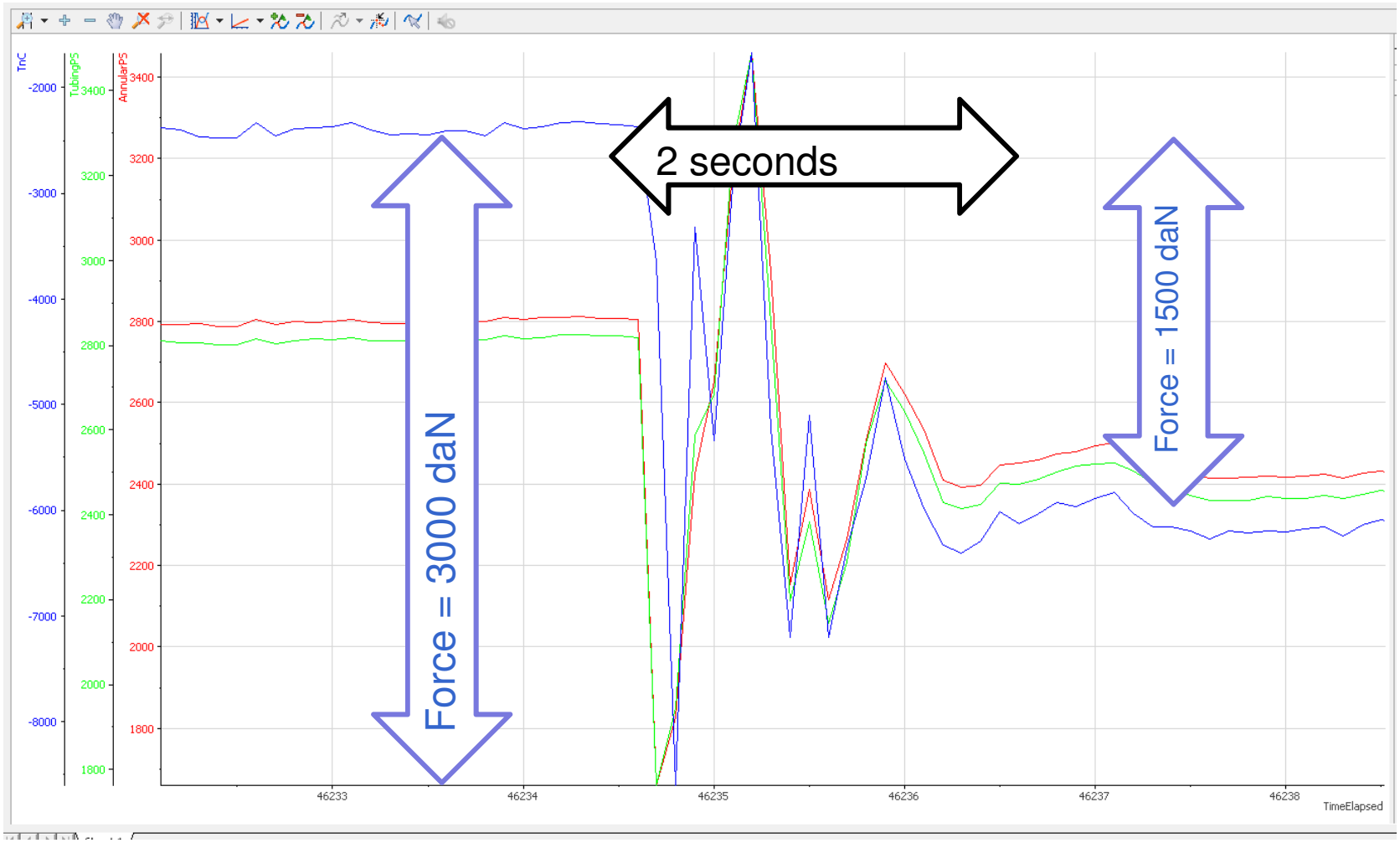
Locate Example #1



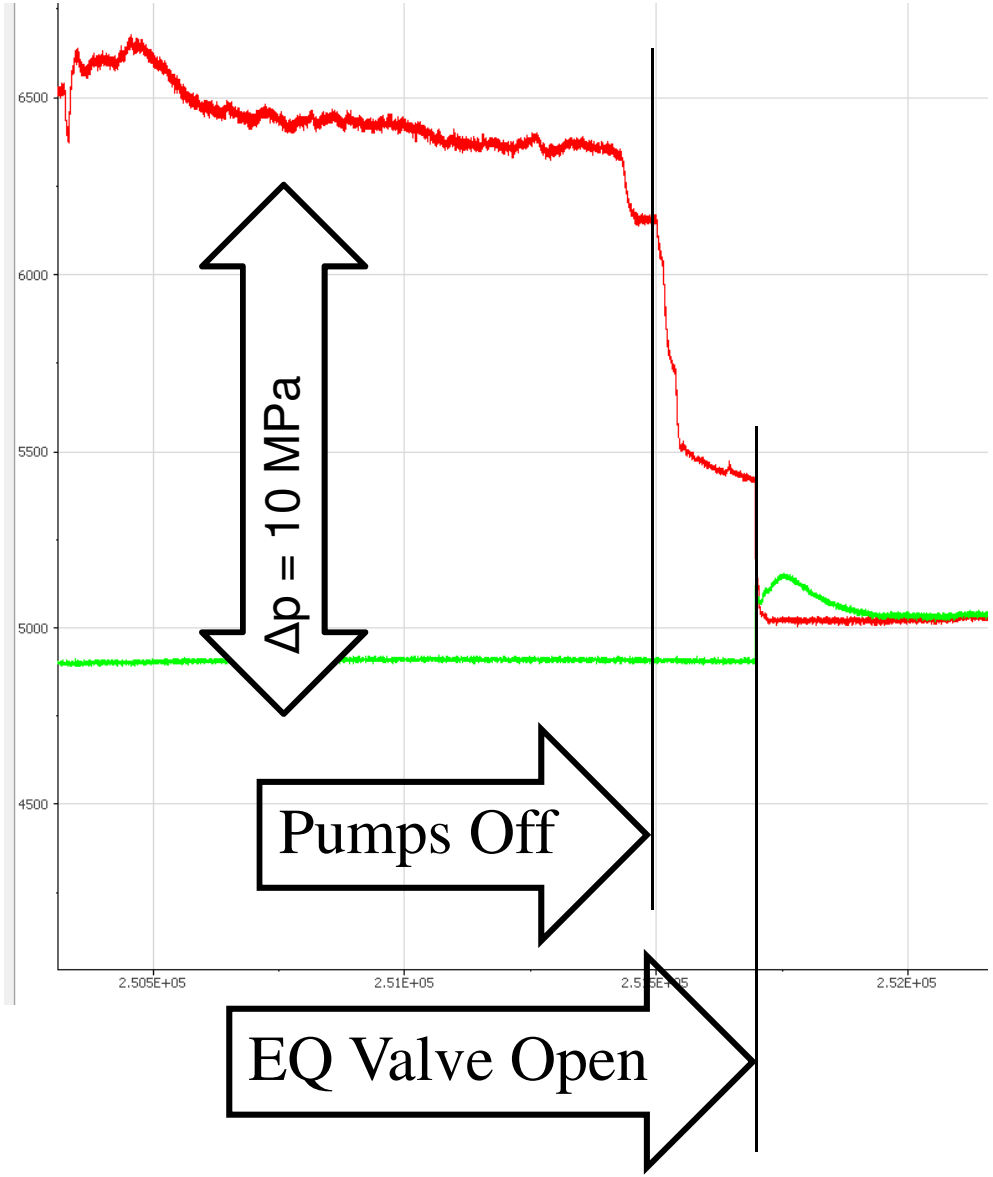
Locate Example #2



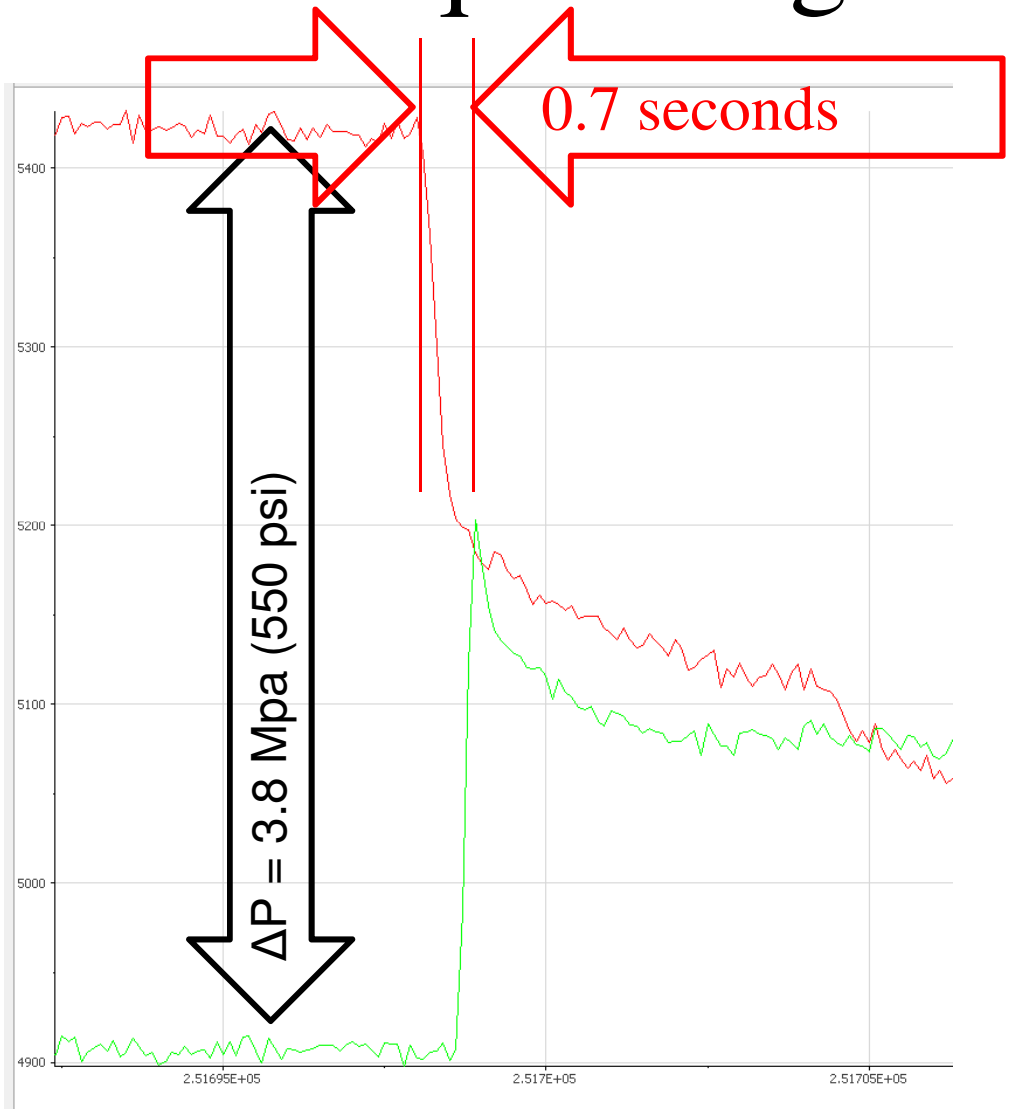
