THE AMERICAN OIL & GAS REPORTER
JUNE 2009
The "Better Business" Publication Serving the Exploration / Drilling / Production Industry

Beam Compression Revives Old Wells

By Robert R. Griffee,
Ernie Current
and Charlie McCoy

MIDLAND, TX.–With oil and gas prices on a downward slope, operators are searching for ways to increase production and cash flow on rod-pumped wells with an authorization for expenditure that returns the investment and produces a substantial return.

Seeking to revive an old lease located in the San Juan Basin south of Farmington, N.M., CrownQuest Operating LLC undertook a project to optimize production from four stripper wells by installing beam gas compression. This project took place on a lease known as the Old Roddy Production Jicarilla in the Apache Jicarilla Field.

As opposed to a conventional field compressor driven by a dedicated natural gas or electric engine, a beam gas compressor utilizes the action of the walking beam on the rod pumping unit as the prime mover. The objective at the Apache Jicarilla Field was to use energy already on location in the form of the pumping units to relieve back pressure on the producing Dakota formation.

Using the walking beam-operated gas compressor, CrownQuest Operating was able to more than double annual revenues and daily production, while reducing operating cost on the rod-pumped wells by drawing gas and gas pressure from the casing. This allowed the production equipment to pump fluid without the mechanical problems associated with gas interference in the pumping system.

As wells produce and natural reservoir drive decreases in time, bottom-hole pressure diminishes to the point where wells must be placed on artificial lift, with rod pump systems the most common. As bottom-hole pressure continues to decline, the surface back pressure required to operate the lease equipment and pass produced gas through the sales meter eventually becomes a greater percentage of the depleted bottom-hole pressure, requiring the operator to install some sort of back pressure relief.

Using the energy from the pumpjack as the prime mover, with the kinetic energy stored in the motion of the weights and rods compressing the gas, as the walking beam movement pumps the well, the beam compressor draws gas from the casing and discharges it into the flowline downstream from the pumping tee. The gas rejoins the tubing production and flows to the separator, and then on to the gas sales line. By installing a separate gas line, the operator can direct the compressed gas to field compression, a separator or to a meter.

The beam-operated compressor pulls into the bottom chamber of the cylinder through a suction check valve during the polish rod upstroke. At the same time, gas is compressed from the top chamber through a discharge check valve and into the flowline. During the polish rod downstroke, gas is pulled from the casing and into the top chamber through a second suction check valve, while at the same time, gas is compressed from the bottom chamber through a second discharge check valve and into the flowline.

Project Economics

CrownQuest's wells produce from the Dakota formation at an average depth of 7,200 feet. The wells were drilled in the late 1970s and early 1980s. As part of the cost of the project, necessary repairs were performed to the pumping units and the gas engines, and the costs associated with those repairs were considered part of the total project cost.

The flowlines in the field fluctuate between 68 and 90 psi. When the pressure is up, production typically is down. There were also some problems with associated gas interfering with the downhole pump. After installing the beam compressors, if the line pressure is up, pressure on the casing is still maintained close to 0 psi because the beam compressors pump the gas down the sales line. The end result is that the wells are no longer experiencing gas interference problems in the downhole pumps.

Using an oil price of $50 a barrel and a gas price of $3 an Mcf to calculate the economics of the project, CrownQuest Operating has achieved a total production increase equating to approximately $15,000 a month from the four wells. Using an average cost of $25,000 per beam-operated compressor installation for a total of $100,000 for all four wells (including all of the preinstallation repair work on the old pumpjacks), the project is expected to generate payout in seven months and a return on the investment that far exceeds 100 percent.

Looking at the project results, the Amerada Jicarilla No. 1 well increased oil production by 145 percent (from 3.5 to 8.5 bbl/d) and gas production by 40 percent (from 10 to 14 Mcf/d) after installing the beam-operated compressor. Oil and gas production from the Chacon Jicarilla Apache D No. 9 well increased by 87 and 17 percent, respectively, after installing beam gas compression. Daily oil production rates doubled on both the Chacon Jicarilla Apache D No. 109 and Chacon Jicarilla Apache D No. 6 wells, with gas increasing by 35 and 29 percent,

respectively.

Overall, daily production rates from all four wells increased from 11 to 23 barrels of oil (110 percent) and 68 to 86 Mcf of natural gas (26 percent). Again using a $50/bbl oil price and a $3/Mcf gas price, annual revenue from the four wells is up $219,000 from the increased oil production and $19,000 from the increased gas output since installing beam compression.

With its successful application of the technology at the Apache Jicarilla Field, CrownQuest now is evaluating the potential for using the beam gas compressors on some Fruitland Coal dewatering projects as part of its San Juan Basin coalbed methane operations.

Extending Asset Life

As this case study illustrates, beam compression is an excellent technological solution for extending the economic life of these types of mature and marginally economic producing assets, particularly in a low wellhead-price climate. Beam-operated compressors are easy to operate and maintain, and do not require an additional energy source to relieve the restricting back pressure on the productive formation.

The compressors can operate in all temperature environments and can be used with virtually any style of pumping unit. They utilize a clamping system to mount the units to the walking beam and pumping unit skid. The technology is designed to operate in corrosive environments as well as with wet and high-Btu gases.

The compressors are double-acting, meaning they compress gas in both the up and down motions of the pumping unit without affecting the counterbalance of the pumping unit. They are designed around the operator's criteria to take into account the desired casing pressure, line pressure and volume of gas, as well as the pumping unit size, strokes per minute, and time cycles or run times.

Shown here is one of the beam-operated gas compressor installations at CrownQuest Operating's Apache Jicarilla Field in the San Juan Basin.

Some operators are using beam-operated compressors to force low-pressure casinghead gas into the sales line, while others are finding that the technology is an economical solution to compress casinghead gas in fields where electricity is not available to operate conventional compression equipment.

The technology also can be configured as a low-cost, multiple-well casinghead gathering system. In this case, the size of the beam compressor is designed to compress the daily gas production from the lease at the desired casing pressure within the pumping unit's normal operating run time. The compressor is typically installed on a centrally located pumping unit, with the casing of the adjoining wells tied together and a trunk line plumbed to the casing of the well with the compressor unit to carry the gas from adjacent wells. ❐

ROBERT R. GRIFFEE *is the operations manager, northern region, for CrownQuest Operating LLC in Farmington, N.M. With operational experience throughout the United States and some international regions, he operates CrownQuest's production in the San Juan and Paradox Basins in New Mexico and Utah. Griffee holds a degree in petroleum engineering from Colorado School of Mines.*

ERNIE CURRENT *is a field production technician at CrownQuest Operating LLC in Farmington, N.M. With 27 years of experience in the San Juan Basin, his responsibilities include the Apache Jicarilla Field, where the beam-operated compressors were installed.*

CHARLIE McCOY *is president of Midland, Tx.-based Permian Production Equipment Inc., which manufactures the patented beam compressor. He is a member of the board of directors of the Permian Basin Petroleum Association, a director of the Permian Basin International Oil Show, and a past director of the Independent Petroleum Association of America. McCoy holds degrees in mechanical engineering and business administration from Louisiana Tech University.*