



SBGIMR

Gaz de Schiste et de Charbon

Drilling Challenges

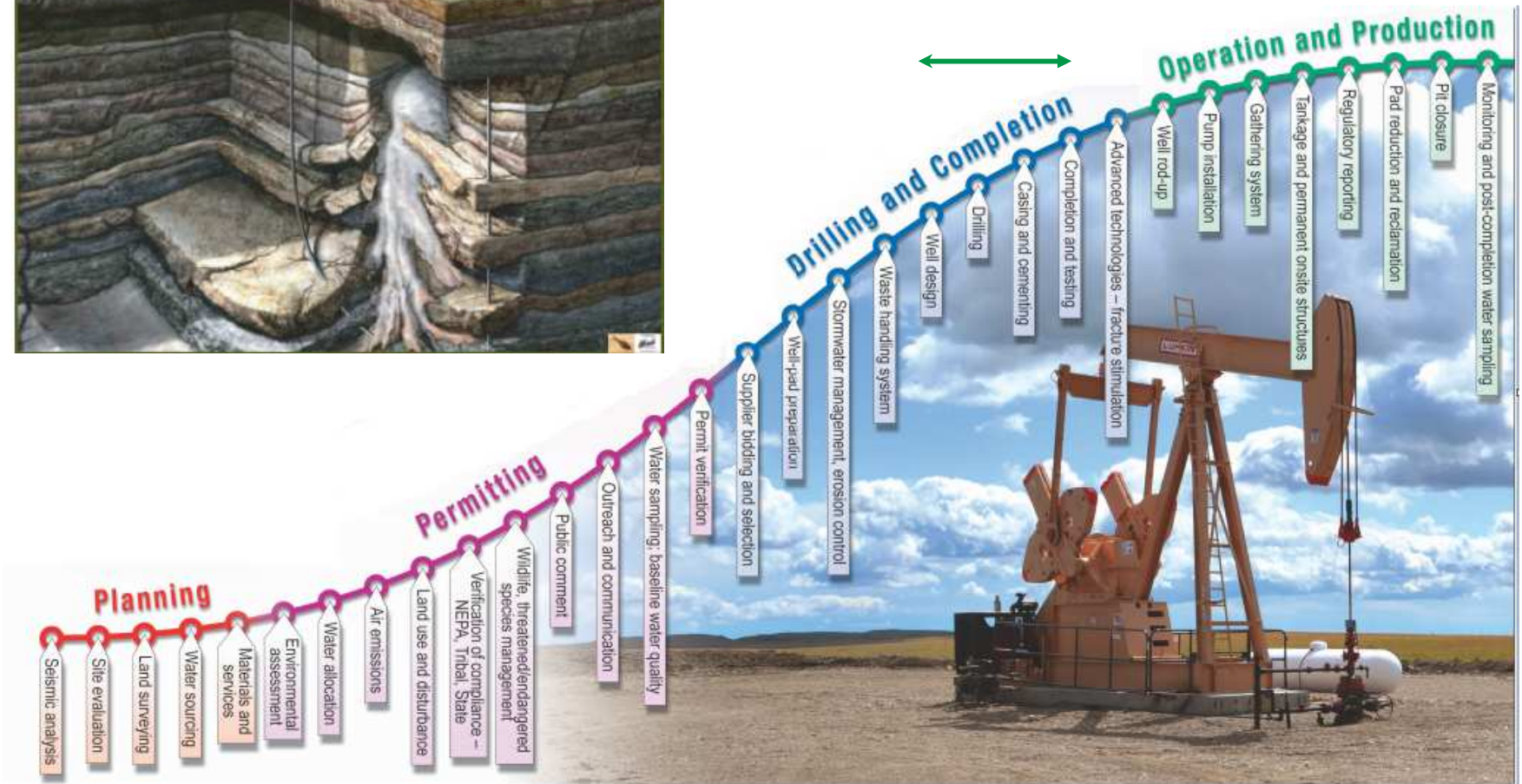
*Benoit DESCHAMPS
Georges DECHIEF*

Mons, 8 Dec 2014

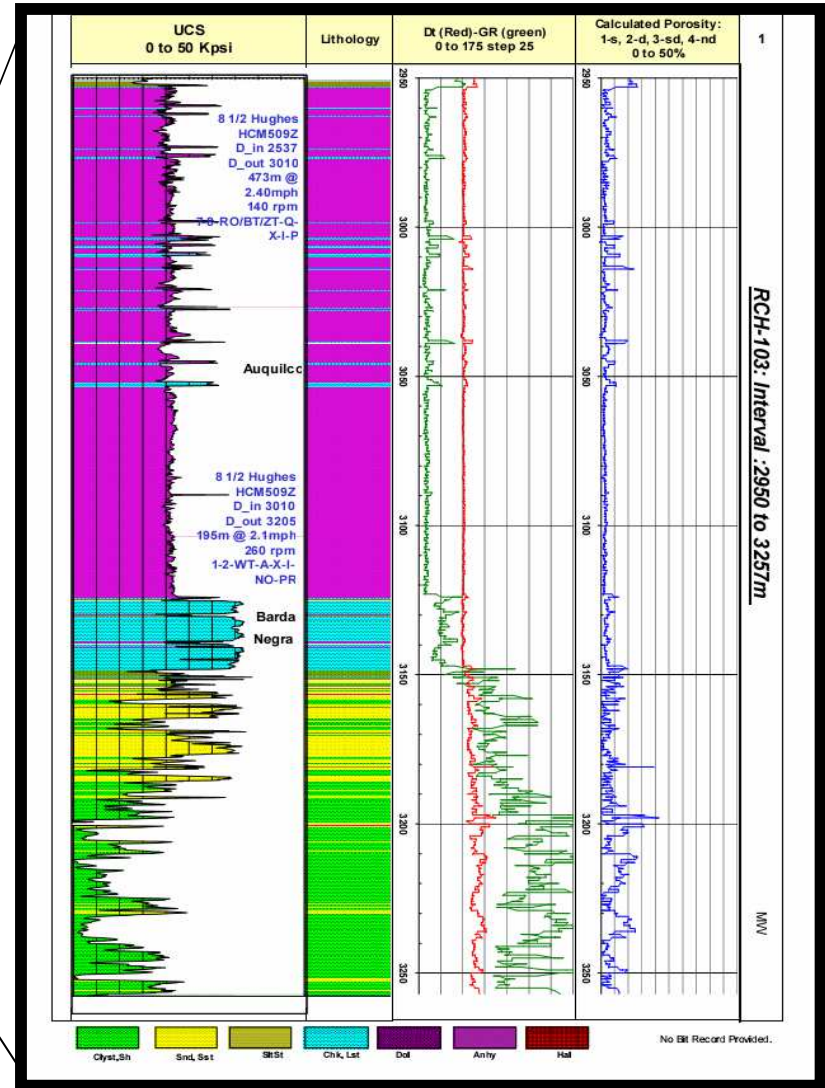
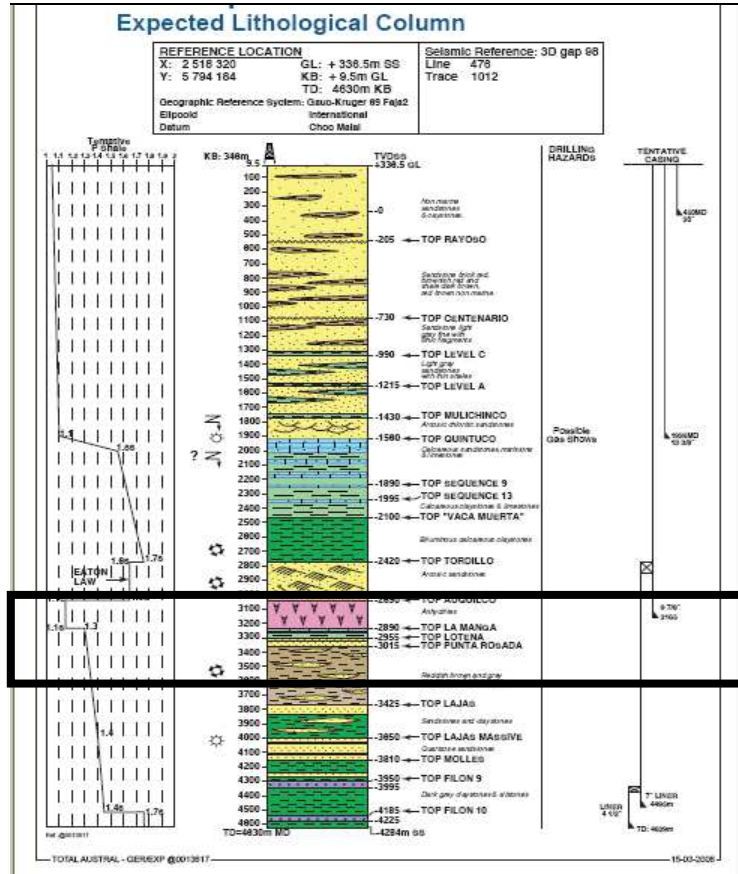
Outlines

- I. Introduction:
Oil & Gas Drilling Operations Overview
- II. Directional Drilling (N. Da Silva – Halliburton)
- III. Wellbore Conditioning
Deployment & Completion Challenges