Sleeve Shift Force Example #1



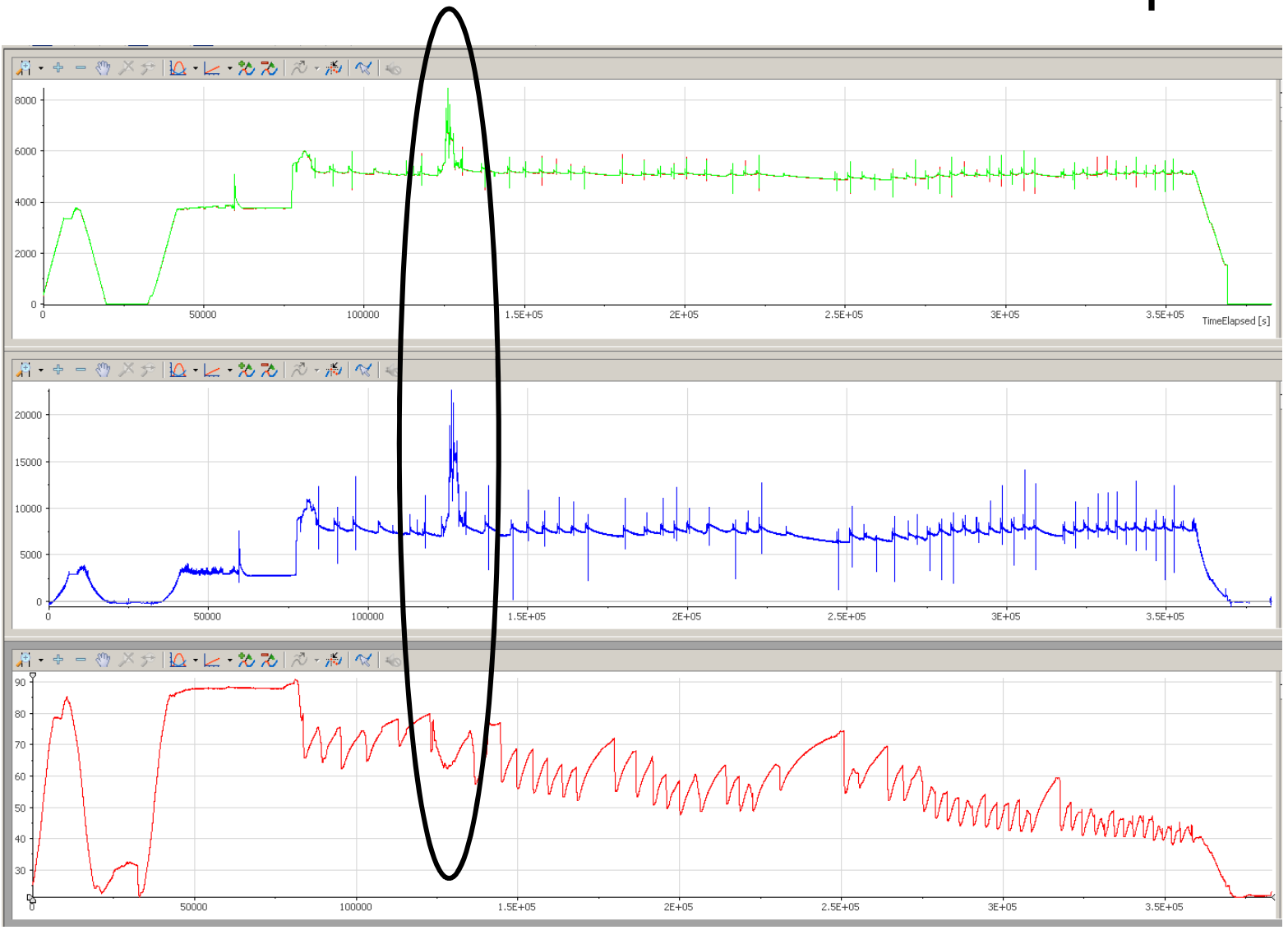
Equalizing Pressure



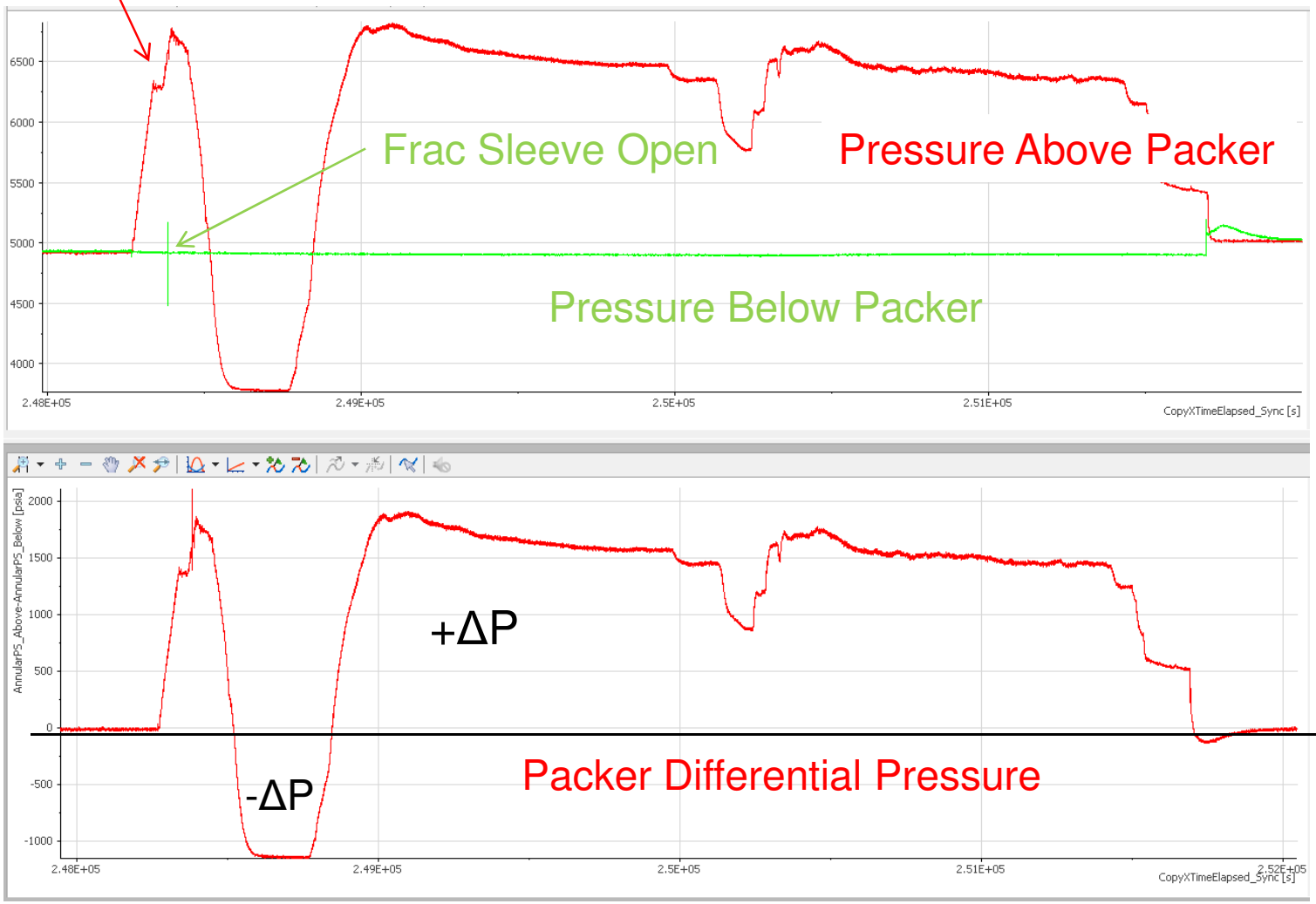
Equalizing


0.7 seconds
ΔP = 3.8 Mpa (550 psi)
5400
5300
5200
5100
5000
4900
2.51695E+05
2.517E+05
2.51705E+05

Entire Job Data – Screen Out Example



What Else?
You don't know what you don't know!



Why isn't this type of technology more broadly used?

- Vision & Up Front Cost
- Cost of analysis
  - Synchronize with other memory tools and surface data extremely time consuming
  - Quick easy access to data

Summary

- Pressure, Temperature, and Force Memory Gauges can take us out of the Dark AGES

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