Coal beds breathe new life into San Juan

Coal-bed methane is breathing new life into the Farmington economy as operators accelerate their hunt for the Fruitland coal seams.

by Sandra Johnson

Did you hear about the Farmington banker who stopped into his favorite restaurant for a meal? In the back booth a bunch of rowdies were cussin' and shoutin' and in general making a ruckus. Normally, the banker said, he would have been offended, but the men looked like drillers and "Frankly, I'm glad to have 'em back."

He's not the only one who feels that way. The Farmington economy has survived its lean years. But now, coal-bed methane is breathing new life into the economy. And with another year left before the federal tax credit for drilling and developing nonconventional fuels expires, operators are accelerating their hunt for the shallow Fruitland coal seams.

Supporting that hunt, service companies report a booming business from the service- and equipment-intensive wells. For example, George Coleman of Big "A" Well Service in Farmington says business has grown 25% to 30% since coal-bed methane became popular. His company bought 10 new trucks, added one well servicing rig and converted two others to 24-hr completion rigs, he says.

Meanwhile, J.A. Drake Well Service Inc., Farmington, doubled its work force to about 100, while Dallas-based Halliburton Resource Management's Farmington office has increased its work force to 68, compared with 53 last year, and 35 the year before.

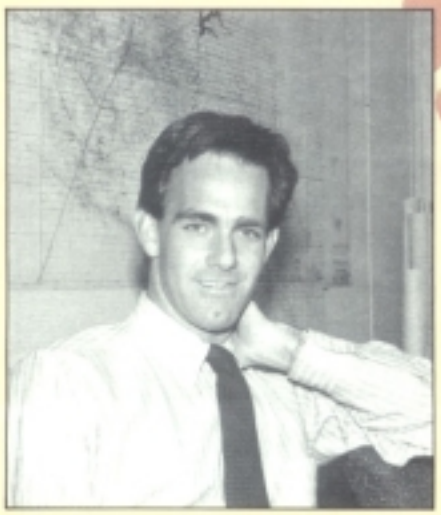
Even exploration and production companies focusing on conventional drilling share Farmington's healthier business cycle. For example, Tom Dugan, president of Dugan Production Corp., Farmington, says he's doubling his office space.

Though Dugan has drilled coal-bed methane wells in the past (and is the coauthor of a 1988 article detailing the history of coal-seam production), his current drilling program calls for 12 Gallup Formation wells by the end of the year.

And Farmington gets an additional economic boost as Phillips Petroleum Co. and Unocal open offices here. They join a growing troupe of coal-bed players, featuring Amoco Production Co., Meridian Oil Inc., Houston, and a full cast of costars.

By the time this magazine reaches mailboxes, Phillips will have begun its 90-well coal-bed drilling program with Northwest Pipeline Corp., says spokesman George Minter.

And Unocal, having drilled five wells in Rio Arriba County, N.M., will be evaluating them before committing to a program. Nevertheless, its efforts represent an extension of the play to the



Looking good

Nassau Resources Inc., Denver, is midway through a 65-well drilling program, says Jerry McHugh Jr., president. (Photo by Sandra Johnson)

Cashing in on coal

Rig hands dig for coal seams on an Amoco Production Co. well. (Photo courtesy of Amoco)

southern part of the basin south of Gobernador, N.M.

Another company testing the southern limits of the coal beds this year is Caulkins Oil Co., Denver, which drilled one well and tried to recomplete another with mixed success, according to Harley G. Higbie Jr., vice president.

But back in the northern and central portion of the basin, Amoco and Meridian dominate—between them accounting for more than 225 MMcfgd of the coal-seam gas coming out of the San Juan Basin.

"The key thing for Amoco, is we construe this as a long-range challenge and opportunity," says R.J. (Ricky) Broussard, southern division operations manager.

Long range, maybe, but right now many companies look at the coming year and try to figure how much drilling they can squeeze in before qualification for the tax credit expires.

In 1989, the New Mexico Oil Conservation Division issued 444 permits to drill through August in this region, most of them for the San Juan's Fruitland coal seams, compared with 279 in the first eight months of 1988. Completions through August 1989 totaled 352, up from 1988's 160. And rigs turning to the right in the San Juan Basin averaged 18.25 in 1989, up slightly from 1988's average of 17, according to Petroleum Information Corp.

