

2026 Drill Bit Forum and Exhibition



Highland Pines Golf Club

February 24, 2026

Hard Rock (and Hotter) Drilling

Allen Sinor, Geothermal Sector Manager
The Competency Alliance

2

The Competency Alliance

PetroSkills | NetZeroSkills | RenewableSkills

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Speaker Information



Allen Sinor

Global 500 oil and gas executive background in R&D, Engineering, Global Sales and Operations.

Industry recognition with 32 Patents, 24 published papers and 10+ industry awards.

BSc Petroleum Engineering

- 4 World Oil Awards
- 3 SPE D&E Magazine Covers
- 2 Harts Meritorious Eng. Awards
- SPE Distinguished Lecturer
- SPE Drilling Engineering of Year Award
- SPE Best Paper of the Year
- US Rock Mechanics Case History Award
- Oil and Gas Journal- Drilling Milestones



Critical Drlg Facility
Lead Drlg Mechanics
R&D Staff Eng.
Ops Eng.



VP Global Accounts
VP Hughes Christensen
VP Technology R&D
Director WW Applications Engineering
Director R&D



VP Sales



CEO



COO



**The
Competency
Alliance**
Geothermal

Speaker Information

- Allen Sinor
- **DRILLING INSIGHTS**
- February 24, 2026
- PetroSkills / The Competency Alliance

Geothermal energy—clean, constant, and largely untapped—has the potential to reshape the global energy landscape. But unlocking its full potential requires more than just drilling deep into the Earth. It demands deep collaboration and bold innovation across borders, industries, and disciplines.



Global alliances: As seen in initiatives like The Competency Alliance, multinational cooperation and diversity of skills accelerates knowledge transfer and standardizes best practices.



GE (Geo Earth) and VA (Valuable Earth Energy)



Hard Rock (and Hotter) Drilling

Things That Keep Me Up At Night

- PDC Size, Shape, Density, Velocity, Weight, Chemistry
- BHA Stick-Slip
 - Bit and BHA Damage
- BHA Torsional Oscillation
 - High Frequency Can Damage the PDC Cutters
- Bit Whirl
 - Significant Cause of Bit Damage, Possible Design or BHA Whirl
- Thermal Heat
 - PDC Cutter Friction (additional heat), Diamond Expansion, Delamination from Carbide
 - 2019 Iceland Deep Drilling Project Used Roller-Cone bits & 1 Hybrid (except for coring)
- Managed Pressure Drilling
 - Water + MPD Often Yields 20 – 50% Higher ROP w/ Lower Viscosity, Higher Jet Velocity, etc.
- Water vs. Drilling Fluids
 - Granite / Basalt Potential 20-50% Faster Drilling, Limestone/Dolomite 14-35% Faster
- Insignificant Fluid Velocity
 - Cuttings Slow to the Surface Causing Significant TopDrive Torque Variance

Japan Circa 1998

500 C / 932 F

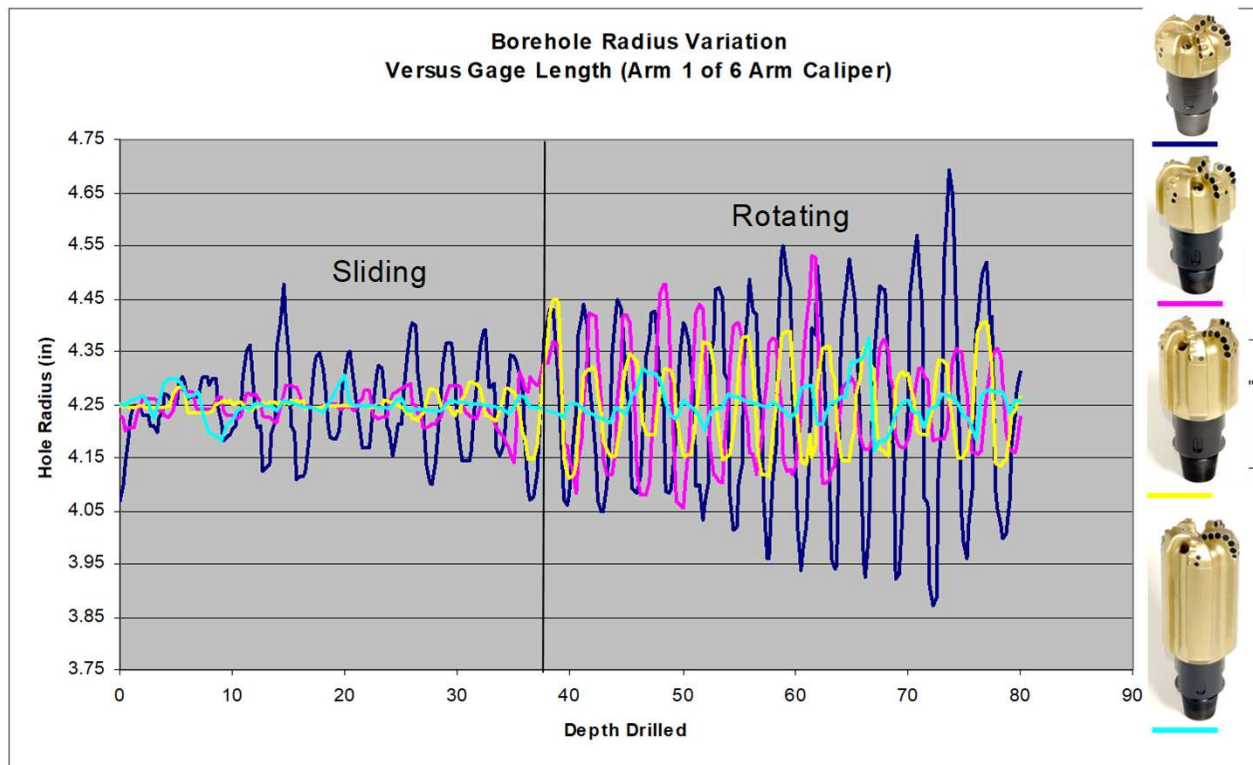
- 3,729 m / 12,234 ft
- **Three Mud Coolers**
- Roller Cone Bits
- Top Drive
- Coring
- PDM