Oil & Gas Well Life Cycle

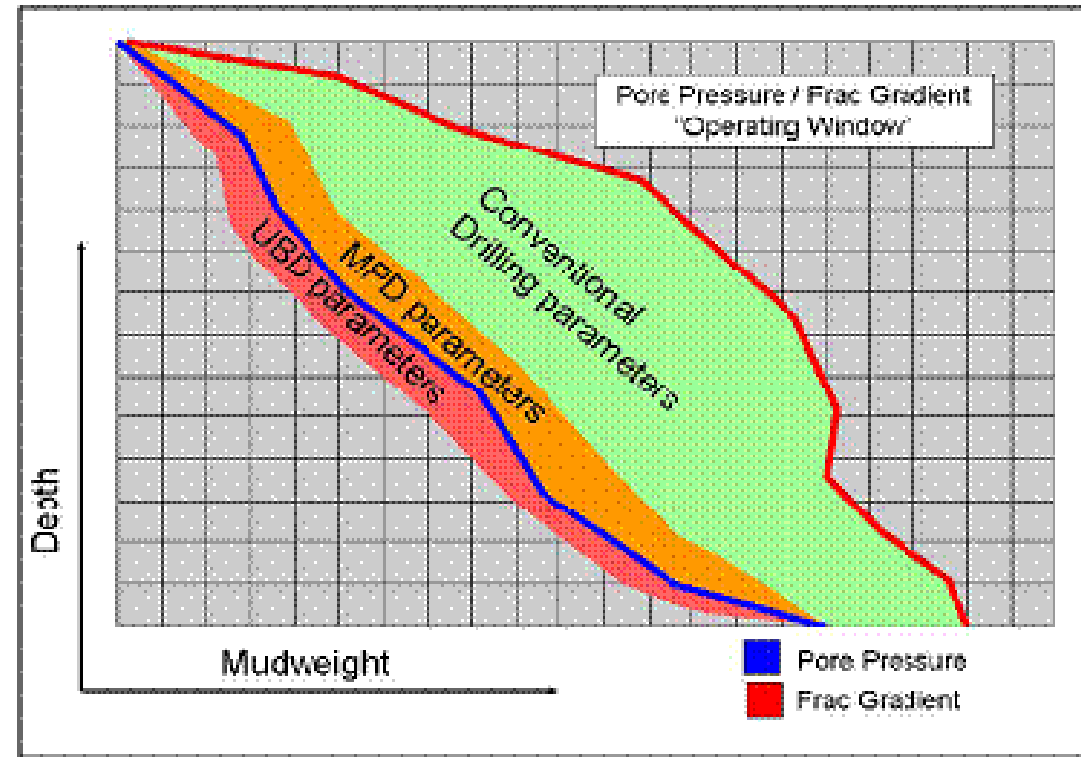


Oil & Gas Operations: Geomechanical Environment



Oil & Gas Operations: Well Architecture

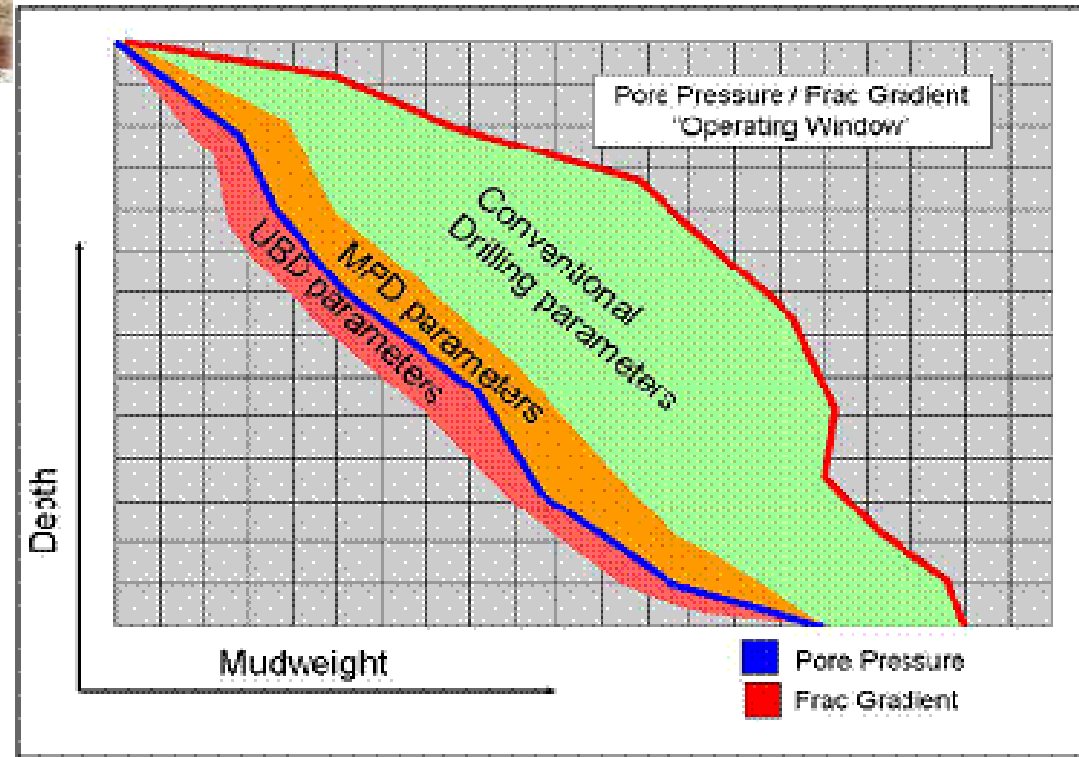
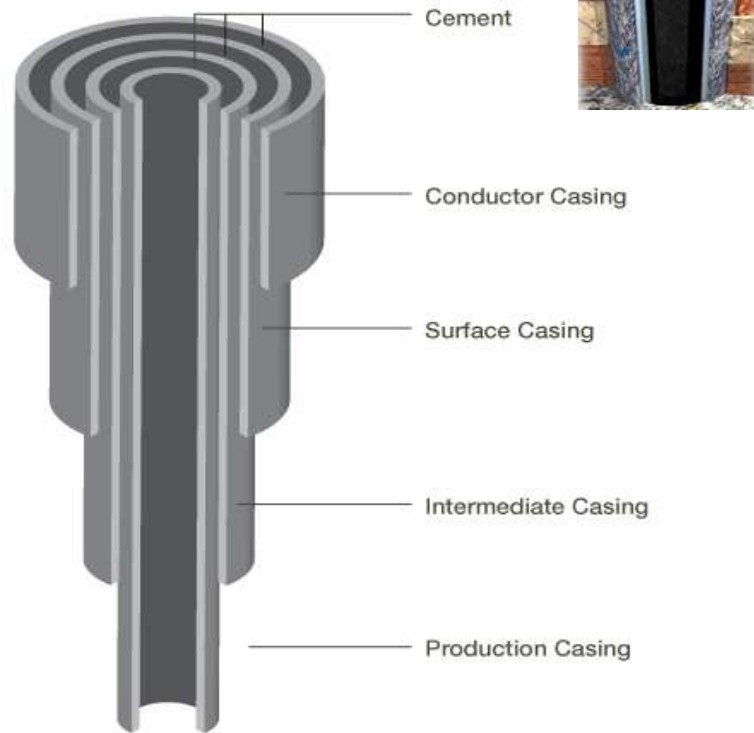
Drilling Unit		Well architecture		MD
		MD/RT		
Claystone, siltstones, limestones	RKB	25		
	Mud line	2000		1.03 _{ra} seawater
	36" CP	2080		
	28" Casing TD 26" x 42" section	2493 2500		
	22" Casing TD 28" section	2693 2700	Miscen	
SALT	18" Liner TD 16 1/2" x 22" section	3000 3010	Clipped	1.15 _{ra}
	Top of salt	3500		
	16" liner TD 17" x 20" section	4100 4105		
	Base salt - 13 5/8" casing TD 14 1/2" x 17 1/2" section	6000 6007		1.35 _{ra}
	11 3/4" Liner TD 12 1/2" x 14 3/4" section	6400 6402		1.25 _{ra}
Limestones, calcareous, shales	9 7/8" casing TD 9 1/2" x 12 1/2" section	6700 6707		1.25 _{ra}
	7" Liner TD 8 1/2" section TD 6" section	6998 7000		1.25 _{ra}
Basement				



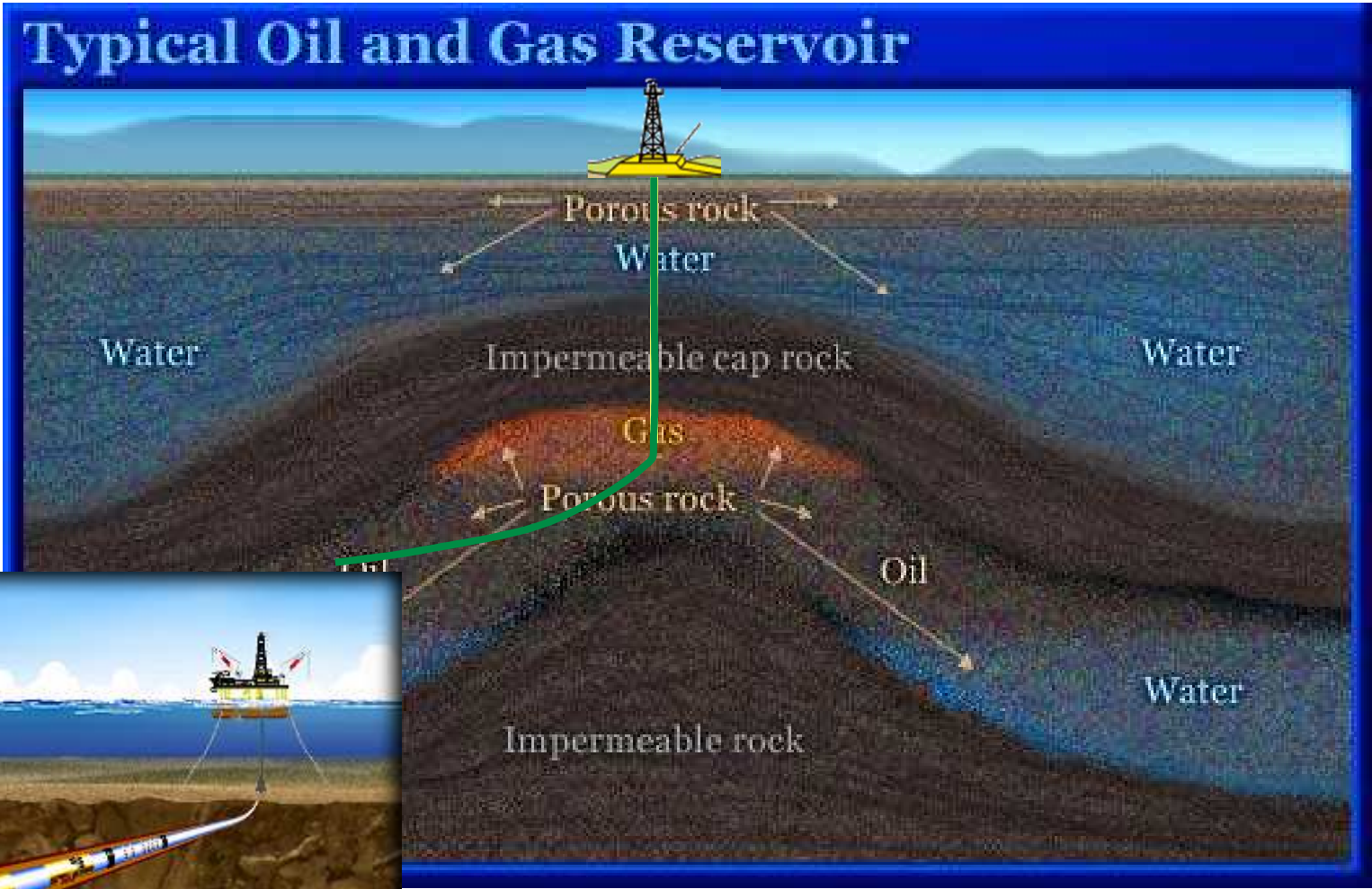
Oil & Gas Operations: Well Architecture

Typical Well Casing Diagram

(Not to Scale)