In addition, Amoco considerably strengthened its position through its Tenneco purchase last year. That transaction, which gave Amoco about 2200 conventional wells and valuable associated acreage in the basin, ensured Amoco a larger role in New Mexico. The company already dominates the Colorado side of the coal-bed play.

With 330 coal-bed wells already drilled, Amoco plans approximately 50 more by the end of the year and as many as 150 next year, Broussard says. Of the 330 drilled, 160 are hooked up to a pipeline, producing about 37 MMcfgd. With the coal-bed's inverse production curve, these results make Amoco very excited because "these wells have a 50-yr life or better," he predicts.

But despite Amoco's extensive drilling program, Meridian still ranks first in production. The company's production hit 195 MMcfgd in mid-October, says Ray Owen, regional operations manager. Meridian holds the title for the basin's best producing wells—with one well producing a whopping 14 MMcfgd and two others producing about 10 MMcfgd. The unpredictability of these wells means that production rates vary somewhat, Owen says.

Meridian isn't resting on its laurels, though. It plans to add 37 more wells to the 120 it's already drilled in 1989, bringing the company's total to more than 350 Fruitland wells.

It's no accident that Amoco and Meridian play starring roles in this region. Besides the fact that these companies already held much of this mature area's land by production, these wells take capital—lots of capital—first to drill and then to produce. Many believe it's a play for larger, well-financed companies. By the time the credit expires in 1991, Amoco alone will have invested about $350 million into its San Juan properties, Broussard says.

One cost problem lies in the unpredictability of the wells and the new technology required to drill them. "Everything you thought was a constant is a variable," explains Michael J. Bowen, vice president of Bowen-Edwards Associates Inc., Denver. The inverse production curve and high initial water production represent just a few of the obstacles that operators must deal with, he says.

But although expensive for the producer, these obstacles represent another plus for the Farmington economy. In drilling and completing, surface-equipment costs alone can run $200,000-$300,000, Bowen says. For example, the wells require separators, CO_2 scrubbers, pumping units and so on, most of it custom equipment.

Nevertheless, Bowen-Edwards, with 18 Fruitland wells to its credit, plans anywhere from 10 to 30 wells this year, with an ultimate goal of 100, Bowen says.

In some locations, rugged terrain requires roads, while operators also must construct water and gas gathering systems. For example, Houston-based McKenzie Methane Corp., which is just finishing its 35-well drilling program, experienced delays hooking up its wells because of water disposal problems, says Howard Dennis, vice president. Its shallow disposal well caused a furor among environmentalists, so the company is drilling some deeper Jurassic Entrada disposal wells.

Costs and complications aside, these wells continue to attract operators. And no wonder. Blackwood & Nichols Co. Ltd., Oklahoma City, drilled three wells that tested over 10 MMcfgd, says William Clark, operations manager in Durango, Colo. The company has drilled most of its 50-well program and plans a similar program next year.

So with results like that for encour-

agement, Richmond Petroleum Inc., Dallas, just entered the fray with a 33-well program. Of these, the company has drilled five. "We will go nonstop until we've drilled everything," says Mike Hogue, president and chief executive officer.

Marathon Oil Co., too, is considering the San Juan's coal-bed potential, with tentative plans for 13 to 19 wells next year, says Brent Lowery, Marathon reservoir engineer.

After 1991, there's no doubt that drilling will fall off, but many operators say they will continue to drill even without the tax credit. "We wouldn't have gotten involved in it had it not seemed economic without the tax credit," says Dennis of McKenzie Methane. Some operators also believe that Congress may extend the tax credit for a year or more longer.

Another possibility for future activity lies in plugging back conventional wells in the basin to the shallower coal zones to cut costs, says Jerry McHugh Jr., president of Nassau Resources Inc., Denver. Nassau is considering

San Juan Basin goes high tech

San Juan Basin producers can look for two new tools to keep them informed on basin activity. The first, a project by the New Mexico Oil Conservation Division, will provide a quick data summary of wells in the region.

The Division's Aztec District Office is computerizing its well records for San Juan, Rio Arriba, Sandoval and McKinley counties. When complete, the project will allow anyone with a personal computer and modem to access the records without coming into the office. The Division has already begun the process of transferring its card file system—containing up to 100 items of information for more than 18,000 wells—to an electronic data base, says Frank Chavez, district supervisor.