Iceland Circa 2019

600 C / 1,112 F

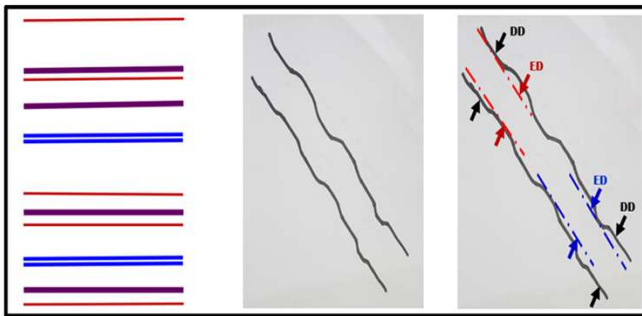
- 4,659 m / 15,285 ft
- Reverse Cementing
- **Water Flow**
- Top Drive
- LWD Tools
- Coring
- PDM

Motor Steerable-Bit Gage Effect



Sample of all four bits transitioning from slide mode to rotate mode, and the oscillation is clearly visible.

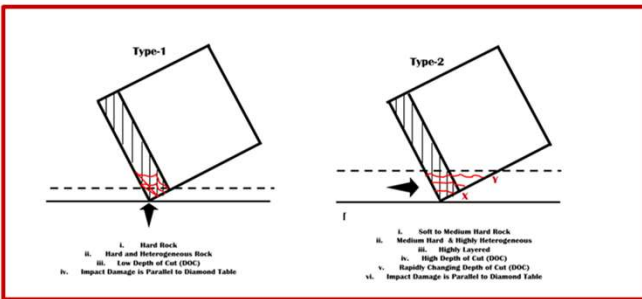
For this purposes of this study, the caliper arm readings are examined as individual data sets and are reported in terms of borehole radius.



Borehole Quality
Drilled Diameter (DD) Vs. Effective Diameter (ED)



- i. **Bit @ Type-A (Directional Profile)**
- ii. **High WOB/Low RPM**
- iii. **% Slide Time @ 18%**
- iv. **Footage/ROP @ 2282ft/47fph**
- v. **Poor Borehole Quality**
- vi. **Dull @ 3:8:ROP**
- vii. **Multiple Bits/BHA for Section**
- viii. **Increased Cycle Time**



Impact Damage
Type-1 (HHR) Vs. Type-2 (VMR)



VMR Specific Bit

- i. **Bit @ Type-B (Directional Profile)**
- ii. **Low WOB/High RPM**
- iii. **% Slide Time @ 2.02%**
- iv. **Footage/ROP @ 5699ft/49fph**
- v. **Excellent Borehole Quality**
- vi. **Dull @ 3:4:BT:TD**
- vii. **Shoe to Shoe Run to TD**
- viii. **Lower Cycle Time**

This Is A Surprise

Critical Observations / Questions

Basin Types @ Implications and Challenges

- Basin Types @ Implications and Challenges
 - Hard Hot Rock (HHR @ Dry) Vs. Volcanic Metamorphic Rock (VMR @ Wet)
- Formation Drillability, % Slide Time, and Borehole Quality
- Drilling System Design and Functional Compatibility
 - Bits/BHA/Drive System/Hydraulics/Drilling Parameters Roadmap
- Directional Profiles (Build/Drop, Hold @ Different Angles) Vs. Bend Sizes
- Dominant Vibration Mode
 - Sources, Initiation, Amplification, and Consequences
- Fractures, Caverns, Lost Circulation, Compressor Limitations Vs. Hydraulics @ VMR
- Perceptions @ RPM Vs. Temperature and Heat
- Bit and Stabilizer Dull Characteristics
 - Forensics and Interpretations
 - Wear Vs. Impact Induced Wear
 - Thermal Impact Vs. Graphitization
- Drilling Parameter Roadmaps @ Basin Types
 - Bit Types and Tolerances

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Thank You

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9

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