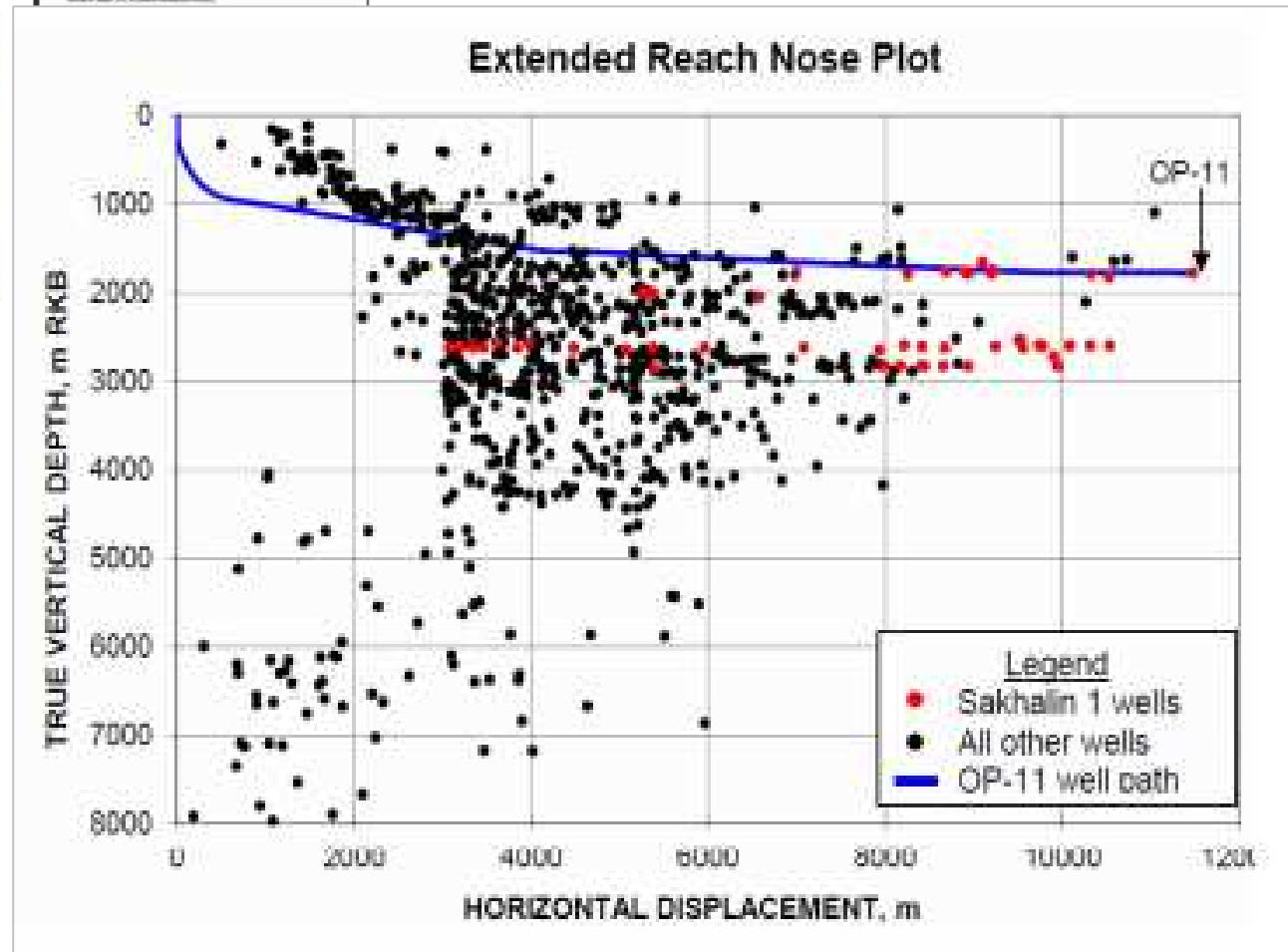


Oil & Gas Operations: Reservoir Engineering

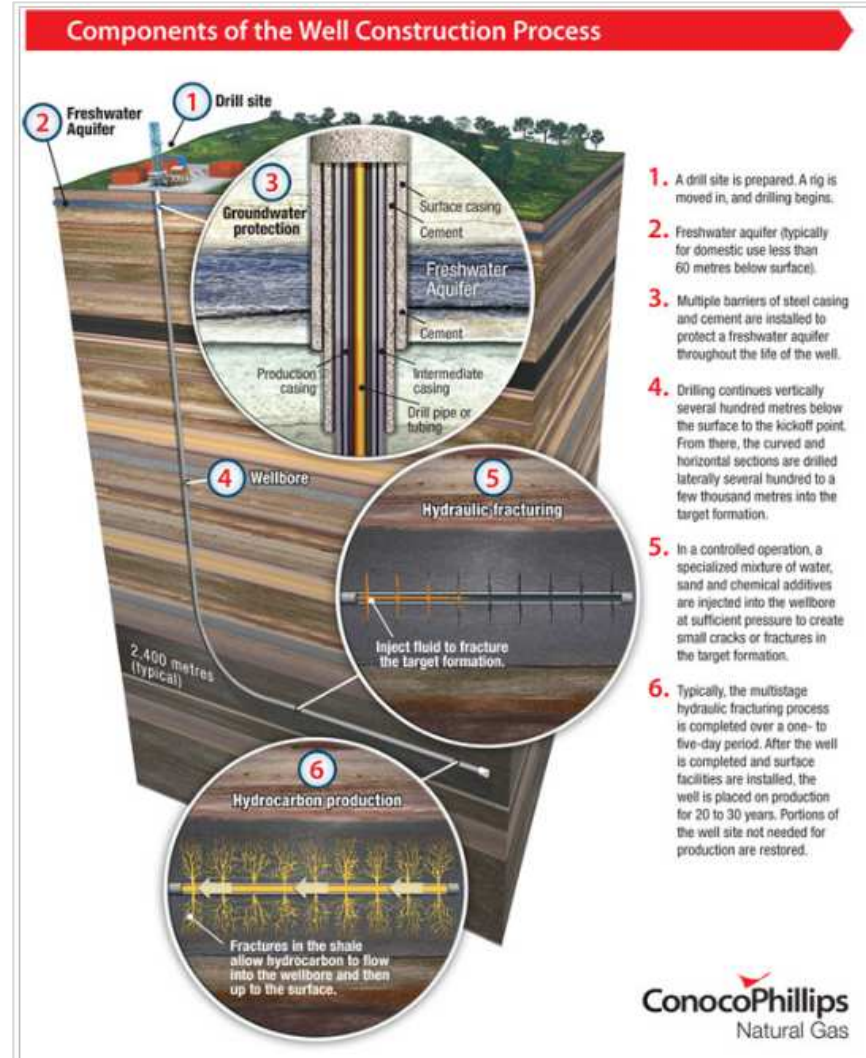
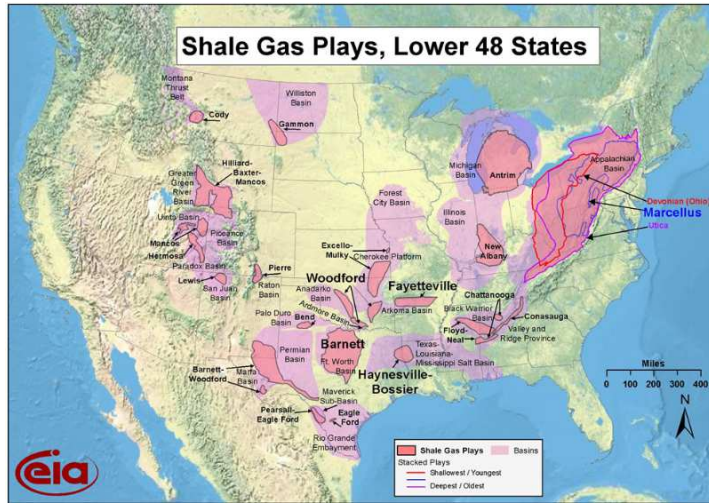


