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DOE Pulse

Science and Technology Highlights from the DOE National Laboratories

Number 33 June 28, 1999

Research Highlights . . .

At arm's length: wending our way into waste tanks

Sometimes you can't quite reach the itchy spot in the middle of your back. A similar problem faced DOE's Idaho National Engineering and Environmental Laboratory engineers when they needed to inspect large underground waste tanks and sample the radioactive dregs after emptying. Working with other DOE labs and private industry, the INEEL developed a mobile system with a robotic arm similar to the space shuttle's payload arm. Called the Light Duty Utility Arm, it can maneuver deeper inside the tanks than ever before. INEEL-developed arm attachments give engineers their first three-dimensional view of the tank's innards and the ability to do non-destructive examinations and take samples.

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Sandia, University of Oklahoma aid domestic energy producers

The Well Construction Technology Center — whose goal is to make U.S. oil, gas, and geothermal energy production more economical — has been established by DOE's Sandia National Laboratories and the University of Oklahoma's Petroleum and Geologic Engineering Department. OU has a record of success in science and technology development for the exploration and production of oil and gas, and Sandia has been DOE's lead laboratory for drilling technology for the past 20 years. Sandia brings to the partnership a variety of technology development activities, including modeling and simulation using high-performance computers, advanced sensing and information systems, robotics, and micro-machine technology.

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National lab brings engine oil analysis on board

Technology developed at DOE's Pacific Northwest National Laboratory will soon be providing the railroad industry valuable information about an engine's condition without having to take locomotives out of service. On-Board Intelligent Lubrication Prognostics, or OILPro, eliminates the need for the costly and time-consuming process of taking locomotives out of service to obtain oil samples, sending the samples to a laboratory for analysis and waiting days or even weeks for results. Instead, OILPro brings the lab to the equipment. Pacific Northwest has licensed LRC Northwest to market OILPro to the railroad industry. Pacific Northwest is pursuing opportunities to market the technology for use on ships, trucks and planes as well.

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SLAC's B Factory bringing in the data

The B Factory, located at DOE's Stanford Linear Accelerator Center, is up and running after four years construction. In May scientists recorded their first beam to beam collisions. In June, the B Factory delivered more luminosity in a 24-hour period than in any comparable 24-hour period of its predecessor, PEP I. Now with over 4,000 events to study, researchers are looking at exciting new data. The goal is to generate particles called B mesons and thereby investigate why there is more matter than antimatter in the universe.

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DOE Pulse highlights work being done at the Department of Energy's national laboratories. DOE's laboratories house world-class facilities where more than 30,000 scientists and engineers perform cutting-edge research spanning DOE's science, energy, national security and environmental quality missions. ***DOE Pulse*** (www.ornl.gov/news/pulse/) is distributed every two weeks. For more information, please contact Jeff Sherwood (jeff.sherwood@hq.doe.gov, 202-586-5806).

Model for Tennessee rivers adapted to Montana project

A computer model developed by the Tennessee Valley Authority to simulate water flow through the TVA's system of dams in the Southeast has been adapted to a Montana river system by researchers at DOE's Oak Ridge National Laboratory.

At issue is the relicensing of several hydroelectric dams in Montana, particularly along the Madison River, which flows north from Yellowstone country to eventually form the Missouri with two other rivers. Some environmental organizations want the Madison returned to a pre-dam condition; other groups say the dams are needed for power generation and reservoir recreation. Opinions run strong on either side, and the Federal Energy Regulatory Commission is using an environmental assessment by ORNL to weigh the merits of the arguments in its decision whether to renew the dams' licenses.

A powerhouse along the Madison River in Montana.

"There are many competing interests. Some individuals and groups want drastic changes while others prefer to leave things as they are," says ORNL researcher Bo Saulsbury.

To help them gather information, the ORNL team enlisted the help of TVA's computer model. The model, originally developed by TVA to simulate water flow and quality in the TVA system, was adapted to mimic effects on the Montana system under different conditions.

"We modeled the river to include things that would affect temperature-the shape of the channel, shade, flow, elevation and local weather," says ORNL's Mark Bevelhimer.

Saulsbury concedes that the difficult task for policymakers is to balance the interests of all parties, including those who would remove one of the dams, which they blame for adversely affecting fishing downstream, and those who wish to maintain it for power generation and reservoir recreation.

"We've provided FERC with recommendations that recognize the need to balance power generation with preserving the environment," says Saulsbury. "If the recommendations are accepted by the FERC commissioners, a new license will be issued complete with numerous measures to protect the river environment and allow for the production of hydroelectric power."

Submitted by DOE's Oak Ridge National Laboratory

Getting environmentally friendly with microbes

Bugs don't bug Gene Premuzic, at least, not when they're the strains of naturally occurring bacteria that he and colleague Mow Lin have been culturing at DOE's Brookhaven National Laboratory for the past decade. These tiny organisms can play a big role in the fossil fuel industry, waste cleanup and mineral recovery.

Premuzic's latest line of custom bugs form the basis of a technology that may be the answer to two oil-industry problems: vast reserves of crude oil left in the ground by conventional extraction techniques, and crudes too heavy and impure to refine easily into clean-burning fuel.

This new technology can be used in two ways: either, by injecting special bacterial biocatalysts directly into oil wells or, as it is currently being used, above ground. In oil wells, the biocatalysts help break down the crude oil, allowing it to be more easily recovered. As they are used above ground, the biocatalysts remove from the oil up to half of the impurities, such as sulfur, nitrogen and heavy metals. Invented and patented by Premuzic and Lin, this technique has now been licensed exclusively to BioCat of New York.

Another strain of bacteria that Premuzic and his team developed became microbial "miners"—sulfur-eating bacteria that formed a key part of a process that treats waste streams from geothermal energy plants and simultaneously recovers valuable minerals. Recognized by the National Awards Council for Environmental Sustainability, this research was included in the 1997 Environmental Success Index.

Yet another of the team's successful bugs are grease-eating bacteria used to clean up waste from restaurants and the food industry. Developed as the EnSoL System under a Cooperative Research and Development Agreement between BNL and Environmental Solutions Corporation, this technology employs bacteria to change grease and solid waste to environmentally benign water and carbon dioxide.

Submitted by DOE's Brookhaven National Laboratory