



Redefining Fit-For-Purpose ERD Equipment

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Introduction

ERD is among the most expensive and highest risk of all types of drilling.

Therefore, the equipment we use should be designed specifically for this application in order to manage the associated risks / cost.



Presentation Objectives

- **Challenge application of current “ERD” Equipment**
- **Give examples of inappropriate tools**
- **Propose alternative design criteria**
- **Produce “Momentum” for change**



Why do we need different tools?

1. Load direction

- Tension ↓ Torque ↑

2. Cuttings Behavior / Hole Cleaning

- Dirt must be considered

3. ECD's

- Larger fluctuations
- Consequences are more dramatic

4. Time

- Drilling, tripping, etc.



Discussion Points

- 1. Directional Tools**
- 2. Liner Systems**
- 3. Tubulars**
- 4. Rig Equipment**
- 5. Completions**



Directional Tools

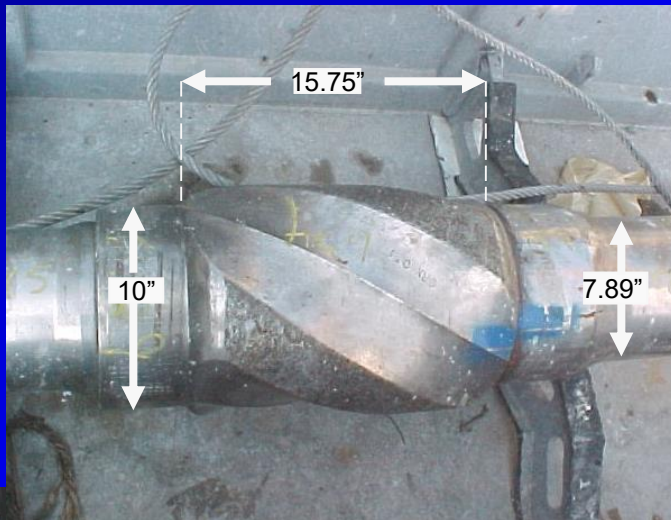
Current Design Priorities

- ROP (ie, PDM + RST)
- Enhanced communication (ie, PD Xtra)

ERD Priorities

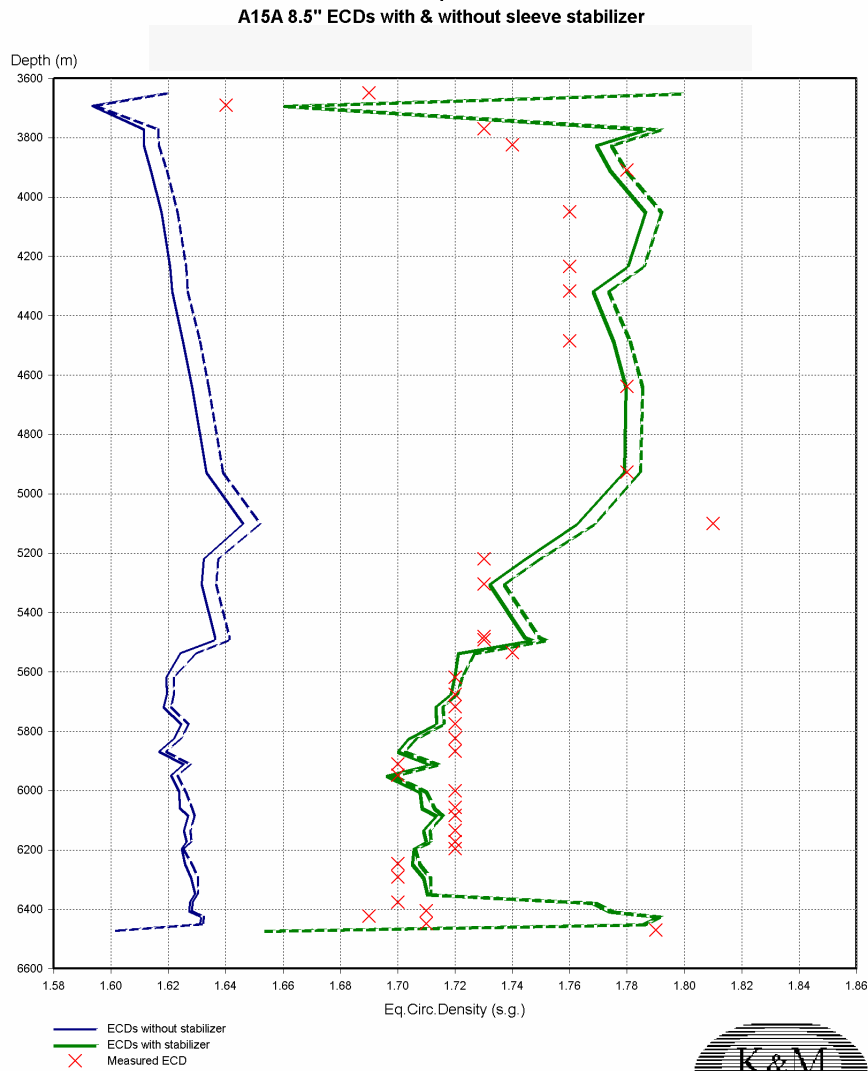
- Maximum RPM capability
 - Reliable at >150 rpm for 250+ hours
- Maximum Junkslot area
- Ability to rotate at high RPM off bottom (RWD)

Directional Tools





Directional Tools



A15_8_ECD - TAD 4.77z 5/18/2004



- Model is unable to match PWD readings

- Error is 0.16 sg falling to 0.10 sg (1.33 – 0.83 ppg EMW)
- Even gross changes in mud properties cannot explain the results

- But when the stabilizer is accounted for ...

