Second Quarterly Microhole Integration Meeting
Minutes

November 16, 2005
Houston Research Center
11611 West Little York Road
Houston, Texas 77041

The second quarterly Microhole Integration Meeting was held in Houston on Wednesday, November 16, 2005. The meeting was designed to provide the attendees (1) an overview and update of DOE, PTTC and industry activities regarding the progress of the Microhole Initiative, (2) individual project progress since August, major milestones and estimated timeline to completion, (3) an in-depth discussion by industry experts of coiled tubing drilling/slimhole activities in Alaska, Canada and North America, and (4) a discussion of future meetings: dates, venue, topics. CDs of all of the Microhole Technology (MHT) project overview presentations made in August were made available to the attendees as well as the latest DOE brochure on the Microhole Program and projects. The morning coffee, breaks, lunch and post-meeting period provided opportunity for individual discussions. All presentations made at the meeting are posted on the PTTC Microhole website http://www.microtech.thepttc.org/past_meetings.htm.

The meeting began with registration, coffee and individual discussions from 8:00 to 8:30. Don Duttlinger, Executive Director of the Petroleum Technology Transfer Council called the meeting to order, discussed safety and logistics, and then introduced Roy Long, DOE Technology Manager for the National Energy Technology Laboratory and Ginny Weyland, DOE Project Manager for MHT. Dwight Rychel was introduced as project manager for PTTC and recognized for his role as Microhole Integration organizer and technical point person. Long provided an update of DOE and industry activities, pointing out a number of ongoing Coiled Tubing (CT) slimhole/microhole drilling activities in North America. He briefly presented the days agenda, highlighting the individual presenters. An overall timeline of the program was presented, showing the phase of development for all of the projects from feasibility to a commercial system (see http://www.microtech.thepttc.org/timeline_of_projects.pdf). Lastly, Long presented a Venn diagram illustration highlighting the overlapping applications of MHT in achieving the overarching goal of maximizing domestic oil recovery. The remainder of the morning session consisted of Principal Investigators providing updates and milestones for 13 MHT ongoing projects. The highlights were:

- Bandera/Impact Technologies (Self-Contained Zero-Discharge Mud System, Ken Oglesby): Several pumps have been evaluated for Microhole applications and most have been determined to be too big.
- Impact Technologies (Advanced Ultra-High Speed Motor, Ken Oglesby): Design specifications have been completed for 1.69-inch diameter and 3.0-inch diameter 0 – 10,000 rpm, 300 volt motors.
- Baker Hughes Inteq (Microhole Smart Steering and LWD System, John Macpherson): A 2-3/8 inch rib steering motor device and a 2-5/8 inch resistivity

measurement device are being developed. Two prototypes of each will be assembled and tested in Alaska in February.

- Baker Hughes Inteq (Microhole Wireless Steering While Drilling Tool, John Macpherson): The conceptual design review is complete for the 2 3/8-inch diameter downhole bi-directional communication and power module utilizing mud pulsing. The end of the project is expected in September 2006.
- Stolar Research Corporation (Radar Navigation & Radio Data Transmission for Microhole CT BHAs, presented by Larry Icerman): The radar antenna is in the test phase. It will transmit data through a slickline in the coil. It will have additional application in horizontal drilling for coalbed methane .
- Tempress (Small Mechanically-Assisted High Pressure Waterjet Drilling Tool, Jack Kolle): The phase I prototype design and yard test will be complete in 1Q2006. The tool will essentially be a completion tool capable of ultra-short radii (100 feet). The intensifier will be capable of increasing pressure from 3,000 psi to 7,000 psi.
- CTES (Friction Reduction for Microhole CT Drilling, Ed Smalley): A test stand has been built and initial measurements made without the vibrator. The vibrator will act on the tubing as it goes into the injector.
- Technology International, Inc. (High Power Turbodrill and Bit for Coiled Tubing, Bob Radke): Catoosa test site has provided baseline data for Phase II prototype turbodrill. Blade design has been optimized improving performance 13 %.
- Ultima Labs (Microhole CT BHAs (Low Cost MWD/LWD, Don Macune): The project is transitioning from the product specification phase to the detailed design phase. The field testing of a prototype is expected in 1Q2007.
- Schlumberger (Built for Purpose Coiled Tubing Rig, Bart Patton): The floor truck, mast truck, and coiled tubing unit are in various design stages, with the floor truck near completion. Weight limitations are driving the design of the major components. A layout showing how the pieces will come together to rig up was shown.
- Kalsi Engineering, Inc. (Advanced Sealed Bearing Assembly for Positive Displacement Motors used in Microhole Drilling, M.S. Kalsi): Dr. Kalsi presented an overview of this Small Business Innovative Research project. These new seals form a hydrodynamic film when in motion allowing more energy to be available for drilling and hole cleaning.
- GTI (Field Demonstration of an Existing Microhole CT Drilling Rig, Kent Perry): 23 wells, a total of 40,000 feet have been drilled to date, the deepest at 3,100 feet. Savings on the order of 30% have been demonstrated while being environmentally superior. Rosewood, the operator, will have drilled 303 wells by the end of 2005.
- GTI (Counter Rotating Tandem Motor Drilling System, Kent Perry, presented by Eric Twardowski of Dennis Tools): The drill was tested in September 2005 at the RMOTC facility. It achieved an 82 ft/hr ROP with low vibration. The connections will be redesigned and the size of the right hand motor increased from 2 5/8-to 2 7/8-inches.