Oil & Gas Operations: Complex Well Designs

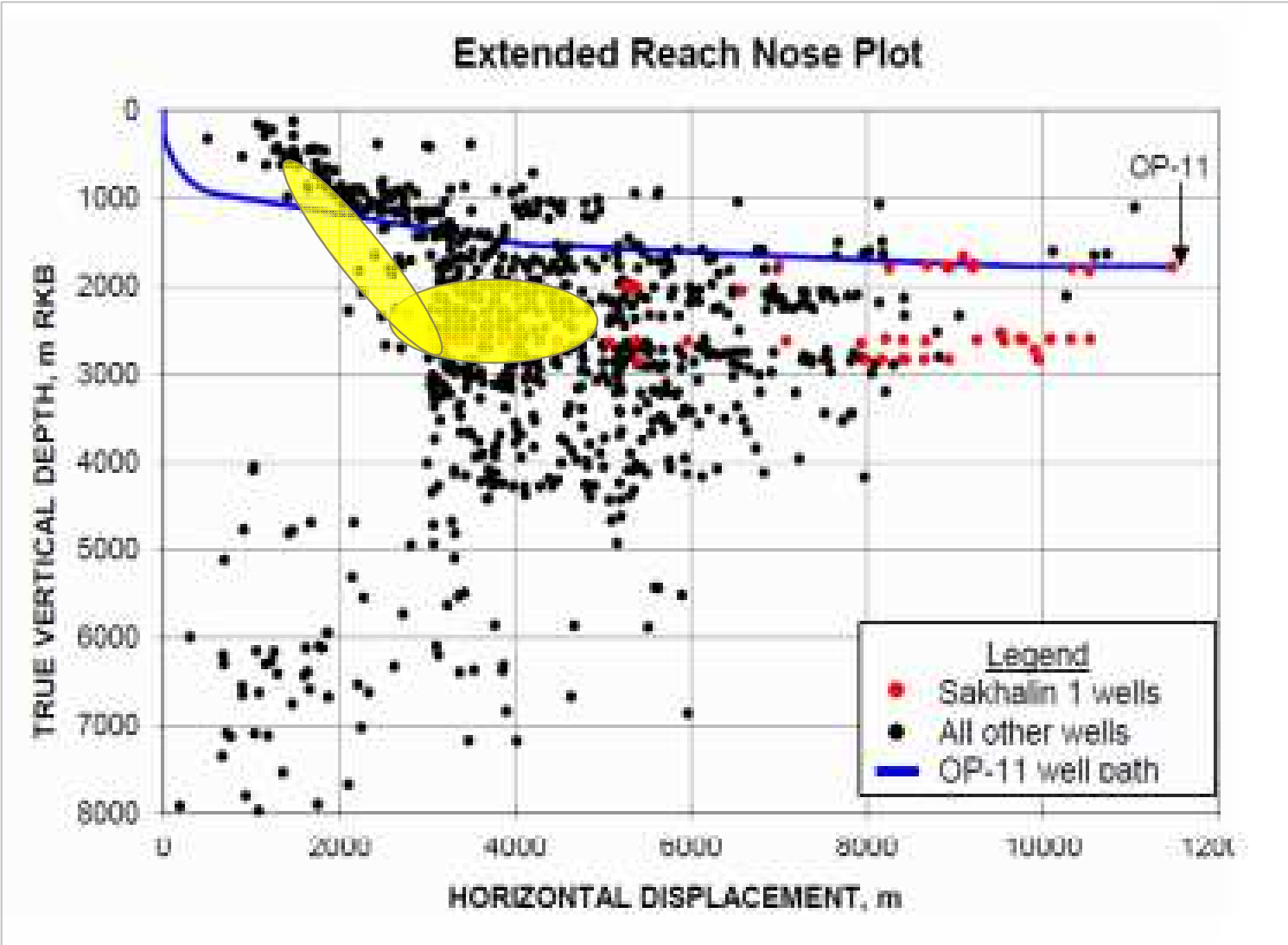
Extended Reach Targets ... 12345m MD



Oil & Gas Operations: Shale Gas - NAM



Oil & Gas Operations: Shale Gas



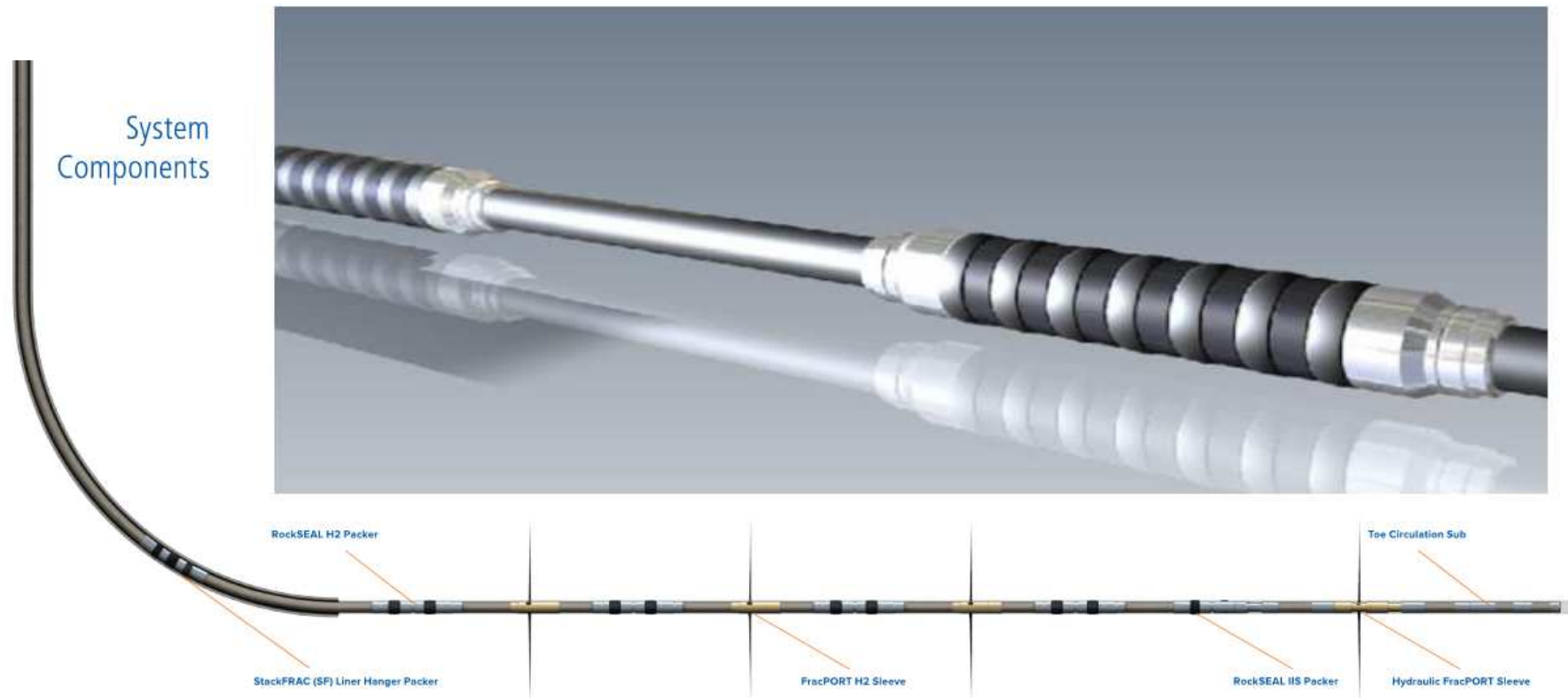
Oil & Gas Operations: Shale Gas – NAM Technical Enablers - Drilling

- Directional Drilling Technology
 - Driving systems
 - Drill Bits Technology
- Wellbore Conditioning
- Completion deployment in highly deviated wells

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Deployment & Completion Challenges

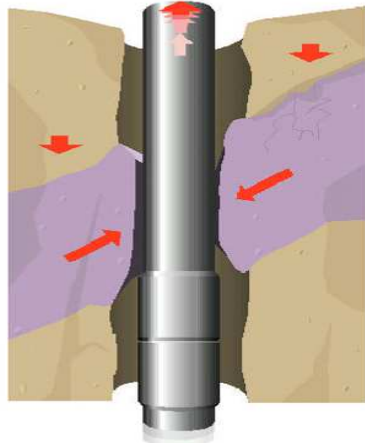
USA – Barnett Shale – Typical Completion



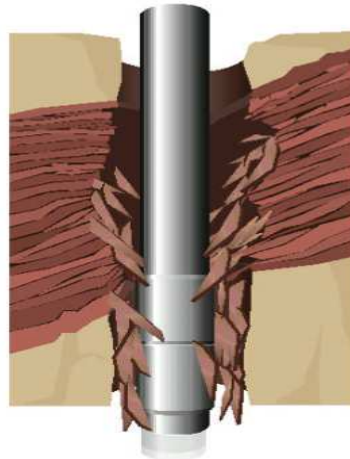
Completion Equipment:

- Less prone to be rotated, low mechanical strength
- Deployment = Sliding Operations

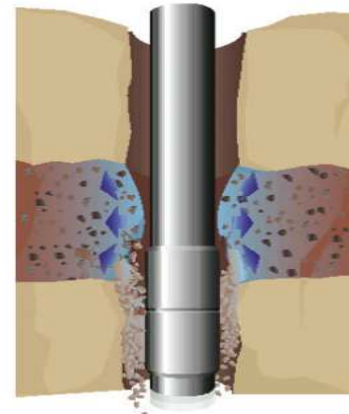
Open Hole Potential Environment



Mobile Formations



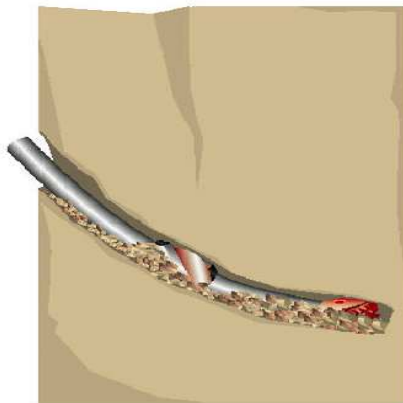
Moderate Fractured & Faulted Formations



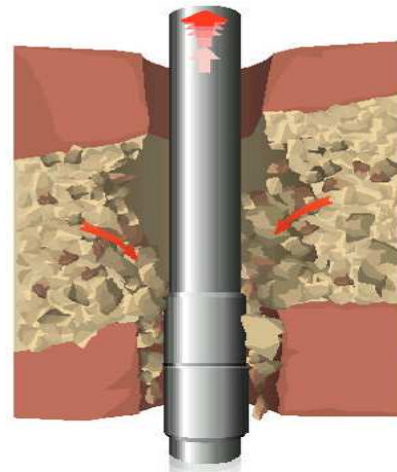
Reactive Formations



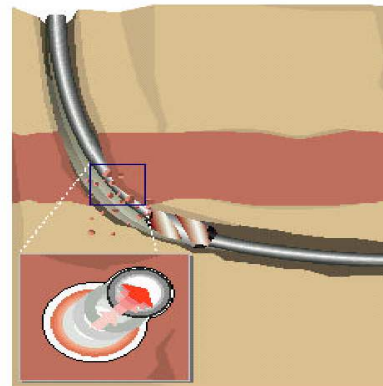
Over-Pressured Formations



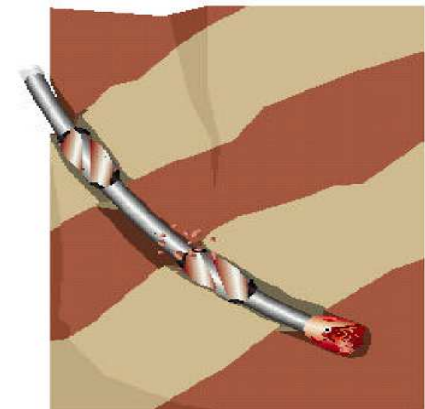
Hole Cleaning



Unconsolidated Formations

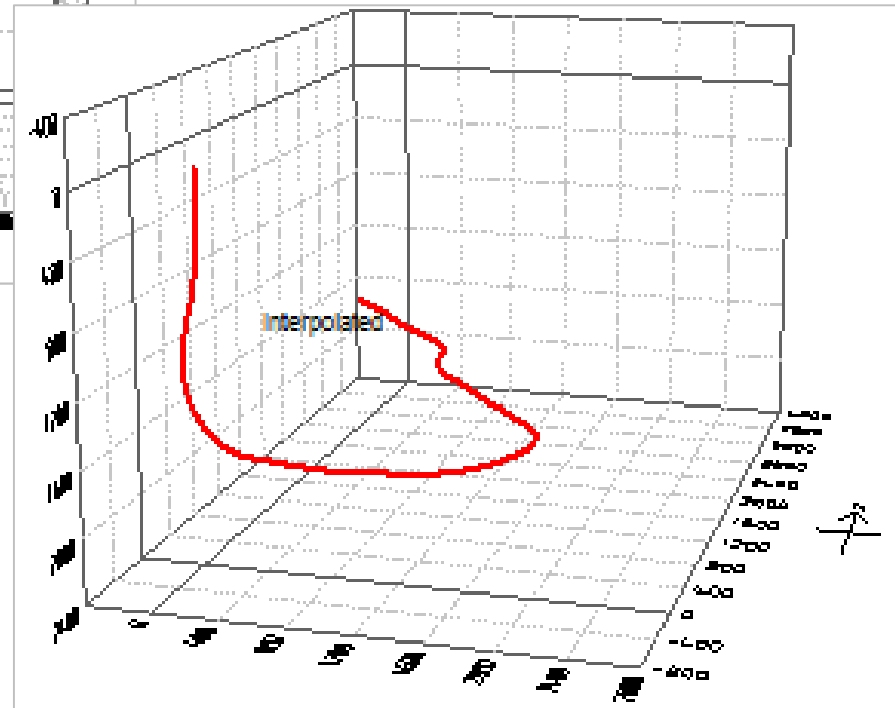
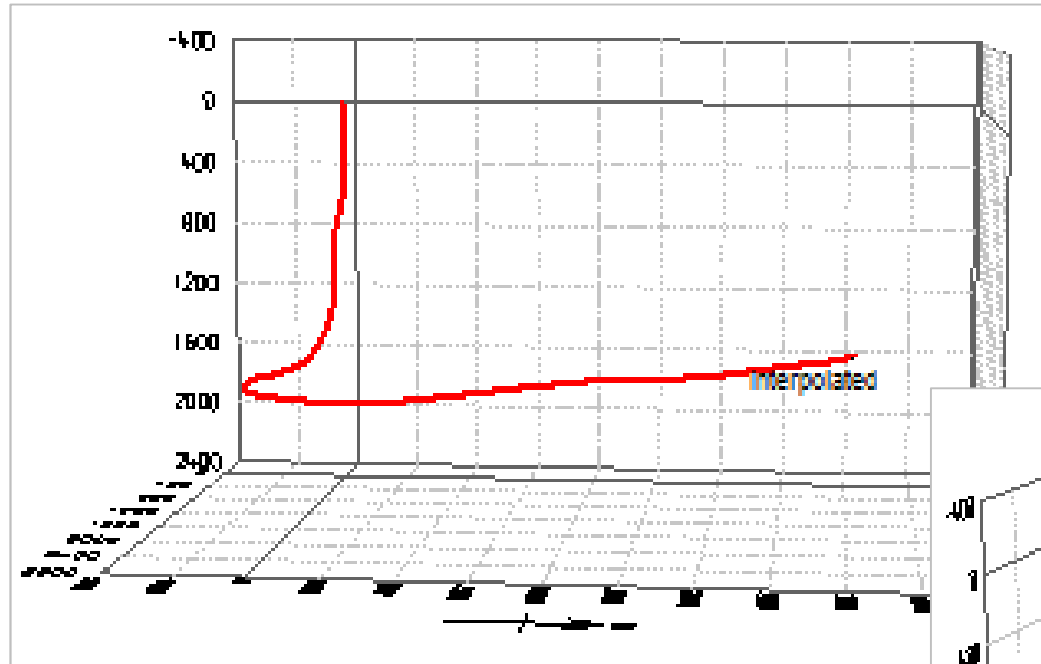


