Next Generation Directional MWD Tool Requirements for Relief Wells, SAGD & Safety

Discussion and Proposal for a Market/Technology Feasibility Study

Gordon Richardson and Robert L. Waters
gr@techrichconsulting.com; 617-504-3340
rwaters@austin.rr.com; 512-258-2419

Presented at the Drilling Engineering Association Q1 meeting, Houston, TX, April 28th, 2011.
Relief Well Drilling Technology

• Industry lacks tools to efficiently and precisely regain control
  – Mexico’s undersecretary of hydrocarbons: “need drilling and development plans to include design of emergency procedures” for countering blowouts.
  – Netherlands’ inspector general of mines stressed “it is absolutely necessary to raise standards in industry.”
  – Norway’s top petroleum and energy minister: dismayed by “the inability to cap blowouts,”
  – 74 days to kill Montara, 85 to contain Macondo

• Could a directional MWD tool drill relief wells?


April 28, 2011
Relief Well Drilling Technology - brief history

• First directional relief well in the U.S. was drilled in 1933 in Texas
  – Directionally drilled into same reservoir
• Special guidance tools followed
  – MAGRANGE (HO&M) 1975
• Process has not changed much in 30 years
  – Deploy mag ranging tool, analyze, drill ahead, repeat
  – Ixtoc 1 used MWD, Survey, Ranging tools in 1979
  – Same technology used in recent mishaps

Source: http://science.howstuffworks.com/environmental/green-science/relief-well1.htm
Directional MWD Capability

- Basic Mag/Accel functionality same for 20 years
- Drive to reduce drilling costs
  - Focused on costs, not value added
  - Limited investment to improve/add sensors
- Developing tools for niche applications is financially challenging
- IP barriers to implementation
Next Generation MWD Relief Well Application

Industry needs:
• Reduced time to intersection
• Better proximity accuracy
  – Distance
  – Direction
Next Generation MWD Anti-Collision Application

Industry needs:
• Enhanced collision avoidance
• Reduced safety risk
• Fewer wells shut-in
• More accurate proximity detection

April 28, 2011
Next Generation MWD
SAGD Application

Industry needs:
• Improved proximity accuracy
• Decreased positional uncertainty
• No wellbore intervention
Next Generation MWD
Proximity Application

Industry needs

• Improved distance and direction accuracy
• Especially near old wells with large ellipses of uncertainty
Next Generation MWD
What is Required?

• Industry needs Directional MWD tools that can quickly and efficiently drill relief wells
• Anti-collision, safety more important now
• SAGD & intersection applications growing
• Proximity data near old wells with large ellipses
• Next generation tools should be used routinely for better well placement and safety, gaining revenue to defray development costs
Survey Proposal

• Independent consultants to gather data
  – Survey operators to define requirements/specs
  – Assess price tolerance for next generation MWD service for multiple applications
  – Assess technical requirements and gaps
  – Assess IP barriers for key technologies
  – Can multiple service suppliers develop the solution?

• Recommend a path forward for industry
  – DEA Charter is “to advance new technology”
Deliverables

• Report with operator survey findings, needs assessment & recommendations
• Proposed next generation Directional MWD (functional specification)
• Cost/benefit analyses for significant scenarios
  – Safety and HS&E liabilities
  – Well shut-in cost vs better proximity determination
  – Development, deployment, R&M expectations
DEA - JIP Proposal

• Two phases, both start with interviews of drilling engineers and managers
  – 1st to develop preliminary findings
  – 2nd to confirm findings & conclusions
  – 35 to 40 interviews, most face-to-face
• Survey and assess available and needed technologies – visits to developers/suppliers
• Conclusions documented in written report
• Projected budget: $260,000 plus expenses
• Projected schedule: 7-8 months
• Participant cost ≈ $30,000 if 10 participants
Gordon Richardson

Mr. Richardson has been active in the design, development, and evaluation of electronic systems, instrumentation, and drill-string components to advance the state-of-the-art in drilling for oil and gas for more than 35 years. He is the founder and principal of TechRich Consulting, which has provided technical and business consulting services to industrial clients since 2001. Previously, Mr. Richardson was on the professional staff of Arthur D. Little, Inc., where he was a Director of the Technology and Innovation Management and the Global Energy Practices. During his 22 years with the firm, his consulting work focused on the impact of new technologies in industrial markets, management of multidisciplinary product development projects, finding and assessing new technologies for acquisition or license, and technology (or R & D) planning. Before joining Arthur D. Little, Inc., Mr. Richardson was Chief Engineer for Eastman Whipstock, Inc. His educational background includes a B.A. from Amherst College, graduate work in Ocean Engineering at the University of Rhode Island, and completion of the M.I.T. Program for Senior Executives at the Alfred P. Sloan School of Management.
**Robert L. (Bob) Waters**

One of the founders of Tensor, Inc, and Exec. Vice-President, Austin, Texas, in 1975 through 1998, when company was acquired by AlliedSignal (later became Honeywell), and traded to GE Energy. Continued working as a chief engineer and resource for the development and improvement of products for oil and Gas industry. Co-inventor, developer and operating engineer of MAGRANGE, the proximity detection system, first use in 1975. Performed services with this system for clients in the oil fields on 125 to 130 relief wells. Co-inventor, developer and operating engineer for MAGRANGE services for operators on 125 -130 relief wells. At Tensor, developed downhole navigation instruments including magnetic orientation modules for service companies for incorporation into their MWD and LWD systems, and steering tools, electronic multishots and retrievable MWD systems. Also developed special sensors for custom measurements. Education: BSEE, University of Texas, Austin, Texas.