PROGRAM facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center for Natural Gas & Oil

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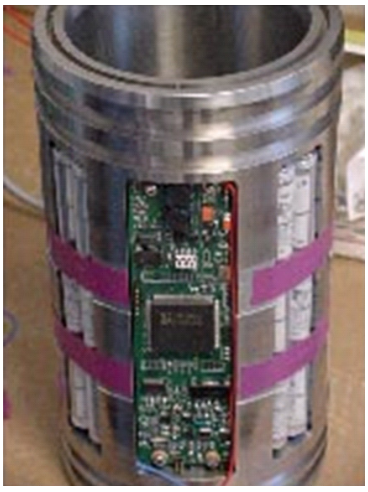
SMART DRILL PIPE – REVOLUTIONIZING THE INDUSTRY

The quest for high-speed data transmission has been a holy grail in the exploration and drilling disciplines since its inception. High-speed transmission is essential to evaluate the down-hole drilling environment, accurately characterize the formation being drilled, and precisely navigate well bores to targeted reservoirs in real time. Since 1939, technology has been proposed to provide data from down-hole to the surface. The technical barrier has been the couplings between the discrete pipe sections comprising the drill string. Mud pulse telemetry eliminates the need to hard wire pipe and electrical connections and transmits data as pressure pulses through fluid circulated to clean the cuttings out of the well bore. But the excruciatingly slow pace of mud pulse telemetry — 3 to 10 bits per second — often means that data resolution and tool reliability is so poor that the driller cannot make crucial decisions in real time.

Over the past five years, the U.S. Department of Energy partnered with two small businesses ($8.5 million DOE; $8.3 million cost share) to develop new pipes that will revolutionize the way the industry drills for oil and gas. During the last two years, field tests with the Intellipipe™ have demonstrated data transfer rates over 1 million bits per second, five orders of magnitude greater than the industry standard. This pipe is expected to be commercially available in 2005. Research conducted on composite drill pipe shows that it could also facilitate high-speed data transfer via cables or fiber optic leads embedded within the body of the pipe during construction. A prototype will be developed by June 2005 with field tests scheduled for 2006. These new smart pipes will enable real-time downhole data to more accurately control the drilling operation thereby increasing drilling efficiency and leading to safer, more productive wells.



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Intellipipe – Novatek Engineering, Inc.

Intellipipe™ is a drill pipe with built-in telemetry that can operate thousands of feet below the surface. It has an innovative coupler that is embedded in connections between 30-foot long sections of drill pipe. At the end of each section is a tool joint, leading to a high-speed data cable. The coupler permits data to be sent across small gaps between each pipe section through the cable that is attached to an inner pipe wall. The system was developed by Novatek Engineering in Provo, Utah, with funding from the Energy Department. Since then, the system attracted the attention of a global leader in drill pipe technology, Grant Prideco Inc. of Houston, Texas, which invested in Intellipipe. The two companies have formed a joint venture, IntelliServ™, to market the revolutionary drill pipe. The technology, called Intellipipe™, is able to transmit large bits of data to the surface as a well is being drilled. About 1 million bits of information—including temperature, geology, pressure, and rate of penetration—can be transmitted in a single second, which is unprecedented. Over 50,000 feet in five wells have been drilled in Oklahoma with the IntelliPipe. The pipe has undergone over 3,000 operating hours in harsh conditions including high shock air drilling and demonstrated handling characteristics of standard drilling tubulars. Additionally, a third party MWD/LWD tool was successfully integrated into the system of field trials. Commercial launch of IntelliServ is anticipated in 2005.

Originally there were only 5 people working on this project at Novatek to develop a high speed network for drill pipe. A little more than four years later, IntelliServ™ employs over 115 people. IntelliServ™ expects to become a service company that services the entire oil and gas industry with over $1 billion in sales within 10 years and employs thousands of people in good paying jobs.

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Composite Pipe – Advanced Composites Products & Technology, Inc.

Composite drill pipe (CDP) consists of a composite material tube with steel box and pin connections. The tube is manufactured by winding graphite fibers and an epoxy resin around a metal mandrel and the metal box and pin connections. This is then cured and the mandrel is removed. The cured pipe section is machine finished and the abrasion resistant coating is applied. A significant feature of CDP is that it can be designed to carry electrical power and/or communication signals via lines embedded in the composite pipe wall. The problem to be solved is reliably transmitting signal or power across the metal joints connecting individual CDP sections. Several approaches to solving this problem are currently being examined. Although direct connections have been tried unsuccessfully in the past, a new approach to this technology has been successfully demonstrated in this program. The current effort includes a reduction-to-practice demonstration in the full-length CDP sections.

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