Key Seating

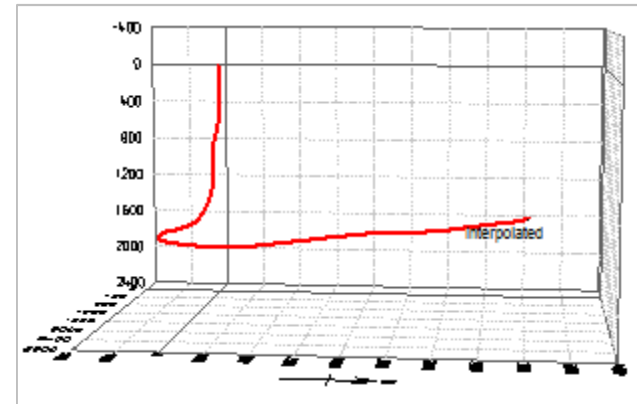


Ledges and Doglegs

Actual Complex 3D Well Trajectory



USA – Barnett Shale – Typical Completion

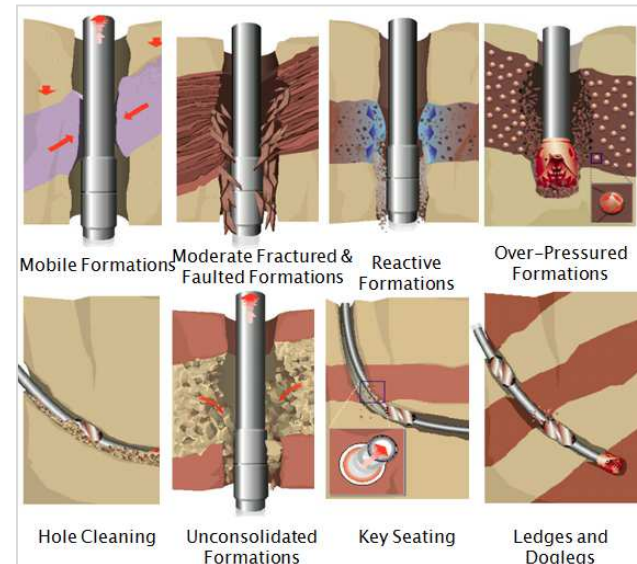


➔ Challenge = “FRICTION”

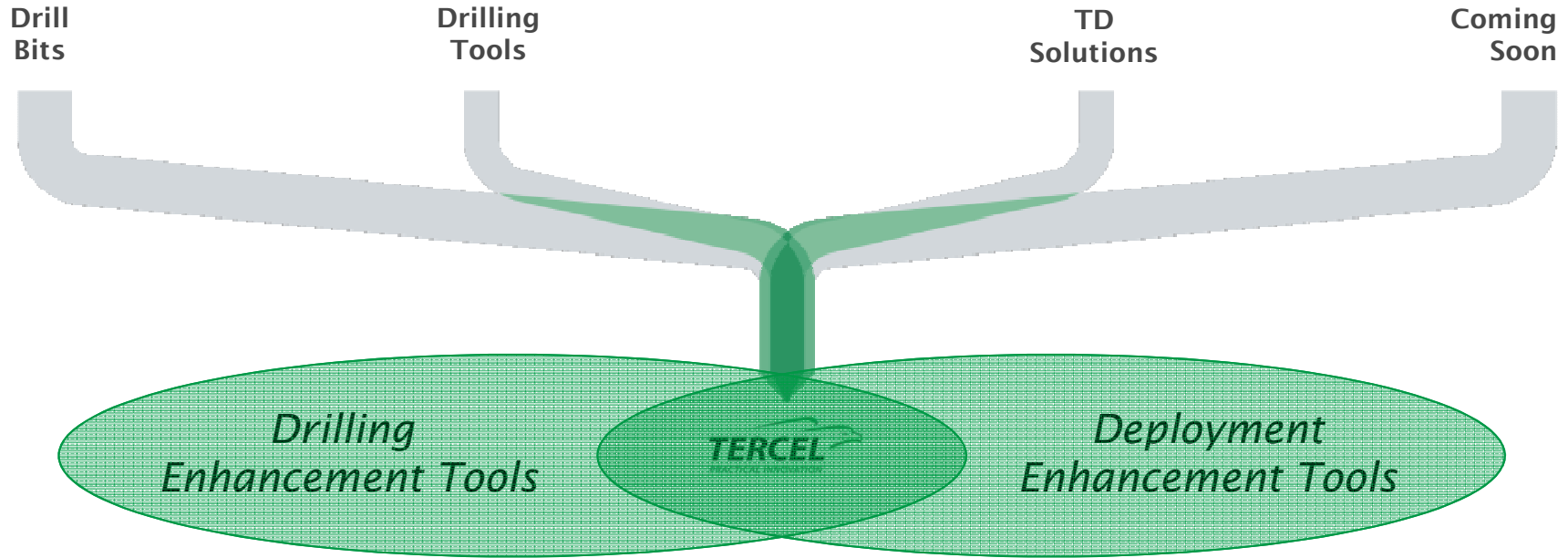
➔ Solutions:

➔ WELLBORE CONDITIONING

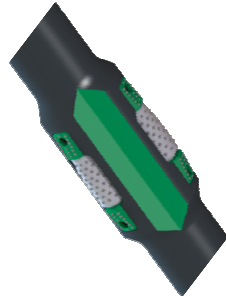
➔ FRICTION REDUCTION TOOLS



Product Lines: *Drilling and Well Construction*



MicroCORE



TorqAVENGER



GunDRILL



Product Portfolio: Drilling Enhancement – GunDRILL™ Reamer ‹‹



A drilling enhancement tool equipped with PDC cutters on a bevelled profile to help maintain gauge of wellbore.



Replaces conventional stabilizer and provides reaming through an integral blade design using tungsten carbide inserts (TCI).

GDR is not an Under-reamer. GunDRILL™ Reamer is a Hole Conditioner and a POOH Insurance !!!

GunDRILL™ Reamer - Benefits

Make it Happen

Tercel GunDRILL™ Reamer Enhances borehole quality by under-cutting/polishing ledges and tortuosities while drilling

- Reduced torque compared to the fixed blade stabilizers
- Increased WOB transmission
- Security against sticking downhole, provided string can be rotated
- Re-opens holes to avoid having stuck pipe due to borehole problems
- Reduce NPT related to POOH and encountering heavy back reaming in mobile and transient formations



Illustration - 7 7/8" Section (Australia - Coal Seam Gas)

Used the 7 5/8" directional GDR in more than 15 **directional** wells.

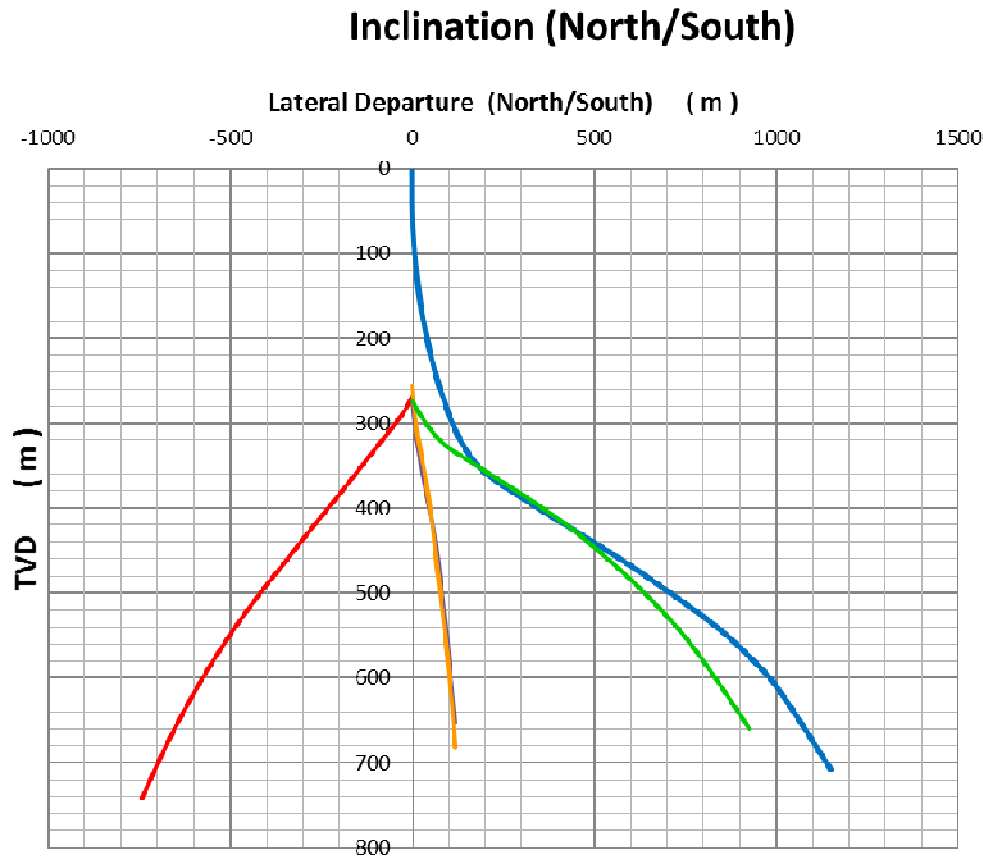
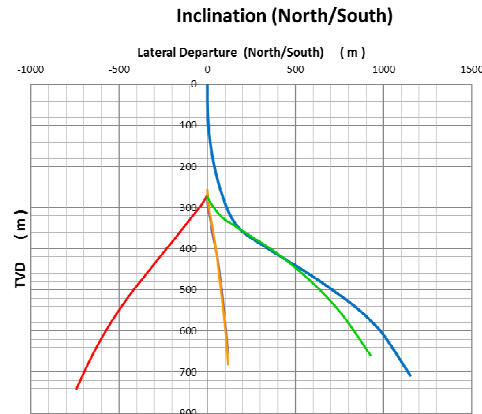
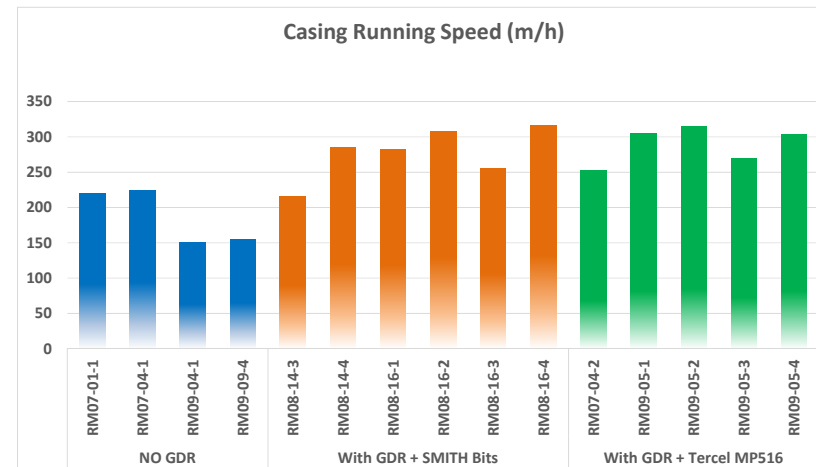
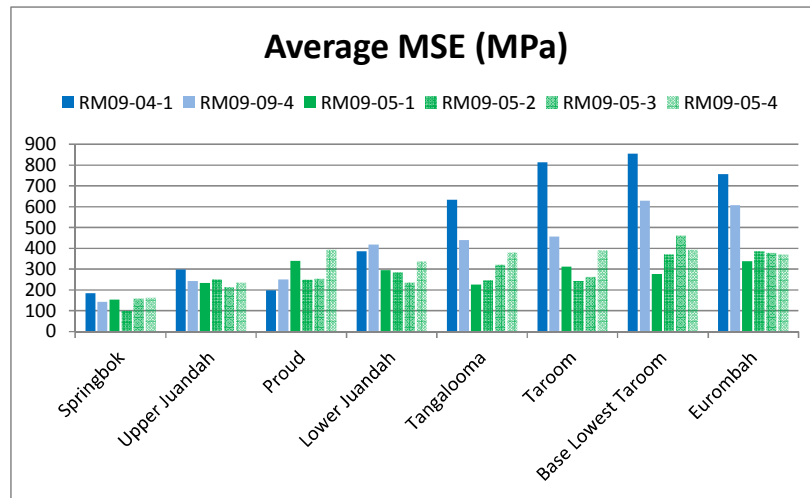