Chavez expects to have the data entered by the end of next summer, at which time walk-ins can use the program from the Division office. Soon afterwards, Chavez hopes to make it available via modem.

Also, in a paid service targeted exclusively at coal-seam drillers, Dwight's Energydata Inc., Richardson, Texas, is offering production reports on methane-gas wells in the San Juan and Piceance basins. Available in two formats, the reports give property descriptions and production figures for methane gas, water and condensate, plus cumulative production and test information.

No easy answers for coal seams

"This is such a strange play. All the old rules for drilling wells you have to throw out the window," says Jerry McHugh Jr., president of Nassau Resources Inc., Denver.

Most operators working with San Juan's Fruitland coal beds—found from the surface to about 4300 ft—would see that as a fair assessment. From completing to fracturing to producing, these wells take expertise and innovation. Fracturing, particularly, presents a problem for operators, but is critical for production, especially in a cased-hole completion.

"The No.1 problem, as compared to traditional or conventional wells, is a very high fluid loss of fracturing fluid into the coal beds," says Boddy McDaniel, research engineer with Halliburton Services, Duncan, Okla.

This arises because of the nature of the coal beds—a system with natural fractures intercepting one another horizontally and vertically, also called "cleats." While the purpose of stimulation is to connect the natural fractures to the wellbore, these same natural fractures also cause fluid to leak off, McDaniel says.

The coal beds are often very small—maybe only 1 to 3 ft thick—with multiple beds scattered throughout an interval. Yet operators must attempt to fracture these many small beds with one pumping operation. In this respect, coal beds resemble sandstone or carbonate formations, but the problems are more pronounced, McDaniel says.

The softness of the beds, referred to as a low modulus of elasticity, adds another challenge. Though this works in favor of the fracture, it gives operators another factor to consider.

In choosing a technique, "The thing to remember about these wells is there's no universal answers," McDaniel says, a refrain that one hears over and over here.

As with conventional wells, prefracture evaluation ranks as critical, according to a paper by John Ely, Stephen A. Holditch and Ronald H. Carter for the first Fruitland Formation coal bed conference in 1988. Engineers need data from core, log, and well test analyses, they say. Engineers also must know the thickness of the coal seams, the initial pressure, the desorption pressure and the permeability.

For the fracture itself, Halliburton and others generally prefer a borate crosslinked fracturing fluid, McDaniel says, injected at rates of 30 to 50 bbl/min and proppant concentration of 8 lb/gal or more. The viscous crosslinked gel helps lower costs by increasing the effectiveness of the operation, while the high injection rate works to counteract fluid loss. Fracturing accelerates dewatering and releases pressure, vital to making a well commercial. Therefore, lower pumping rates, while more economic, may result in a poor well due to insufficient proppant placement, McDaniel says.

For proppant, most operators find a 12/20 mesh sand to work best, he explains.

During treatment, some wells show abnormally high treating pressures, forcing premature termination of the job, McDaniel says. Halliburton handles this problem in several ways. In some areas, merely increasing the injection rate helps. For other wells, the problems must be solved by reperforating before the fracturing treatment, or perhaps injecting a small amount of hydrochloric acid ahead of the fracture job, McDaniel says.

plug-backs, probably after it completes its current 65-well program, he says.

Meanwhile, pipelines also see long-term potential here. Among projects in the planning stages:

- El Paso Natural Gas Co., El Paso, Texas, awaits FERC permission for a $23-million project to expand its San Juan pipeline capacity by 500 MMcfgd.
- Northwest Pipeline Corp. and Transwestern Pipeline Co. propose a 500-MMcfgd, 30-in. gas transmission line from Northwest's Ignacio treating plant located in Durango, Colo., to Transwestern's facilities at Thoreau, N.M.
- Arco Oil & Gas Co., Dallas, wants to convert its Four Corners crude oil pipeline to carry gas from its own 65 coal seam wells. Arco plans 100 wells total, says John Roam, Arco's coal degasification program director.

Projects like these imply that coalbed methane has opened to an enthusiastic audience and looks to be a long-running show. And if recent developments are any indication, the cast of players may grow as more operators audition for parts. □

Partaking of prosperity

Tom Dugan, right, of Dugan Production Corp., Farmington, and John Roe, manager of engineering, find that Farmington's economy is brisk enough to expand business.