

THE AMERICAN OIL & GAS REPORTER®

JANUARY 2006

The "Better Business" Publication Serving the Exploration / Drilling / Production Industry

PCPs Prove Value At Anschutz Ranch

By Kamran Mirza,
Kevin Thomas
and Dave Erickson

ENON, OH.—Handling condensates in gas applications has long been a challenge to field operators, and there is an ongoing need to come up with innovative and cost-effective solutions as the production and operating conditions change.

In its primary phase, formation pressure is usually sufficient to move the fluids and smaller quantities of gas, but as wells age, fluid production can decline and greater amounts of gas are produced. As the well transitions to secondary and tertiary phases, the produced fluids may require a pump to facilitate fluid movement. The presence of higher volumes of gas further complicates the process.

Because of the low boiling point of condensates, even small changes in pressure or temperature can cause vaporization. When this happens, the inability of most pumps to handle the vapor causes cavitation that can result

in serious damage to pump components. Fortunately, the newest generations of progressive cavity pumps is designed to handle large volumes of gas and vapor, and are not affected by such changes.

Since natural gas consists primarily of methane, but also varying amounts of ethane, propane, butane, carbon dioxide and hydrogen sulfide, phase changes may occur for one or more constituents at different pressures and temperatures. Asphaltenes and waxes are almost always present in hydrocarbons extracted from oil and gas wells. The deposition of waxes and hydrates can cause major problems in pipelines.

Under certain conditions, gas condensates can lead to the formation of waxes. These waxes, which are in the form of crystals, can change the flow behavior from Newtonian to non-Newtonian flow. This not only significantly reduces pumping capacity, but also increases power consumption and associated operating costs.

The handling of gas condensates is a major problem that encompasses all aspects of pro-

duction and reservoir engineering. For operating companies, the challenges of handling condensates range from the difficulties of pumping them efficiently and cost effectively, to problems associated with wax and hydrate deposition in pipelines and formation damage. The solutions are rarely simple, and they are almost always expensive.

The conventional method of separation and compression requires complex systems and the costs are prohibitive. Compressors do not work well in such applications and require frequent maintenance. Adding chemicals to alter the properties and pour points of the different constituents of the condensates does not work reliably, and is an imprecise science at best. This limits the options to finding a suitable pump.

Cost-Effective Alternative

Progressive cavity pumps offer a cost-effective alternative, and are simple in construction. The key components consist of a single-helix metal rotor turning inside a double-helix elastomeric stator. The cavities thus formed, transport the fluid without shearing or emulsification. The sealing line between the rotor and stator separates each cavity, and handles solids, liquids, gases or any combination of the three with equal ease.

PCPs do not vapor lock and can handle a wide range of viscosities. The principle on which these pumps operate further facilitates their ability to handle slugs, thereby eliminating the need for slug catchers.

When the Anschutz Ranch Field in Evanston, Wy., was first developed, it had a natural pressure of more than 700 psi. The produced gas, water and other hydrocarbons were moved through the field pipelines by the existing formation pressure. The aging field has been operating for 20 years. Now owned by Merit Energy Company, it was formerly owned and operated by BP. Natural gas is trapped in the porous rock like water in a sponge. As the gas is removed, it is often accompanied by large quantities of ground water.

At Anschutz Ranch, natural field pressure gradually decreased to the point that it became necessary to use compressed air to push the natural gas and hydrocarbons out of the



The PCP pumps at the Anschutz Ranch Field handle natural gas condensates and produced water. All wetted metal parts are duplex stainless steel, and the pumps are equipped with a special dry-run protection device.

rock formation. Highly compressed air would be injected at one location in the formation. The air would then push the natural gas, hydrocarbons and water through the porous rock to the extraction points in producing wells.

At first the added production more than paid for the additional cost of large compressors and separating the air, water and natural gas. But as time went by, the economics of the field changed. As the natural gas in the field became further depleted, a significantly greater amount of compressed air was needed, and the air injection process was no longer feasible.

It became evident at this point that the compressed air was traveling through the more porous areas of the rock formation, where the natural gas had already been removed. Also, where the formation was less porous and contained large amounts of very high-quality gas, the compressed air was not effectively extracting the gas. If the injection of the compressed air into the formation were to be discontinued, the higher-quality gas would come out naturally, but the volume would be lower. It was determined, however, that the benefits of this high-quality natural gas would still offset the cost of operating the compressors.