- A good match occurs
- ECD difference is a constant pressure drop of 430 psi (30 bar)
- *Note – sleeve stabilizer had only 3mm clearance ..*
- *The BHA was very difficult to pull out too*





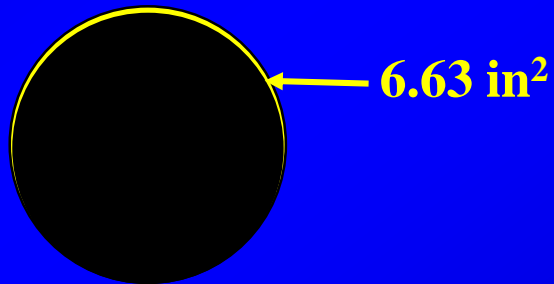
Liner Systems

- **Hangers**
 - Low hanging capacity requirements
 - Are they even necessary?
 - Max JSA
- **Liner Top Packers**
 - Setting mechanics
 - Max JSA
- **Running tools**
 - Purpose-built for selective floatation
 - **BUILT TO ROTATE**

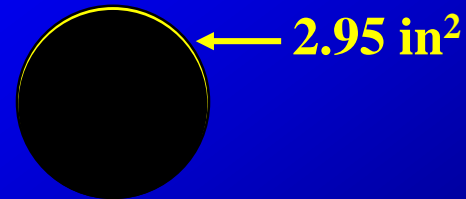


Liner Systems

Size	Bypass Area (un-set)		
	Hanger A (in ²)	Hanger B (in ²)	Packer (in ²)
9 5/8" x 13 3/8"	11.89	25.77	6.63
7" x 9 5/8"	2.66	8.90	2.95



