



**Western Well Tool's**

**Microhole Drilling Tractor**

# Credits to DOE

- This Microhole Tractor Status Report was prepared with the support of the U.S. Department of Energy under Award No. DE-FC26-04NT15475. However, any opinion, findings, conclusions, or recommendations expressed herein are those of the author and do not necessarily reflect the view of the DOE.

# Outline of Microhole Drilling Tractor Project Presentation

- Microhole Tractor Description/Features
- Project Schedule/Accomplishments to Date
- Product Launch 2006



# Western Well Tool: Research Center



# Microhole Drilling Tractor

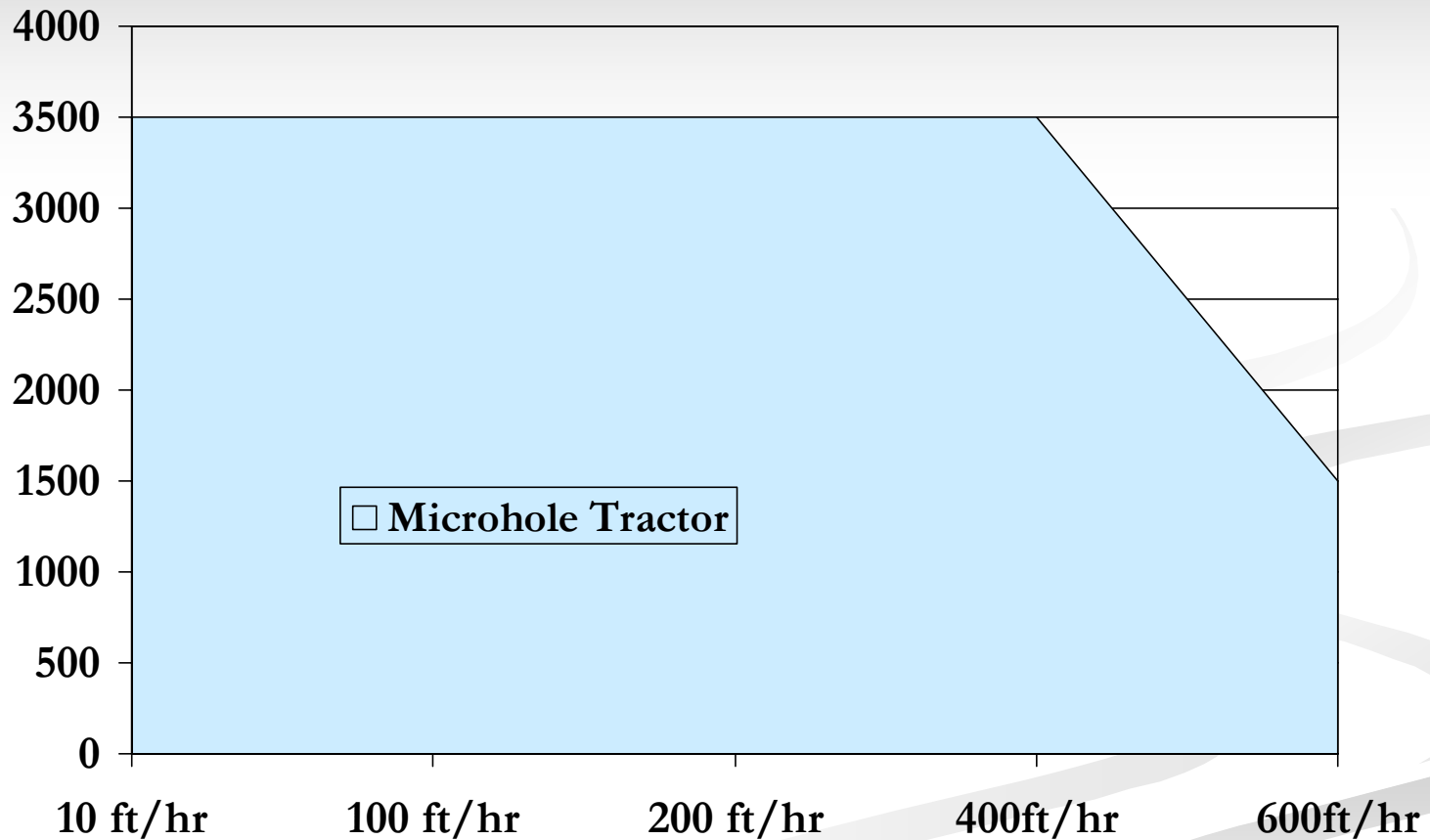


# Microhole Tractor Specification



Length	24-ft*
Tractor OD (Gripper Collapsed)	3-1/4-in.;
Maximum Expansion	4.2-inches
Tractor I.D.	0.625
Maximum Flow rate	20-60 gpm
Maximum Pull (listed by OD)	3500-lbs @ 1000 psid*
Low Speed Range	3-15-ft/hr
High Speed Range (no load)	500-ft/hr*
High Speed Range w/full load	500ft/hr w 3500-lb
Maximum of Radius of Curvature	15-deg or 60 deg/100ft
Tensile Strength	40,000-lbs
Maximum Operating Temperature	300-F
Maximum Operating Pressure	10,000-psi
Controls	On-off, Speed, direction
Materials	CuBe, Inconel, SS

