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PROJECT BRIEFS

Solar Powered Pump

Testing is underway at RMOTC, in conjunction with NREL, on a project in the renewable energy program. Currently, a Solar Powered Pump System is installed and tests are being conducted to determine if photovoltaic panels can be used to provide the power required for select elements of oilfield operations.

Photovoltaic panels at RMOTC.

Carbon Mitigation Initiative (CMI)

RMOTC has been working with Professor George W. Scherer of Princeton University to provide samples and support data for a CO_2 project. Lab studies are being performed to determine the long-term effects of reservoir fluids and injected CO_2 on cement integrity. Dr Scherer commented, “This was the only facility where we received an immediate positive response to our proposal. All of the personnel at RMOTC were extremely competent and pleasant to work with.” Results will be communicated when they are ready.

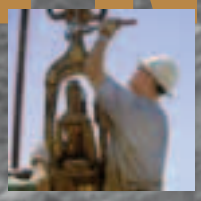
RMOTC (Infrastructure)

A deep Tensleep well was drilled in the summer of 2004, and an extensive core acquisition program was completed. Data interpretation, core description logs, and detailed microscope studies are underway with researchers at the University of Wyoming. Results from the well and core will be compared with surface outcrop studies of Tensleep, located at Alcova Lake southwest of Casper, and used in the CO_2 program for future reservoir modeling.

ROCKY MOUNTAIN OILFIELD TESTING CENTER

2004 FALL NEWS





Office of Fossil Energy

MAKING AMERICA'S PIPELINES SAFER

TESTING LEAK DETECTION TECHNOLOGIES AT RMOTC

Project Lead: Doug Tunison

Americans currently consume approximately 22 trillion cubic feet of natural gas each year. Most of this fuel is delivered by a high-pressure system that crisscrosses the country and consists of over 300,000 miles of pipeline threading through our communities. Various parts of this pipeline system are 40 or 50 years old, making possible corrosion and leakage a major concern.

The U.S. National Energy Technology Laboratory (NETL), other divisions of the Department of Energy (DOE), the Southwest Research Institute, and 15 companies have teamed up with the Rocky Mountain Oilfield Testing Center (RMOTC) to develop more sophisticated methods of detecting natural gas leaks.

"Pipelines are safe today, but it doesn't mean they can't be safer," stated Rodney J. Anderson at a press conference held September 16 during the demonstration week for the remote gas sensing tools tested at the RMOTC site. Anderson is the technology manager for the NETL Natural Gas Infrastructure Reliability Program.

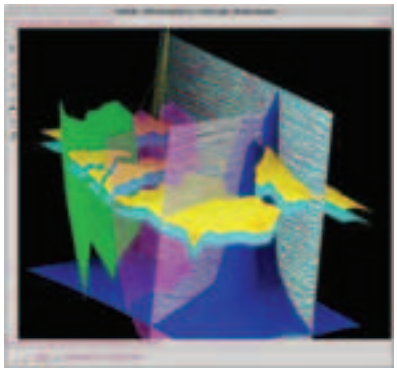
Testing was very exciting as five crews from across the nation launched airplanes, unmanned autonomous vehicles (UAVs), and a helicopter. Mobile platforms, satellites, and special ground based vehicles were also used, all of which were equipped with remote sensing devices that would pinpoint and measure natural gas leaks along a 7.5-mile stretch of simulated natural gas pipeline near RMOTC's Teapot Dome.

The success of these tests, and subsequent development and access to this technology, will enable the gas industry to rapidly and accurately monitor large sections of the Nation's natural gas pipelines and distribution systems for leaks. A task that currently is neither fast nor accurate, leak detection involves a three-man crew walking or traveling by all-terrain vehicle alongside a pipeline route with a gas-sniffing device. This method allows coverage of only 10 miles per day. According to Daniel Brake, director of Active Imaging Solutions, a division of ITT Industries, the successful development of remote gas sensing tools will make this process more efficient. "We can do 1,000 miles in a day."