The afternoon session was kicked off by Roy Long, briefly summarizing the morning message and program goals. After a short recap of the August presentation of the Geoprober project (Demonstration of the Use of Composite Coiled Tubing to Drill Low-cost Deepwater Wells), Dwight Rychel introduced the first industry speaker.

David Wennerstrom, of Technicoil (Calgary) presented "Grass Roots drilling – A History and Look Ahead". Wennerstrom began with a description of early grass roots (drilling from surface) drilling attempts in Alberta from 1976 to 1998, then the recent commercial success with new rig designs and a fleet growing from 15 in 2000 to an estimated 55 by the end of 2005. Market share of all wells drilled increased from 9.6% to 27% in the same time frame. The advantages of coiled tubing drilling and the latest technologies were highlighted. He concluded by summarizing the market for CT drilling in the lower 48 states.

John Pursell, filling in for Jerry Noles of IPS Procoil, gave the IPS perspective of coiled tubing drilling market drivers, benefits and limitations, equipment and highlights from their 10 well recompletion project with BP in the Texas Panhandle. Drivers that were covered include commodity prices, CT rig availability and rates relative to rotary and improving technology. Potential markets include re-entries, shallow gas, and underbalanced and managed pressure drilling. Benefits include time, directional control and environmental considerations. The components of the equipment used on the pilot were highlighted: drilling unit, blowout preventers, CT reel, injector, fluid pump, BHA and mud system. The project showed increasingly successful results as experience was gained. One reel completed all 10 wells with an average drilling time of six days per well. Recommendations for improvement included "fit for purpose" equipment and greater BHA availability at a better price.

The final speaker was Curtis Blount, speaking of ConocoPhillips' experience with slimhole recompletions in the Kuparuk Unit of the North Slope. Drilling activity has increased steadily, currently up to 50 per year. They have demonstrated costs of 69% of the cost of rotary (on a per barrel basis). They have set a world record with the ID-34 well, drilling a 2,630 ft. lateral in a well with a mean depth of 18,350 feet.

The meeting concluded with a discussion of future meetings and activities, led by Roy Long. The next meeting will again be set to coincide with the DEA quarterly meeting on Wednesday, March 22, 2006. Possible industry topics may include Schlumberger discussing the market study for coiled tubing drilling prepared in conjunction with their MHT project, BP discussing the results of their Texas Panhandle project and CBM activities in Alberta and implications for the lower 48. It was suggested that for the next meeting, the technical characteristics of the motors, bits, BHAs rigs be compared for compatibility: speed, pressure, size, flow rates. Other suggestions were made to give the PIs more time – not trying to do all the projects each meeting, or expanding the meeting times. Consideration of these and other issues will be ongoing in the next few months.

The meeting was adjourned at 3:00. MHT minutes provided by Dwight Rychel for review.