DOE/FE Co-Funded Drilling Technologies

DEA Meeting
February 27, 2003

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National Energy Technology Laboratory

Implementation Via Partnership Approach

- Careful Planning with Significant Industry Input
  - Technology roadmaps; advisory committees; consortiums; merit reviews.
- Cost-shared R&D conducted with partners
  - Industry; federal agencies; National labs; universities.
- Modest oil and gas program budgets
  - $20 - $30 Million/year each
- Small business program
  - Risk reduction for innovative technologies
- Technology transfer
  - Successful field demonstrations; PTTC; Web Site; workshops; Gas TIPS.
High Speed Communications Up Drill Pipe
(“Intellipipe” - Grant Prideco/Novatek)

- Steel drill pipe with high speed data communication capability
- 1 million bits/sec = 100,000 times faster than existing technology
- Field test at RMOTC Feb 03

Cost Effective Composite Drill Pipe
(Adv. Composite Products & Technology)

- Half weight of steel
  - Extend rig fleet
- Ultra-short radius use
- High speed data capable
- Small diameter field test completed Nov 02 Oklahoma
- Large diameter field test
  - Spring 03
Arctic Drilling/Production Platform (Maurer/Anadarko)

- Good for environment (reduced footprint)
- Good for industry (year round drilling)
- 1/2 scale platform designed & built
- Moved to AK in late December 2002

Advanced Materials By Microwave Processing (Penn State and Dennis Tool Company)

- 30% Stronger Composite Metals
- Able to Sinter Tungsten Carbide with Diamond Composite
- More Ductile = Better Impact Resistance
- Higher Heat Conductivity

IMPROVED IMPACT STRENGTH AND HIGHER HEAT CONDUCTIVITY
Mudpulse Drilling System
(Tempress Technologies)

Oscillator Valve
- Valve Open
- Valve Closed
- Flow Cycling Valve
- Poppet
- High-Speed Plug
- PDC or Tri-cone Bit
- Seismic Pulse

Suction Pulse Train
- Exhaust
- Suction Pressure Pulse
- Hydraulic Thrust

Seismic Lookahead Detail
- Sweep Mechanism
- Valve Cartridge

8-3/4” Prototype

LWSA for Dual-Gradient Drilling JIP
(Maurer Technology)

Mud Pump (Mud)
- Swivel
- Shale Shaker Spheres
- Mud Pump (Spheres)

Drill Ship
- Mud & Spheres

Drillpipe
- Mud & Spheres

Wellhead and BOP
- Mud

Mud Line
- Mud

BHA
- Rock

http://www.tempresstech.com/hydropulse.htm

http://www.maurertechnology.com/DGD/index-DGD.shtml
http://www.conoco.com/about/major/special/subsea.asp
Advanced Mudhammer Project (Novatek)

Integrated Drilling System

http://www.novatekonline.com ids.html

High Pressure Coiled-Tubing Drilling System (Maurex)

Applications
- Reentering old wells
- Hard/Slow Drilling
- Deep drilling
Laser Drilling (Gas Technology Institute)

High Strength and Faster Drilling TSP Diamond Cutters (Technology International)

- **NEW ENDURUS™ TSP CUTTER**
  - Thermally Stable Polycrystalline Diamond Brazed to a Tungsten Carbide Substrate
  - Will Lower Hard and Abrasive Rock Drilling Costs
Deep Trek

Technology to dramatically decrease cost of drilling below 20,000’

- **Resource**
  - 7% U.S. production 1999 - 14% in 2010
  - High temperature (350°F)
  - High pressure (10,000 psi)
  - Highly corrosive (H₂S)

- **R&D Areas**
  - High-speed wellbore data transmission
  - High-performance DCS systems
  - High temp/ high pressure sensors
  - Low friction/wear-resistant coating/materials

- **Expected Benefits, by 2015**
  - Drilling time reduced by 33%
  - 30 TCF economically recoverable gas

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Deep Trek

Status

- 6 active projects worth $8M ($5M DOE)- Awarded Sep 02
  - APS Tech Inc.: Drilling vibration monitoring & control
  - E-Spectrum Tech: HT (200°C) wireless electromagnetic telemetry
  - Penn State: Microwave process for seamless coiled tubing
  - Pinnacle Tech: Deep completion stimulation technologies
  - Terra Tek: Test emerging diamond bits & HT/HP fluids
  - Schlumberger Data & Consulting: Benchmarking deep drilling costs

- Round 2 proposals look very promising (Review Mar 03)
  - Need HT/HP microprocessors & integrated circuitry

- More information at:
Microdrilling
Potential For Truly Invisible Footprint

Microhole Technologies
(Los Alamos National Lab)

Micro-electromechanical Systems (MEMS)  Micro-Drilltrig

Relative Borehole Sizes

2 3/8” DIAMETER AND SMALLER

Typical borehole sizes

Downhole Systems

http://www.sandia.gov/ngotp
Microhole Technology Roadmaping Workshop

- **Where**: Albuquerque, NM
  - Site: TBD
- **When**: April 29th/30th
  - Tuesday - PM Start
    - LANL Microdrill and Downhole Tools Display
    - Presentations and Breakout Sessions
  - Wed AM – done by Noon
    - Wrap-up with Panel Discussion
  - Wed PM - Plane back to Houston by 4:30PM
- **Signup Sheet for Notifications/Updates**

**QUESTIONS ?**