PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

OIL recovery PROGRAM

TEXACO — APPLYING IMPROVED TECHNOLOGY TO BOOST OIL PRODUCTION IN SOUTHEASTERN TEXAS

PRIMARY PROJECT PARTNER
Texaco Exploration and Production, Inc.
New Orleans, LA

FOSSIL ENERGY PROGRAM
Oil Field Recovery Demonstrations

MAIN SITE
Port Neches Field
Orange County, TX

TOTAL ESTIMATED COST
$23.9 million

COST SHARING
DOE - $8.5 million
Non-DOE - $15.4 million

DE-FC22-93BC14960

Project Description

Texaco, as a partner in the Department of Energy's oil recovery field demonstration program, is combining two improved oil recovery technologies, carbon dioxide (CO_2) flooding and horizontal drilling, to boost production from a depleted sandstone reservoir in southeast Texas. The demonstration site, the Port Neches field, contains reservoirs in two faulted blocks. Prior to the project the reservoirs produced mostly water with little oil.

When production from conventional production techniques, such as natural reservoir energy or by waterflood, drops to low levels, injecting CO_2 into the reservoir under pressure can make a significant contribution to increasing production. The gas dissolves in and thins the oil, which can then be more easily moved by injected fluids through the reservoir rock to producing wells. In this project, Texaco is injecting the CO_2 through both standard vertical wells and long horizontal wells, which will provide quicker injection of a greater volume of gas throughout a larger area of the producing horizon.

In the project's larger fault block, Texaco injected salt water to raise reservoir pressure to the level at which CO_2 mixes completely with the oil, then began injecting CO_2 in 1993 in vertical injection wells. A horizontal CO_2 injection well was drilled in early 1994, but mechanical problems limited the horizontal section to only 250 feet, rather than the planned 1,500 feet. To improve control of CO_2 flow in the reservoir, CO_2 and water are alternately being injected in the injection wells. In the smaller fault block, which is smaller than originally thought, some additional oil is being recovered by stimulating the single producing well with cyclic (huff-n-puff) injection of CO_2 and water.

Geologic and engineering data gathered by Texaco indicate that the original water drive energy was stronger than originally thought, and that the volume of movable oil was much lower than originally estimated at the start of the project. Oil production increased by more than 400 barrels per day in late 1994, but has since declined because of problems experienced in injecting enough CO_2 and water. Ultimate oil recovery from the project remains to be determined.

Program Goal

Waterflooding of Gulf Coast reservoirs is commonly unsuccessful, leaving oil trapped in the rock. These reservoirs could face abandonment within the next decade or two, leaving abundant unproduced oil reserves. With DOE Oil Program support, Texaco is testing the ability of combined CO_2 flooding and horizontal well technologies to recover more oil from depleted Gulf Coast reservoirs similar to those in the Port Neches field. Initial efforts look successful, but some production problems are being addressed. Successful demonstration of the ability of these combined technologies to increase production will provide operators with a new technique that can be applied to other Gulf Coast reservoirs, a potential target for as much as 500 million barrels of oil.

Project Partners

TEXACO EXPLORATION AND PRODUCTION, INC.
New Orleans, LA

SCIENCE APPLICATIONS, INT'L. CORP.
Reston, VA

LOUISIANA STATE UNIVERSITY
Baton Rouge, LA

Texaco — Applying Improved Technology to Boost Oil Production in Southeastern Texas

CONTACT POINTS

Sami Bou-Mikael
Texaco Exploration and Production, Inc.
New Orleans, LA
Phone: (504) 593-4567
FAX: (504) 593-4542

Chandra M. Nautiyal
U.S. Department of Energy
Bartlesville Project Office
Bartlesville, OK
Phone: (918) 337-4409
FAX: (918) 337-4418
e-mail: cnautiya@bpo.gov

Project Benefits

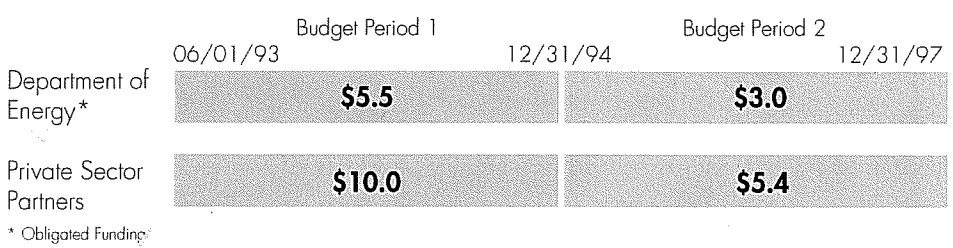
Many reservoirs in the Louisiana-Texas Gulf Coast region are similar to the Port Neches field–oil was originally produced by the energy of natural water flow. As the natural energy decreased, the reservoirs were waterflooded by surface injection, which commonly bypasses parts of the reservoir, leaving large amounts of oil in isolated reservoir compartments. Although large amounts of oil have been recovered from these reservoirs, many are in danger of abandonment because they are now producing a lot of water and little oil. Technologies like those being demonstrated in Texaco's Port Neches project are essential to recovering more oil and prolonging the productive life of these reservoirs.

Both CO_2 flooding and horizontal drilling have been successfully used in other areas to recover additional oil. CO_2 flooding is most predominant in west Texas, but some CO_2 projects have been conducted in the Louisiana-Texas Gulf Coast region, most successfully in waterflooded reservoirs, where oil saturations are generally high enough for the CO_2 to mobilize significant amounts of oil. Horizontal drilling has been successfully used in fractured reservoirs, like the Austin Chalk region of Texas, and in producing thin layers of oil above aquifers. With horizontal injection wells, much more of the reservoir can be contacted. Injection rates can be higher and project lives shorter.

Texaco estimates that combining these two technologies in the Port Neches field project could increase the amount of oil recovered by nearly 20%. As much as 2.2 million barrels of crude oil may be produced from the Marginulina sand reservoir using these processes, compared with only 200,000 barrels that would be expected if only waterflooding continued until the wells were abandoned. Up to half of the remaining oil in the Gulf Coast trend may be recoverable using these processes in similar waterflooded reservoirs. The benefits would be thousands of jobs preserved and millions of barrels of domestic oil added to the Nation's reserves, each barrel contributing increased federal royalties, additional federal, state and local taxes, and positive impact on local economies.

Several products useful to industry have been developed during the course of this project. Texaco produced a computer software program for screening candidate reservoirs for the CO_2 flooding process; Louisiana State University, a project partner, summarized past CO_2 projects in Louisiana and identified potential CO_2 sources, and also developed a preliminary ranking of reservoirs suitable for the post-waterflood CO_2 process, including appropriate maps.

Cost Profile (Dollars in Millions)



* Obligated Funding

Key Milestones