Illustration 1 - 7 7/8" Section (Australia - CSG)

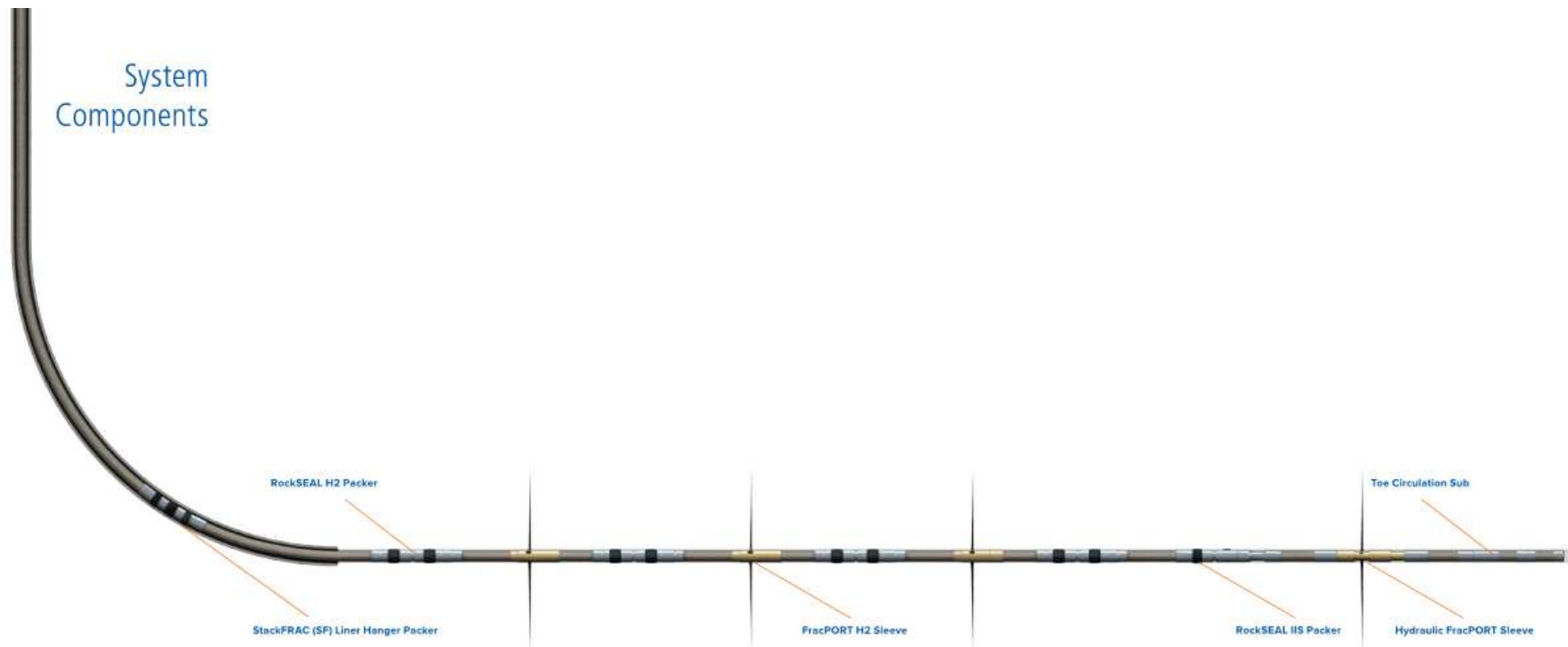


- Improvement while drilling
- Improvement while POOH
- Improvement when running the casing



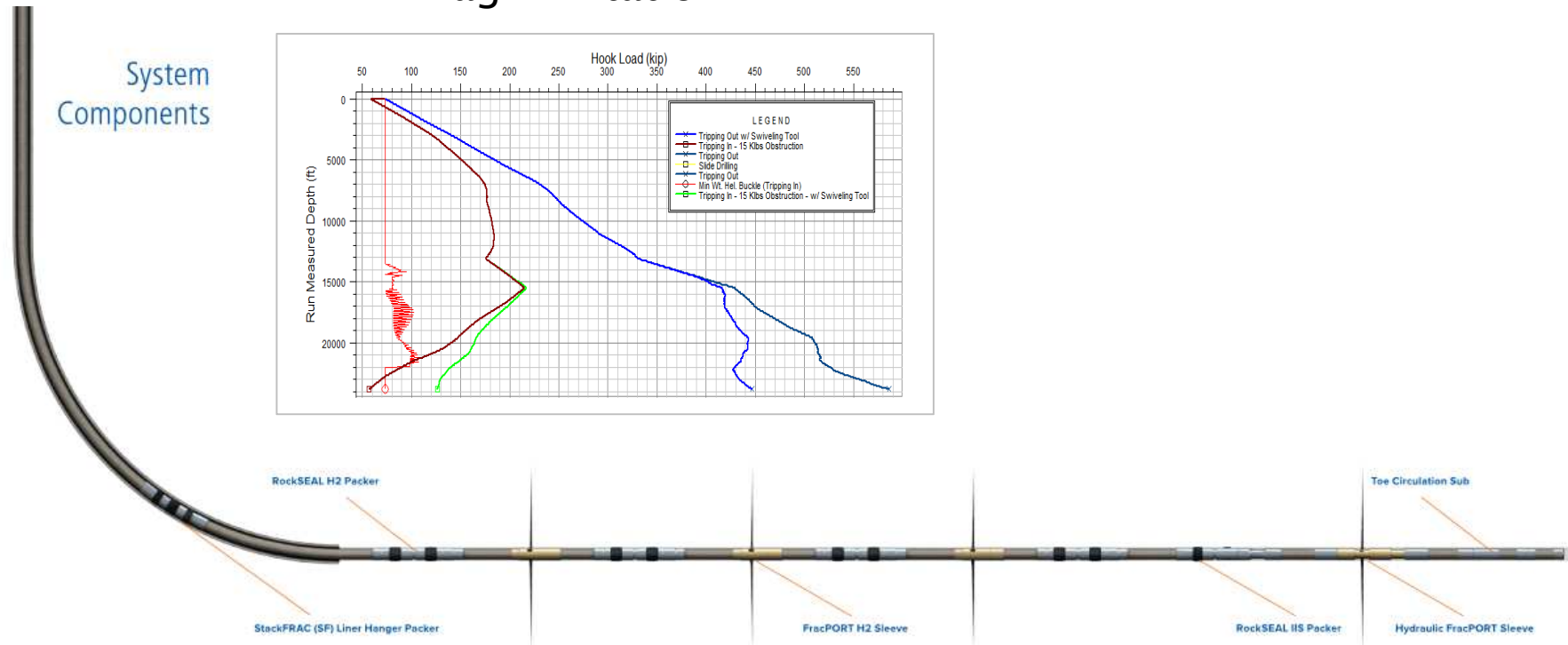
The use of **GunDRILL Reamer** enables total saving of **640 k\$** in terms of Reaming/Back-reaming & Casing Running Operations for only 11 wells.