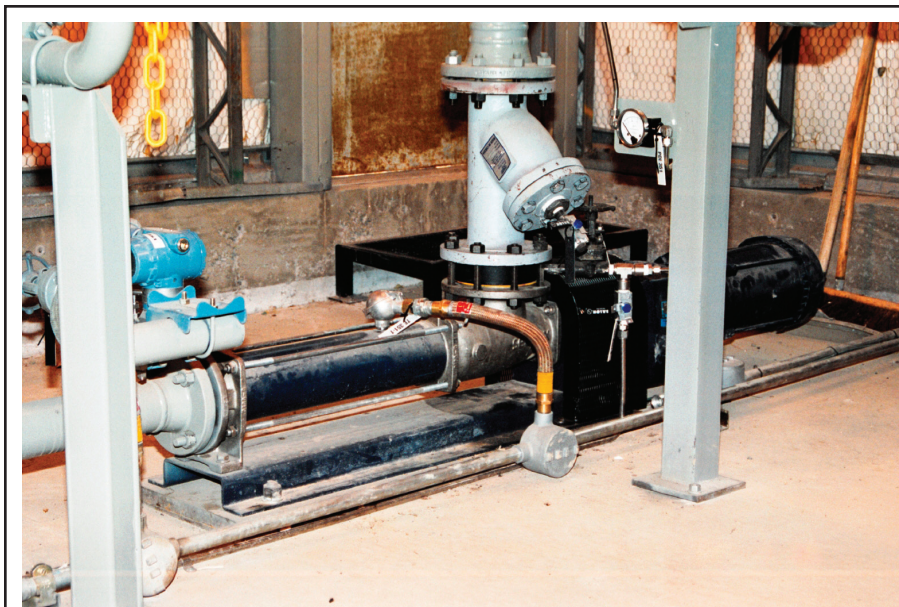
Unique Challenge

By 2000, Anschutz Ranch faced a unique challenge to improve production and keep the field profitable. Dropping the field pressure would mean that the gas, hydrocarbons and water mixture would need to be pumped across the field. This would require a unique pump that had to be:

- Highly efficient;
- Able to pump with a very low NPSHR in order to keep the light aromatics in a liquid form and avoid cavitating the pump;
- Tolerant of abrasive particles;
- Able to pump a wide range of viscosities;
- Economic to install, with low operating costs; and
- Constructed of materials resistant to corrosive produced brines.

During their investigation of various pump options, Merit Energy's management had heard that PCPs are versatile and easily adapt to pumping liquids, solids, gases or any combination thereof. In environments with large quantities of gas present, with the flow conditions and quantities of each phase continuously changing, they thought progressive cavity pumps would be the logical choice.

The pump that best met these requirements was a progressive cavity pump that had an NPSHR of less than seven feet (absolute pressure). The pumps are efficient to operate and economic to install. The only other pump design considered was a reciprocating pump that had a purchase price of almost four times that of the PCP system. □



Because of the success of this slug catcher pump, additional transfer pumps were purchased for production operations at Anschutz Ranch Field.

The progressive cavity pump system Merit Energy selected is designed to operate efficiently and reliably in a wide range of conditions encountered in the oil and gas industry. The materials, including Duktal-coated rotors and specially formulated fluoropolymer stators, provide long-term, trouble-free service with minimum maintenance. Of particular interest for the Anschutz Ranch Field was the ability to obtain pumps with all the wetted metal parts made of "duplex" stainless steels, including the mechanical seal.

The pumps feature a short, compact design with a directly flange-mounted drive, and for this application, there are equipped with a special dry running protection device. A 100 horsepower motor operates the pumps at 225 rpm for a target flow rate of 350 gallons a minute. Because of the field's high altitude, the motor rating had to be decreased.

In fact, the altitude at the Anschutz site is approximately 7,000 feet above sea level. Other pump designs would have required that they be placed at much lower levels due to NPSHR considerations. In the Rocky Mountain region of Wyoming, the added cost of blasting and excavating several feet of almost solid rock is phenomenal. Yet, this PCP system is able to operate with ease with high fluid vapor pressure and low atmospheric pressure.

Merit Energy is very satisfied with the performance of the PCPs. The pumps are now entering their fifth year of trouble-free operation, and the Anschutz Ranch Field continues to demonstrate how PCP systems incorporating optimized designs and advanced materials can offer cost-effective, value-adding solutions in demanding oil and gas industry applications. □

KAMRAN MIRZA is global market manager, energy systems, at seepex Inc. in Enon, Oh. He has 30 years of experience in progressive cavity pumps, starting his career as a project engineer developing power sections for drilling motors and downhole pumps for the oil and gas industry. Mirza developed the multiphase progressive cavity pump for Robbins & Myers, and previously served as director of engineering and manufacturing for the Dyna-Drill Division of Smith International, and as director of manufacturing for Baker Hughes Drilling Systems. He holds an M.S. in mechanical engineering from the University of New Mexico.

KEVIN THOMAS is district manager at seepex Inc., responsible for the Rocky Mountain states and South America. In addition to his work relating to progressive cavity pumps with seepex, he spent several years with EIMCO/Baker Process as a project manager. Thomas holds a B.S. in mechanical engineering and an M.B.A.

DAVE ERICKSON is plant foreman at Dallas-based Merit Energy Company. He has worked in the oil and gas industry his entire professional career, and has served as plant foreman at his present location for 27 years.

seepex.com
all things flow

511 Speedway Drive • Enon, OH 45323

Tel: 937-864-7150, ext. 117 • Fax: 937-864-7157

www.seepex.com