# Microhole Tractor Predicted Performance

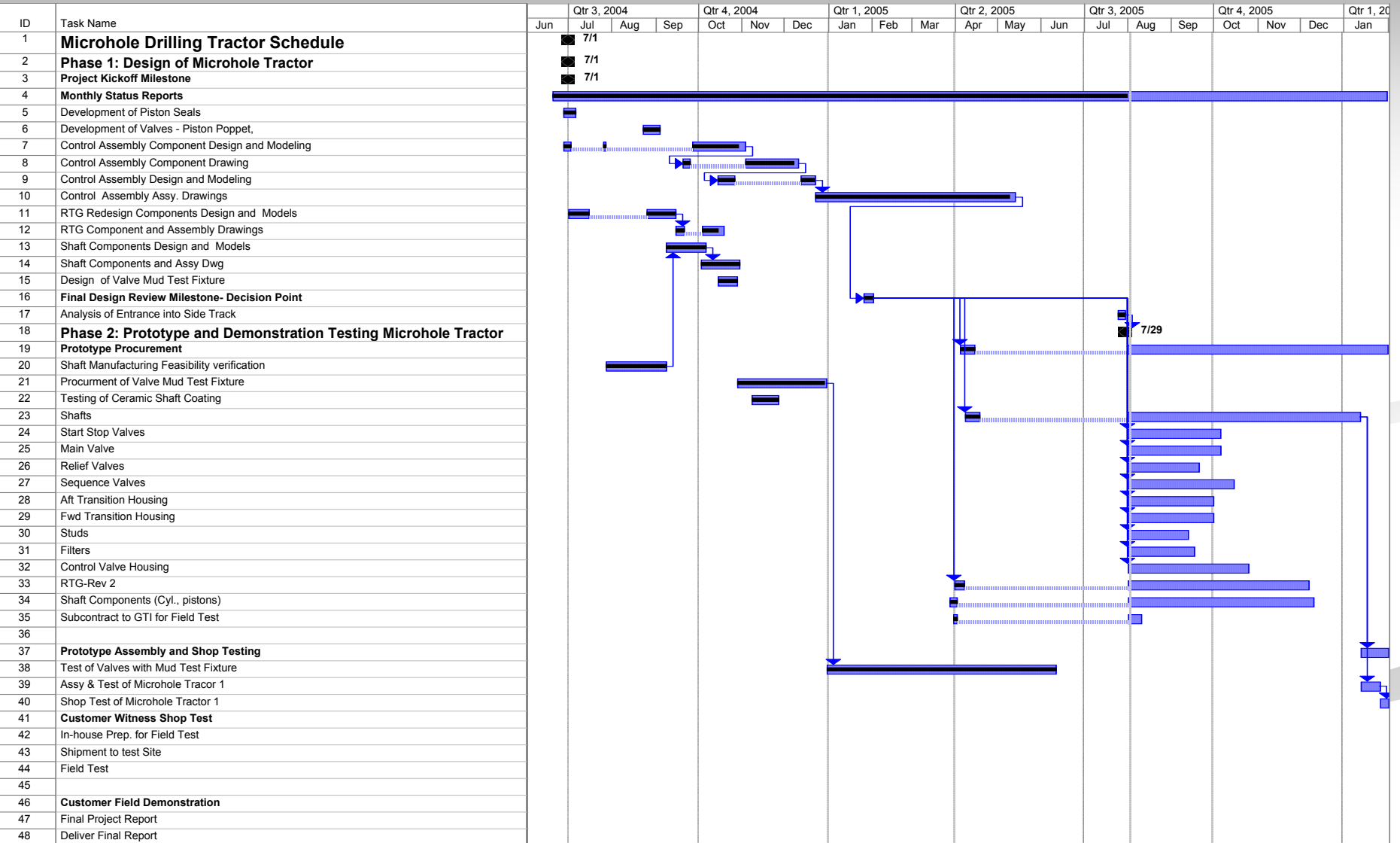


# Microhole Tractor Operations Summary

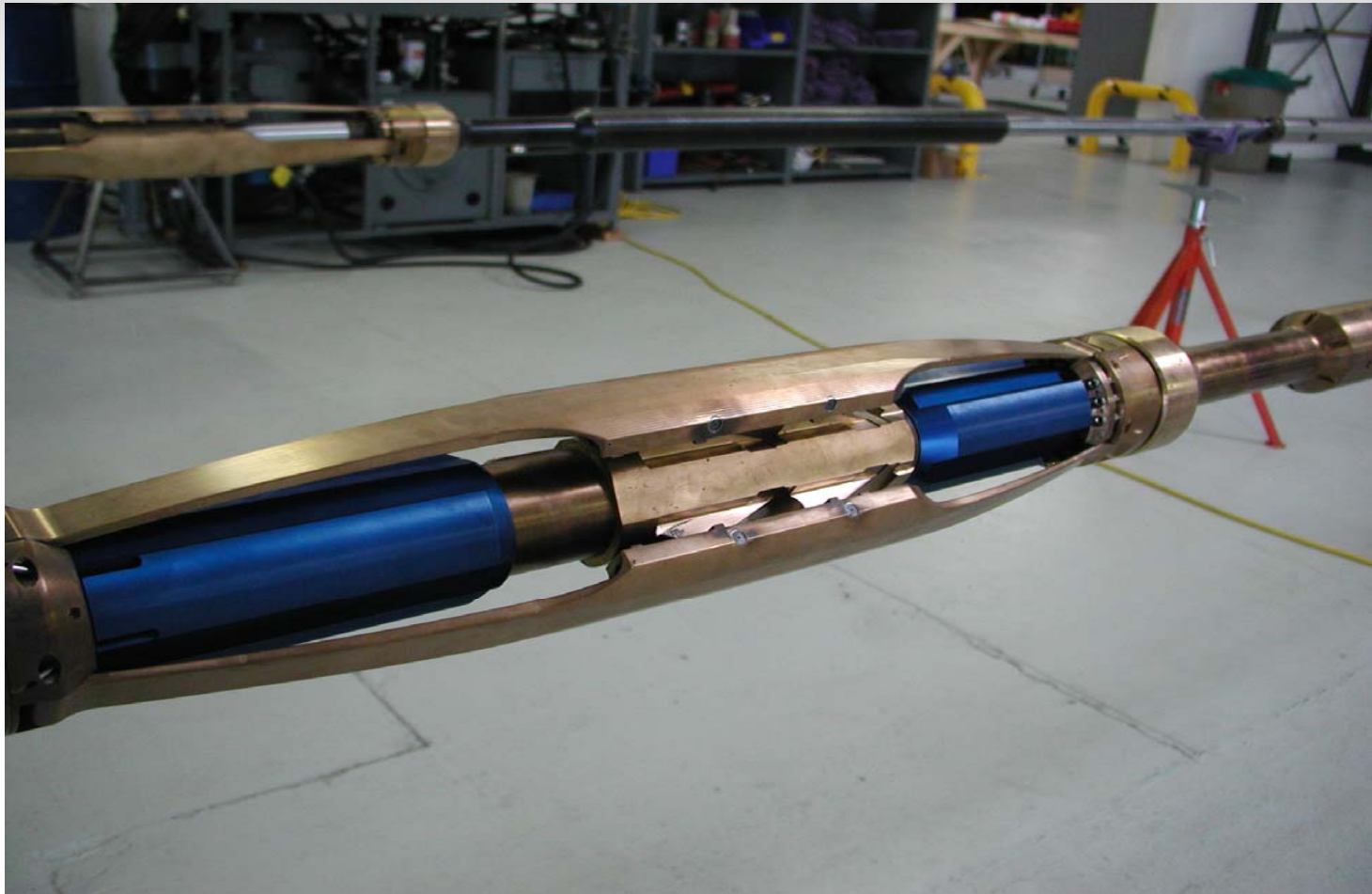
- **Power:** Power is provided by the differential pressure of the drilling mud.
- **ON-OFF Control:** An internal Start-Stop valve is controlled by starting and stopping the mud pumps.
- **Speed Control:** Speed will be governed by the rate that coiled tubing is fed into the hole by the injector.
- **Torque:** Torque will be transmitted through the Microhole Drilling Tractor and delivered to the coiled tubing.
- **Mud Flow Rates:** Excessive mud flow rates beyond the Microhole Drilling Tractor capacity will be released into the annulus via a commercially-available tractor-compatible circulation sub and will aid in hole cleaning.
- **Tractor Steering:** Flexible Microhole Drilling Tractor shafts will allow turning in any direction up to 15-degrees/100 feet while drilling, and slide through 55 degrees/ 100 ft holes.
- **Use of Drilling Muds:** Design of components exposed to drilling mud will incorporate superior materials and design features.