Completion Deployment : Drillstring Mechanics - Torque & Drag & Buckling



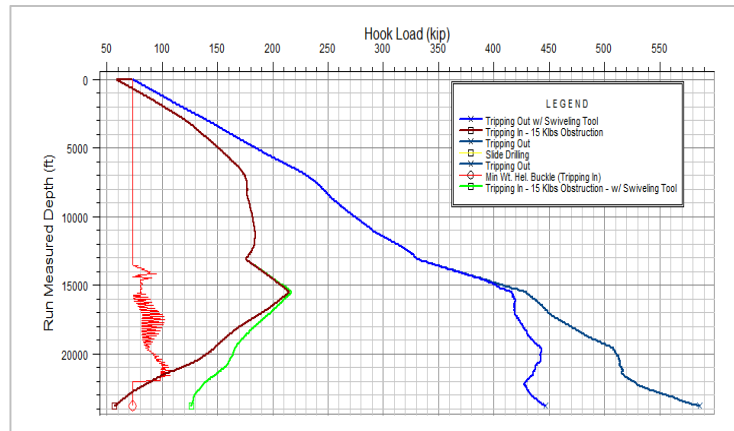
Completion Deployment : Drillstring Mechanics - Torque & Drag & Buckling

Drag Limitation

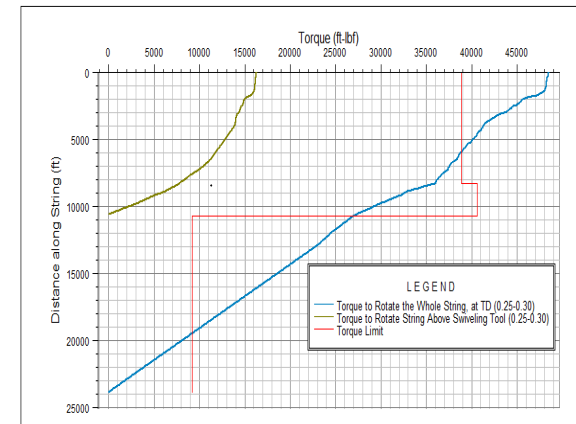


Completion Deployment : Drillstring Mechanics – Torque & Drag & Buckling

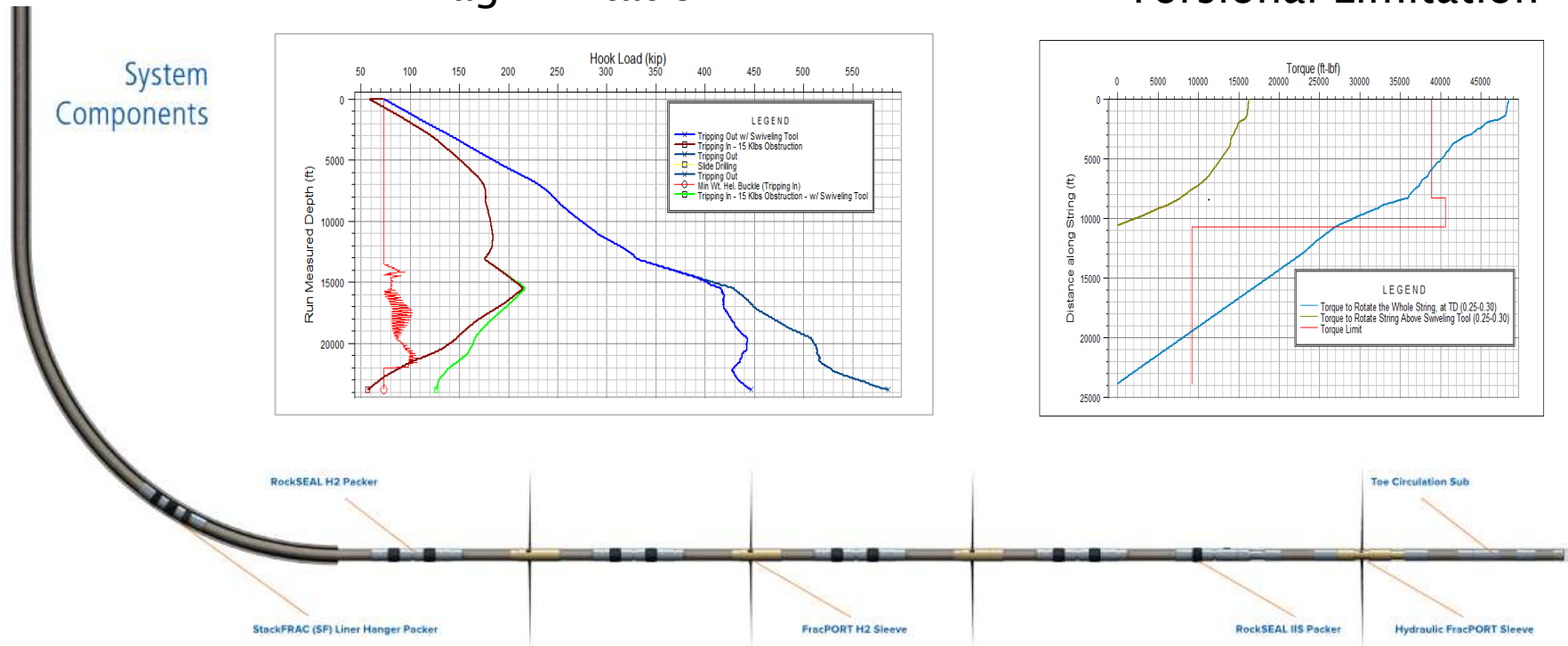
Drag Limitation



Torsional Limitation

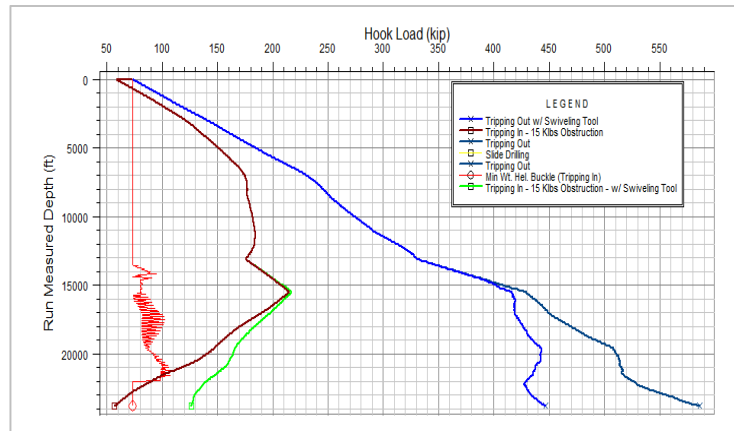


System Components

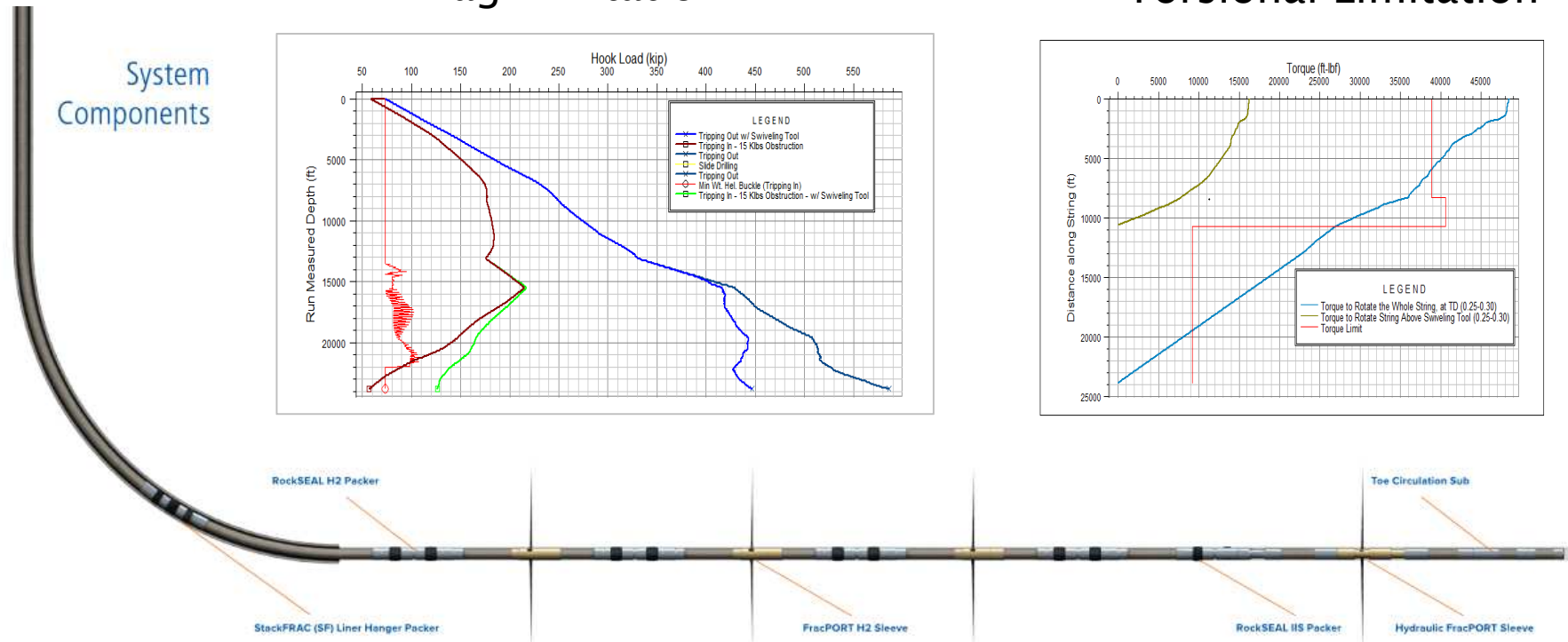
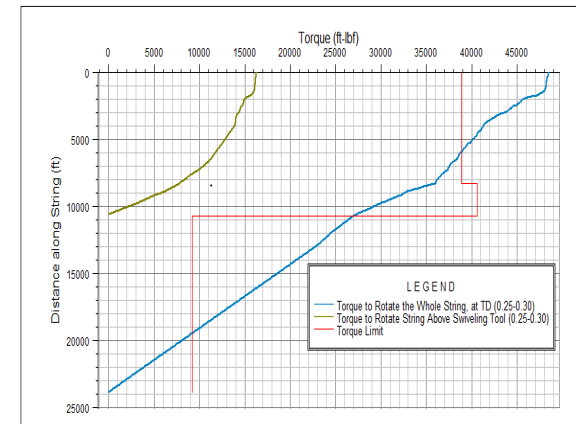


