to identify how borehole stability is affected by mechanical properties of rock and in-situ stress state. Development of a 3-D wellbore stability simulator will take into account effects of multiphase fluid flow in reservoir rock and non-physical linearity of formations.

• **Drilling highly deviated wells in unconsolidated sandstones and unstable shales**—To ensure effective cuttings removal, even at the risk of stability problems, procedures will be studied and tests performed in a surface simulator to determine the best approach in designing wells.

• **Kick and blowout control in deepwater wells**—Technological advances are required to minimize the possibility of well control problems and to deal with blowouts in deep water.

• **Electrical submersible pumps (ESPs) in subsea wells**—The ESP method offers huge possibilities due to flowrate increases and final oil recovery, as well as more flexibility in subsea layout, since production platforms can be located farther from wells in shallower waters.

• **Subsea separation system (SSS)**—Attractive for applications in deep waters, subsea separation could yield higher production rates and recovery. SSSs could reduce the number of platforms required, thereby reducing operational and investment costs.

• **Subsea multiphase pumping system**—This system is considered economically advantageous for deepwater production, where installation and operation of standard production platforms is either too expensive or technically impractical. Economic benefits increase with water depth.

• **Flow assurance in deepwater conditions**—Production losses due to organic deposition (paraffin) in flowlines from wells located far from production platforms are to be avoided through studies aimed at deposition phenomena and feasible operational techniques.

• **Reduction of rig downtime due to BOP handling**—The project goal is to improve subsea BOP reliability to enhance safety of operations, preserve the environment and cut BOP downtime costs.

• **Stationary production units with dry (surface) completions**—Development of fixed production units with wellheads at the surface, such as TLPs, that do not respond to environmental loading.

• **Stationary production units with subsea completions**—Objective is to analyze proven floating production technology, using subsea completion concepts, for applications in 1,000 to 2,000 m water.

• **Acquisition and treatment of geotechnical, geophysical, geological and environmental data**—The purpose of this project is to understand, from an engineering standpoint, environmental loads, geotechnical behavior, geological processes and detailed morphology of the seafloor along the Brazilian Continental Slope in the Campos basin.

About 17% of crude produced in Brazil is from wells in waters deeper than 400 m. Barring any major onshore or shallow-water finds, Petrobras expects this figure to reach 61% by 2003. Brazil enjoys a unique position worldwide, due to discoveries of giant oil accumulations in deep water. Despite limited availability of proven deepwater production technologies, the country needs to exploit these reservoirs. *WO*

Warning device keeps sea gulls off platforms, equipment

Sea gulls are nice to have around for atmosphere when one visits the beach, but when they roost on offshore equipment, the layers of droppings they leave can be a big problem in terms of safety, cleanup/maintenance and cost. The Chicago-based company Bird-X Inc. offers a solution that uses an electronic device that automatically broadcasts gull distress calls to warn birds away. Louisiana Land and Exploration Co. (LL&E) of Lafayette, Louisiana, has cut a major Gulf of Mexico problem significantly with the device. Amerada Hess has the system on trial with good success so far.

The problem. It's obvious and it's not pretty to anyone working on exposed offshore facilities. Sea gulls regard offshore platforms as their personal showcases. They perch in the tall beams to survey the passing scene. But picturesque as they may be, their droppings make misery for maintenance workers. What to do?

"We tried using owl decoys to scare the gulls away," says Doyle Savell, LL&E's measurement supervisor. "For any large producer, maintenance is a major expense. Excretion from gulls is highly acidic and it deteriorates the paint. At our company, we sandblast and repaint our platforms about every three years—and we have 43 platforms," he explains. The gulls lay and rest and roost in the structure. One platform soiled and eroded by droppings is bad enough; multiply it by 43 and you have a significant issue and a huge, recurring maintenance expense.

And the problem is not unique to LL&E. Sea gulls have been a problem for decades for anyone operating an offshore platform where there's not much human activity.

Owls are the natural enemies of gulls, so theory holds that a phony owl will fool the gulls and they will fly away out of instinctive fear. Not true. "The decoys didn't work at all," Savell says. "The birds pushed the owls out of their way and resumed roosting on our platform."

The operator tried another approach. The crew played tapes of guns and explosions, which worked for a week or two. Then the birds figured out that nothing terrible was going to happen, so they returned in full force.

The solution. LL&E then investigated the Bird-X system called Super BirdX-Peller, which replicates and broadcasts authentic sea gull distress cries with very high fidelity through four speakers that can be easily installed on most platforms. The solid-state speakers can be powered permanently by solar panels connected to batteries. The system operates automatically and covers up to ten acres without any effect on the environment. It also eliminates need for costly, labor-intensive methods like chemicals, nets and fences.

LL&E initiated a 75-day trial run. For this test, the staff picked a quiet 60 × 70-ft non-producing platform that was in bad condition—a favorite haunt of the messy gulls. Before installing the repeller, they cleaned up the entire platform, three decks and a heliport. Then they installed the new system.

"The gulls stayed away," Savell affirms. "There were no droppings whatsoever. Three times a week we did fly-by visual checks, and once a week we

While its not something you discuss at the dinner table, sea gull droppings are a major maintenance and safety problem on unmanned offshore facilities.

landed on the helipad. It has been 100% effective for three months," he reports. Pleased with the trial, the operator purchased sound systems and solar panels for two additional problem platforms.

The LL&E crew says that if you extend the life of the paint by one year, even for a small structure, you save thousands of dollars, and if this performance continues, they expect to extend paint life two or three years. "Another way you save is that you would otherwise be steam-cleaning the platform several times a year, with the cost of labor running about $500 per man," they add. Getting rid of the droppings is also healthier for workers as it also gets rid of the harmful bacteria it harbors.

In another case history working, Amerada Hess has similar experience with gulls soiling offshore platforms. Fake owls did not work for them either, and they are experimenting with the new system at the company's West Cameron 576 site, a medium-sized platform (about 80 × 90 ft) with two decks and a heliport. "Since we've installed the system, we've seen very few gulls hanging around, and no droppings," an Amerada superintendent says.

Equipment notes. The supplier says that the systems are automatic for unattended operation, weather-resistant and maintenance free, using solid state electronics. A complete kit includes: steel-cased control box with vinyl rain cover; 110 VAC (220 VAC available) adapter with cable; battery clips with cable; four separate speakers, each with 100 ft of cable, or one four-speaker box with 50 ft of cable. An optional solar panel for use with 12V batteries is available.

Controls are adjustable for day and night, 24-hr operation via light-sensing photocell, with adjustable mute time between sound blasts. *wo*