# Microhole Tractor Schedule



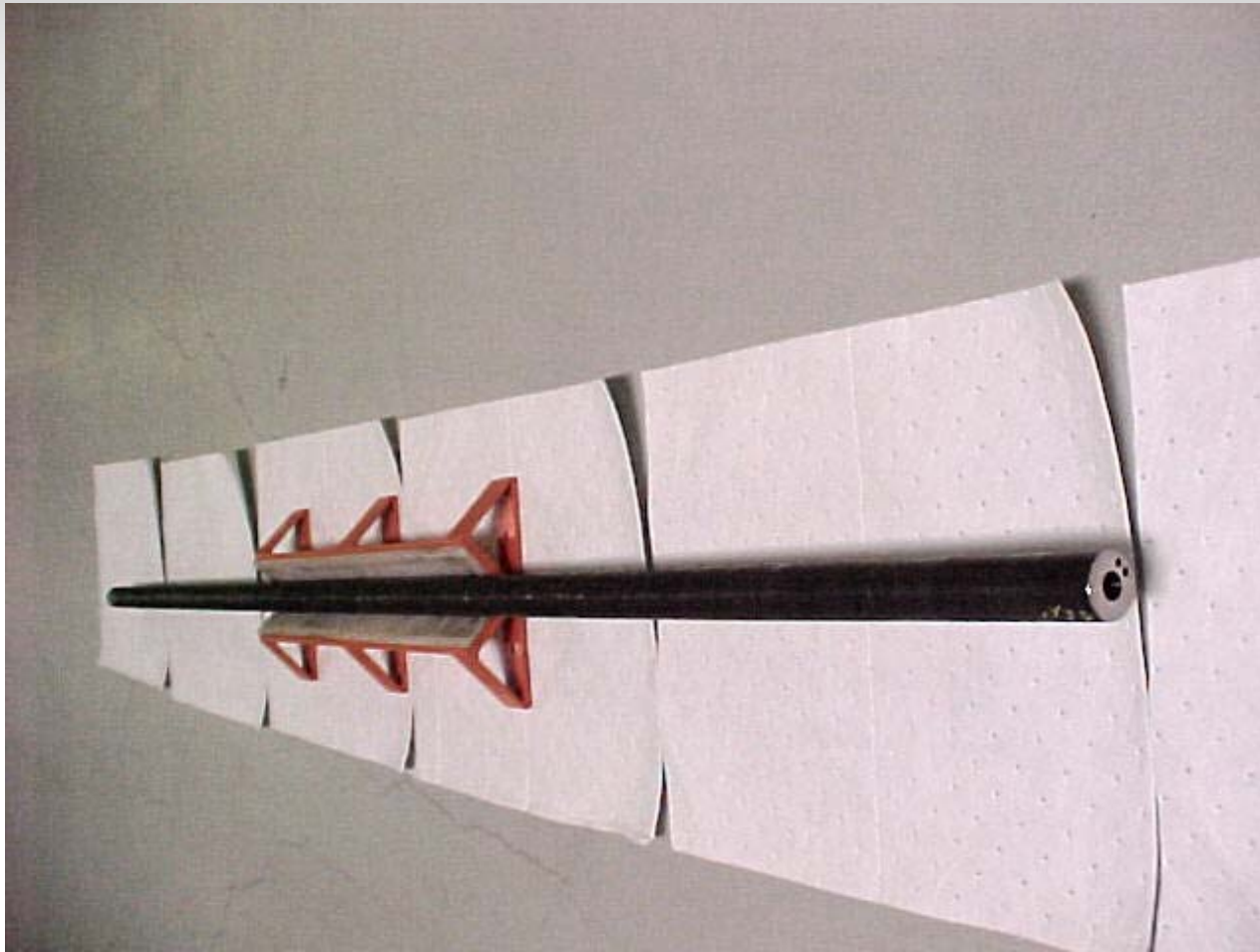
# Roller-Toe Gripper



# Roller-Toe Gripper Summary

- Grips in all formations from shale to Granite (compressive strength 300-30,000-psi)
- Open Self-Cleaning design that operates well in any fluid including mud
- Failsafe operation – loss of power releases gripper
- Fatigue tested to over 30,000 cycles (equivalent to walking 180,000-ft) without failure

# Prototype Microhole Tractor Shaft



# Testing of Microhole Tractor Shaft Coating Materials (survived 48,000ft operation)



# Summary of Microhole Tractor Accomplishments

- Design Phase Completed
- Manufacturability of Shaft Demonstrated
- Endurance life of Shaft Coating Demonstrated
- Experimental Verification of Valves operation with mud completed
- Negotiations for drilling 3 test wells underway



# Microhole Drilling Tractor (MDT) Future Objectives

- Phase 1: Design Complete
- Decision on Redesign of MDT to accommodate test wells
- Procurement/Building Prototype (Phase 2)
- Shop Testing (Phase 3)
- Test Well Testing (Phase 3)



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