Completion Deployment : Drillstring Mechanics - Torque & Drag & Buckling

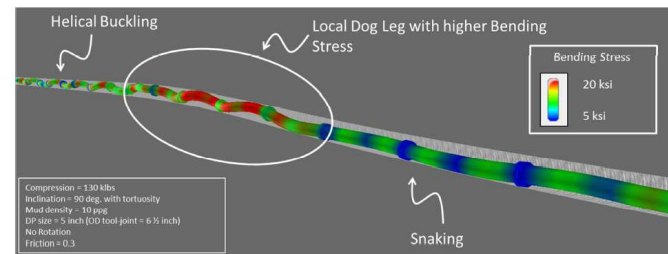
Drag Limitation



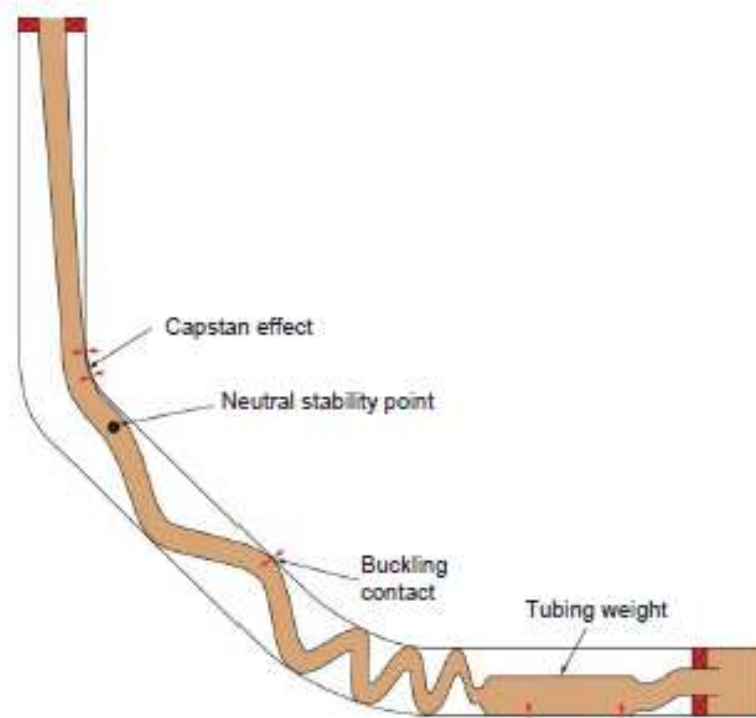
Torsional Limitation



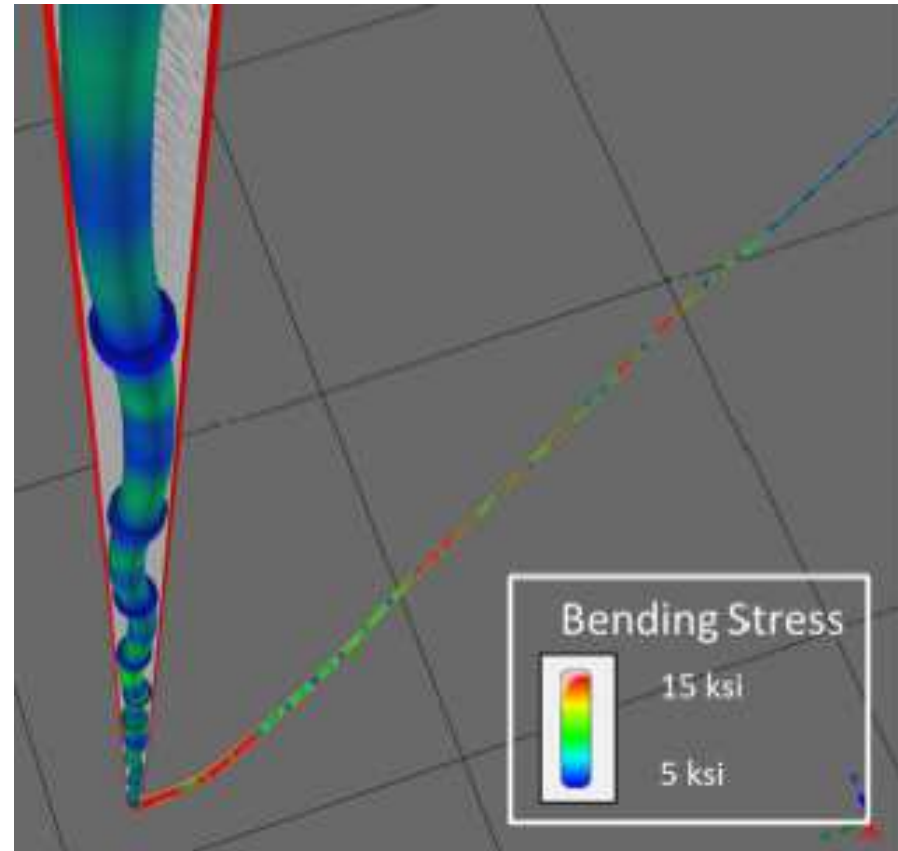
Buckling Limitations



Completion Deployment : Drillstring Mechanics – Torque & Drag & Buckling



2 Tubing-to-casing contact forces in a deviated well.



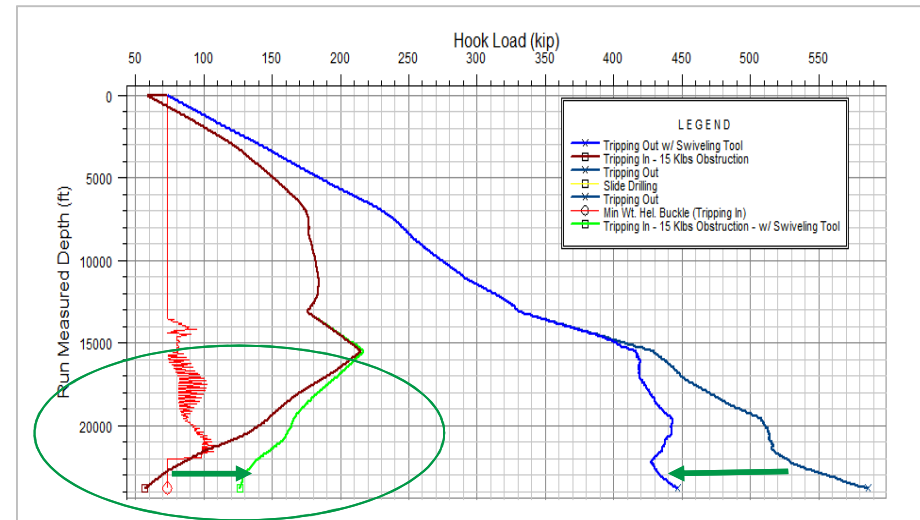
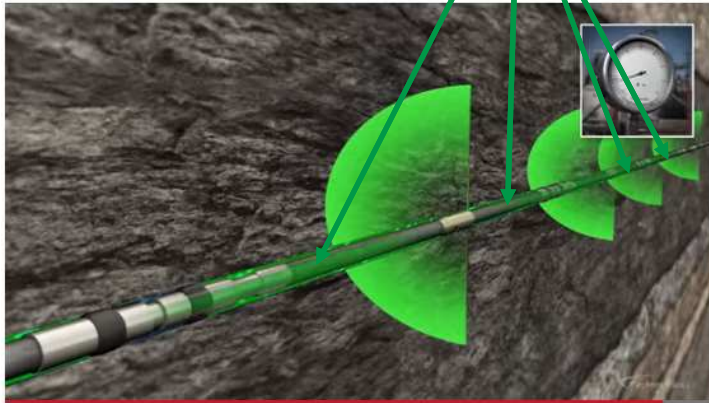
EzeeGLIDER Low Friction Centralisers: T&D Reduction

Product
EzeeGLIDER® OptiMIZER™ Solution
Reduces torque and drag



StackFRAC HD

The patented StackFRAC® HD multi-stage completion system is designed for open and cased hole stimulation in unconventional tight oil and gas formations. This innovative, field-proven system allows for exact placement of stimulation treatments in one continuous pumping operation.



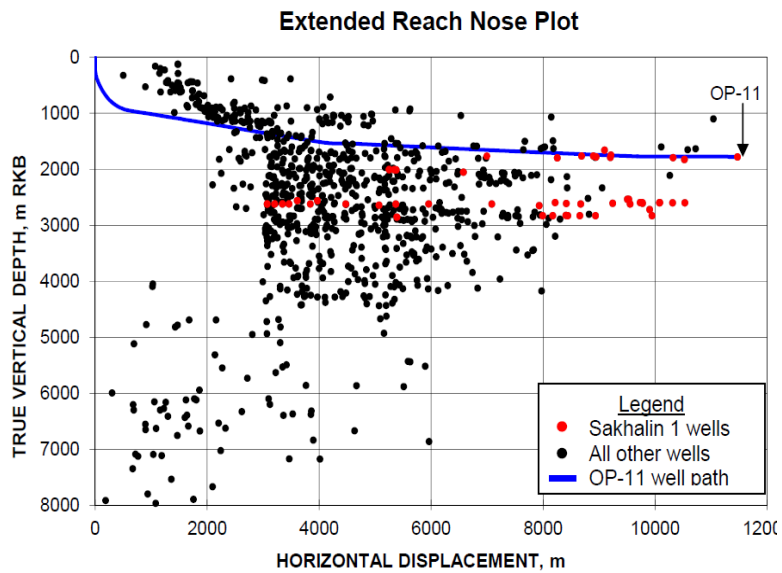
Friction Reduction Tools: TD Solutions SwivelMASTER

SwivelMASTER® positioned at base of drill-string above screens and deployment packer (liner hanger)



Allows the upper string to be rotated without rotation or torque being applied to the string or BHA below it. This ability to rotate the upper workstring provides a dramatic reduction in workstring friction above the SwivelMASTER®.

Extended Reach Target - Sakhalin - 12345m MD



Lower Completion Run Hookload Hindcast

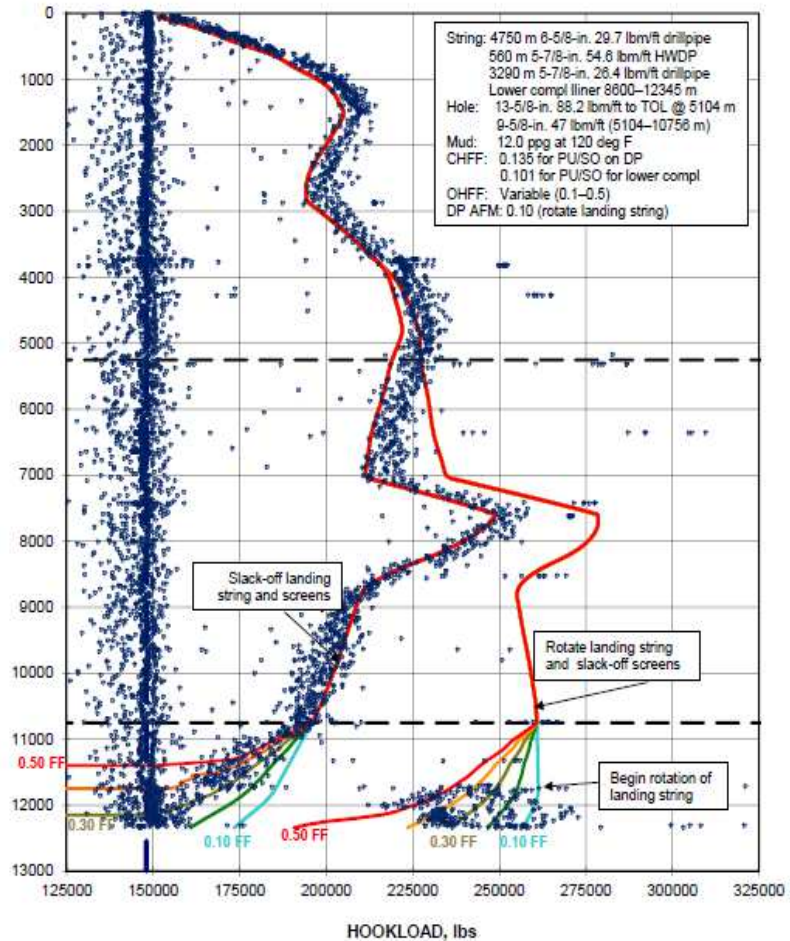


Fig. 6—Hookload hindcast of the Odoptu OP-11 lower completion liner run.

Shale Gas & Coal Gas: Drilling Challenges - Conclusion

Overview of Oil & Gas Well Drilling & Deployment Technology:

- SG & CSG drilling applications are fully integrated within the wider Oil & Gas Drilling & Deployment framework
- SG & CSG benefit from O&G technical developments to lift up their economical feasibility