11.9" DC in 12.25" hole



8.25" DC in 8.5" hole

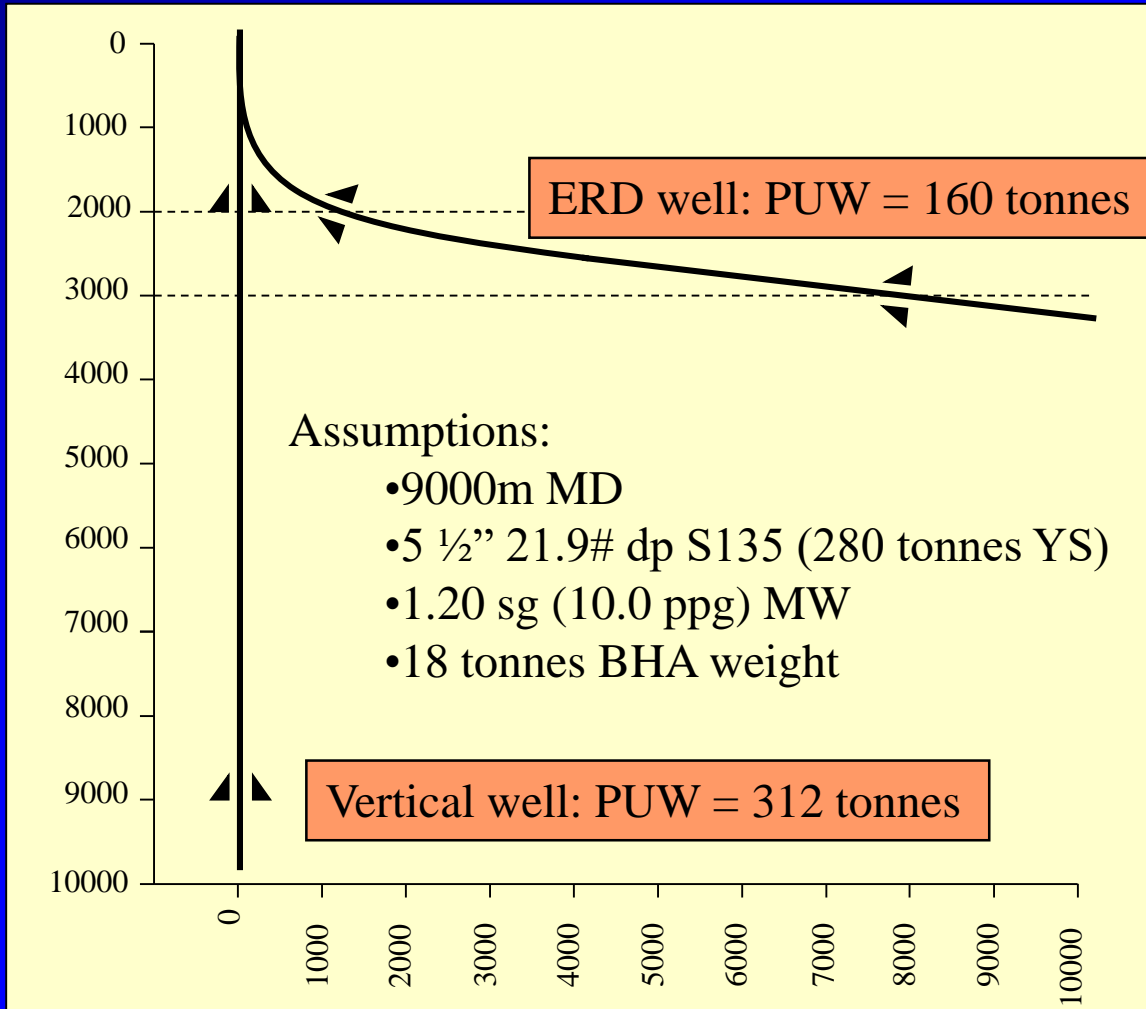




Tubulars

- **Drillpipe**
 - Tubes designed for torque and large ID, not tension
 - Connections for high torque
 - Same goes for bladed drillpipe
 - “Higher Torque” often the reason for not-running bladed pipe
- **Casing / Liner**
 - “Standard” sizes often inappropriate
 - High yield strength to reduce weight
- **Expandables**
 - Difficult to run
 - Difficult to set (must be bottom-up)
 - Currently unsuitable for most “long” wells
 - Cannot run evacuated
 - Cannot rotate

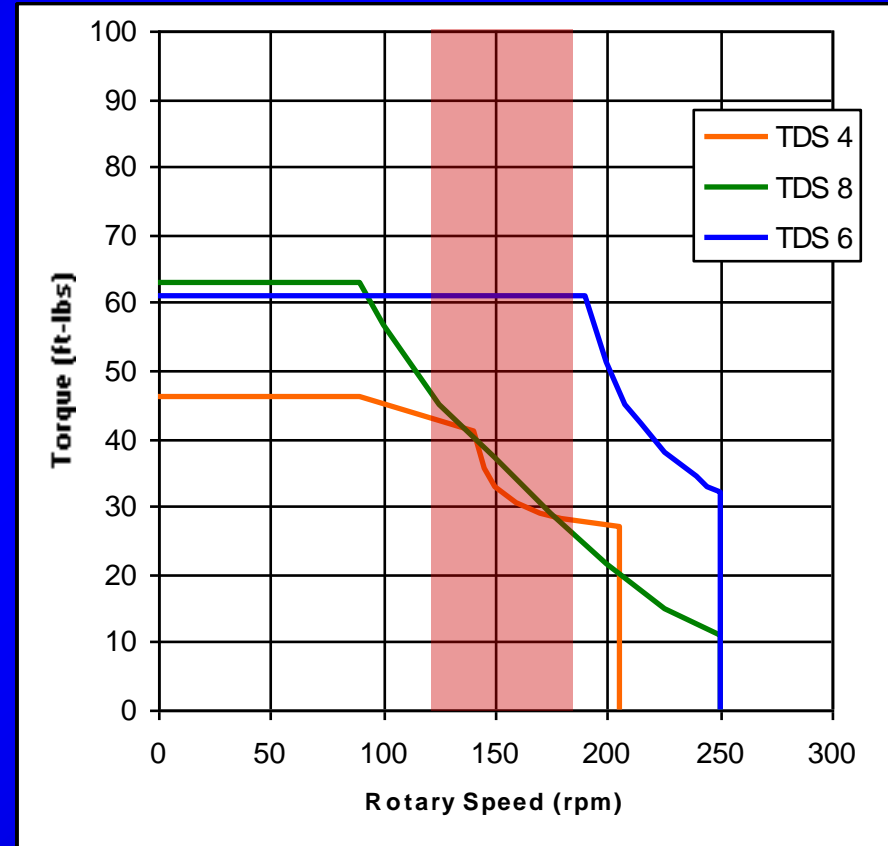
Tubulars





Rig Equipment

- **Top Drives**
 - “High Performance” means high torque at high RPM
 - Reliability is key in this bandwidth
 - Overdrill capability
- **Derrick**
 - Racking capacity
 - Derrick height
 - RBS





Completions

- **Screens**
 - **Lighter is better**
 - **Composite solutions $\approx 52\%$ lighter than steel (similar effect as roller centralisers)**
 - **Need ability to rotate**
 - **Or, just the running string**
- **Intervention**
 - **Wireline tractors can go places CT can't**
 - **Coiled Tubing Tractors**



Summary

- Many of the tools we use to today were designed and built with vertical hole in mind
- Rethinking ERD applications is required in order to develop “fit-for-purpose” solutions
- This is everyone’s responsibility (Operators and 3rd Party)



Questions