DATA MANAGEMENT PROJECT

Project Lead: Tom Anderson

Database management provides a foundation that is central to attracting and developing business in the areas of exploration, research, and reservoir modeling. At RMOTC and the Naval Petroleum Reserve No. 3 (NPR-3), an aggressive Data Management Project is underway to update the NPR-3 database, improve the overall infrastructure, and provide a usable and valuable resource to our partners. By having an improved, updated database of well characterized subsurface reservoirs, research and testing partnerships can expand beyond the traditional drilling and production tool testing that RMOTC has provided in the past.



Subsurface 3D modeling.

The project will:

- Digitize deep well petrophysical logs
- Build cross sections and create subsurface structure maps
- Import seismic wells and logs into the existing GeoGraphix System and additional software tools being implemented
- Perform full 3D integrated seismic interpretation of multiple key horizons and faults
- Conduct velocity analysis and seismic time-to-depth conversion
- Provide special geoscience analysis including fault and fracture trend interpretation using coherence cubes, and stratigraphic analysis using spectral decomposition techniques
- Construct a 3D geologic (geocellular) model
- Input production history and completion data into a production management system, including implementing ongoing real-time field production data capture
- Load drilling data into a system to enable improved drilling and workover operations, planning and design, and implement real-time rig instrumentation
- Run dynamic flow simulation, perform history matching and "tune" the model

An additional benefit of the Data Management Project will be to provide the tools needed for RMOTC and NPR-3 to identify and capture additional reserves, as well as potentially increase production and extend the productive life of the field. The Data Management Project is also needed to support the Carbon Management Program at RMOTC.

MAURER TECHNOLOGY: HIGH PRESSURE JET ASSISTED DRILLING

Project Lead: Ralph Schulte

RMOTC is partnering with Maurer Technology, Inc. of Houston, Texas, to perform extensive drilling tests of the Maurer high pressure drilling system at the NPR-3. The technology was developed by Maurer under a partnership with the National Energy Technology Laboratory (NETL) and uses high pressure drilling mud to drive a high pressure mud motor and a high pressure bit with small diameter drilling jets.

Special high pressure jet bit.

The high pressure drilling mud in conjunction with the small diameter jets result in very high velocity fluid streams. These streams cut a groove in the bottom of the hole thereby increasing drilling rates.

A new well was drilled in order to facilitate testing in May, 2004. The high pressure system was tested from approximately 4,300 to 5,200 feet. During the test, drilling pressures exceeded 8,000 pounds per square inch (psi) at mud circulation rates of 200 gallons per minute (gpm). The total interval drilled was from 4, 363 to 5,156 feet through a variety of lithologies ranging from clean, high porosity sandstone to limestone, as well as a variety of shale and siltstones.

The results of testing were essentially two-fold. On the upside, significant increases in drilling rate were evident over specific intervals, from two to seven times the normal historical field drilling rate. A limiting aspect of the testing was the mechanical difficulty encountered with the high pressure mud motor, jets, and drill bits. The high pressure mud motor's stator failed while drilling and much of the test was completed with a mechanical rotary table, high pressure drilling swivel, high pressure Kelly hose and high pressure mud pump.

Initially, the RMOTC drilling crew had to overcome some mechanical problems to operate the surface equipment used by this new high pressure system. However, following some adjustment, successful pressure testing of the drill allowed testing operations to proceed without incident.

It is hoped that this high pressure drilling system technology, when fully tested and developed, can be used to increase drilling efficiency and speed, thereby reducing drilling costs in the long run.

ITT's Airborne Natural Gas Emission Lidar technology is mounted in the nose of an airplane and casts a rotating, circular laser grid over a pipeline route from 1,000 feet in the air. Brake goes on to say that an aircraft traveling at 150 miles per hour enables the tool to map and record a gas leak within 10 feet of accuracy.

