

# PROJECT facts

DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY

**OIL recovery**  
PROGRAM

## THE HUGHES EASTERN PROJECT — USING A RESERVOIR'S NATURAL MICROBES TO IMPROVE OIL RECOVERY

### PRIMARY PROJECT PARTNER

**Hughes Eastern  
Corporation**  
Jackson State, MS

### FOSSIL ENERGY PROGRAM

**Oil Recovery Field  
Demonstrations**

### MAIN SITE

**North Blowhorn Creek**  
Vernon, AL

### TOTAL ESTIMATED COST

**\$3.96 million**

### COST SHARING

**DOE - \$1.93 million**  
**Non-DOE - \$1.93 million**

DE-FC22-94BC14962

### Project Description

The Hughes Eastern Corporation project is demonstrating how naturally occurring varieties of microbes in an oil reservoir can be used to increase crude oil production. Supplied with the proper nutrients, these bacteria can grow rapidly. Whereas certain strains can be used to thin oil so that it will move more easily through the reservoir rock, other types of microbes can form gels to change the flow paths of water and oil through the formation. Hughes Eastern is using these latter types to effect beneficial changes in reservoir fluid flow patterns.

In the North Blowhorn Creek field near Vernon, Alabama, as in many domestic fields, oil is being produced by waterflooding—injecting water to force oil towards producing wells. After many years, portions of the reservoir have been “swept” of much of the remaining producible oil, but other areas, bypassed during the waterflooding, still contain significant amounts of “unswept” oil. Hughes will use the natural microbes to plug the water-swept parts of the reservoir, thereby diverting injected water to the bypassed oil-containing zones.

Core samples from two new wells drilled in early 1994 indicated that this area of the reservoir had not been swept by the waterflood and contained significant amounts of producible oil. Laboratory testing also showed that, when water containing common plant fertilizers was passed through the core samples, the natural microbes grew, plugged the pore spaces in the rock, and increased the resistance to water flow. Further testing helped researchers learn what mixture of fertilizer and water best stimulated microbial growth.

Hughes began injecting the selected fertilizer mixes in four well patterns in late 1994 and early 1995. Staff are monitoring each pattern's injection capacity and oil and water production rates, and checking for indications of microbial effects. Initial production increases were noted, but major changes are not expected for some time.

### Program Goal

One of the principal DOE Oil Program goals is to maintain access to the wells in operating oil fields for the application of oil recovery technologies that can reduce operating costs and increase production. To forestall well abandonments, which threaten a large proportion of U.S. domestic wells in the next several decades, DOE is supporting projects that will demonstrate technologies capable of extending the productive life of marginal fields.

Successful demonstration of the Hughes Eastern effort to control reservoir fluid flow in waterflooded reservoirs with indigenous microbes will provide operators with a quick and inexpensive process that will lower operating costs and increase production. Technology transfer efforts by Hughes and its partners and by DOE will provide operators throughout the region and in other areas of the U.S. with information on how the process can be applied in their fields. Additional production potential in the North Blowhorn Creek field alone could be as much as 2 million barrels.

### Project Partners

**HUGHES EASTERN CORP.**  
Jackson State, MS

**MISSISSIPPI STATE UNIVERSITY**  
State College, MS

**MORROW DRILLING CO.**  
Jackson, MS

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## Project Benefits

The North Blowhorn Creek field in Lamar County, Alabama, is typical of many U.S. oil fields. Primary production using the reservoir's natural pressure has declined, and for the last decade, operators have had to inject water to force more oil to production wells. Unless new ways are found to increase production, the field is likely to be abandoned after waterflooding is no longer productive—leaving nearly two-thirds of the reservoir's original oil behind.

The Hughes Eastern project, along with other Department of Energy Oil Recovery Field Demonstration projects, is designed to show how many of the Nation's most endangered oil fields can be kept in economic production after traditional recovery processes have been exhausted.

After years of production the waterfloods at North Blowhorn Creek have typically begun to follow the easiest paths through the reservoir, leaving much of the oil "unswept." If water flow through the depleted areas can be blocked off and diverted to the bypassed regions, additional oil might be produced.

The use of microbes offers a relatively low-cost approach. Occurring naturally in the reservoir, the bacteria require no complex cultivation apparatus. Existing waterflood injection equipment can be used to introduce the nutrients into the reservoir, making the process less costly than other types of plugging chemicals. Additionally, because ordinary plant fertilizers are used as nutrients, the process will not adversely affect the environment.

If successful, as many as 2 million additional barrels of crude oil could be produced over the project's 4 1/2 year extent. Through an active technology transfer program, Hughes will provide the results of the demonstration to other operators who have the potential of adding many more millions of barrels of crude oil to the Nation's domestic supply.

## CONTACT POINTS

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## Cost Profile (Dollars in Millions)

	Budget Period 1		Budget Period 2	
	01/01/94	12/31/95	06/30/99	06/30/99
Department of Energy*	\$1.03		\$0.89	
Private Sector Partners	\$1.03		\$0.89	

\* Obligated Funding

## Key Milestones