In addition to detecting leaks faster, and more accurately, RMOTC, the DOE, and NETL want to protect the American economy by helping pipeline companies ensure steady flows of natural gas while enhancing the reliability of the infrastructure and increasing our Nation's safety.

Unmanned Aerial Vehicle (UAV) being readied for data acquisition flight.

RMOTC PARTICIPATES IN INEEL SCIENCE EXPO

PROJECT LEAD: LORRI KIRBY

The RMOTC Science Center Outreach Program participated in the 4th Annual Idaho National Engineering and Environmental Laboratory (INEEL) Science and Engineering Expo, which was held in Idaho Falls, Idaho in September. This year, the Expo's focus was on energy and power.

The exposition of science featured more than 70 interactive exhibits, science experiments, simulations and presentations.

The RMOTC exhibit featured a physical geologic model of an existing oilfield, a traditional pumping unit juxtaposed against a geothermal powered pumping unit, a demonstration of hydroponics (the science of raising crops organically without the use of soil) and aquaponics (the combination of aquaculture and hydroponics).

RMOTC's Mary Allemand working with students at the EXPO.

Nearly 10,000 people – 6,000 of whom were students – came to be immersed in the carnival of events. The Expo is geared toward students in grades five to nine, with the objective of stimulating interest in scientific and technological careers. The Expo is also designed to augment the traditional science curriculum in K-12 schools by linking activities to national and state science education content standards.

OILWELL HYDRAU
PROSPECTS OF REDUCING C

PROJECT LEAD: BRYANT MOOK

A new hydraulic pump currently undergoing field tests at RMOTC could reduce the operating cost of high-volume offshore oil wells by an impressive 40 percent, adding to America's oil reserves and energy security by prolonging the life of mature oil fields.

The new pump, the largest of its kind ever tested, is ideally suited for maturing oil fields where wells have a high water cut (i.e., they produce larger volumes of water relative to the oil produced). Electric submersible pumps currently in use produce an oil-water emulsion that requires a costly separation process before the water can be properly disposed of and the oil sent to a refinery. The large-volume hydraulic pump now undergoing testing produces oil and water with little mixing, and is much easier to service, which dramatically reduces operating and processing costs.

Reduced operating costs can often mean a longer economic operating life for an oil well. The longer a well operates, the more oil it produces, prolonging the life of the field and

ULICS TESTS
COST WHILE INCREASING DOMESTIC OIL RECOVERY

adding to recoverable reserves. The new pump would be admirably suited for use in mature high-volume offshore Gulf of Mexico oil wells, as well as in certain large volume onshore wells with higher water cuts.

The cost-shared, $1.5 million, three-part test being conducted by RMOTC for Oilwell Hydraulics of Odessa, Texas, is now in its second phase and is "going superbly," according to Bryant Mook, RMOTC petroleum engineer.

Each test phase of the hydraulic pump was scheduled to last 30 days, Mook said, but the first phase went so well that RMOTC and Oilwell Hydraulics wrapped up the test after only a few days. The second phase has been completed and the pump functioned well due, in part, to the ideal testing conditions RMOTC offers.

Mook said the payoff for Oilwell Hydraulics in partnering with federal test site comes from RMOTC's large-bore test well that can replicate offshore conditions onshore; experienced personnel including expert engineers and oilfield hands, and a cost-sharing arrangement in which RMOTC's contribution of infrastructure and personnel covers 7 to 10 percent of the test's 1.5 million dollar cost.

"You can compare it to conducting a medical experiment in a fully equipped hospital as opposed to a remote emergency medical unit," Mook said. "Everything you need is right here."

The payoff for RMOTC comes from helping to prove the value of a new technology that could add large volumes of domestic oil to recoverable reserves, adding to the Nation's energy security by reducing our reliance on imported oil.

Workover rig onsite at RMOTC's Teapot Dome test location.