AN UNCOMMON PRODUCTION TECHNIQUE IS REAWAKENING CENTRAL OKLAHOMA’S SLUMBERING OIL PATCH. IN 1995, GEOLOGIST AND OKLAHOMA NATIVE DAVID CHERNICKY BEGAN WORKING IN LINCOLN COUNTY’S CARNEY FIELD. THE 4,800-ACRE ACCUMULATION HAD BEEN SPORADICALLY DRILLED DURING THE YEARS, WITH 31 WELLS REACHING THE SILURIAN HUNTON LIME AT DEPTHS OF ABOUT 4,900 FEET. PRODUCTION LEVELS WERE LACKLUSTRE, HOWEVER, TOTALING JUST 37,000 BARRELS OF OIL AND LESS THAN HALF A BILLION CUBIC FEET (BCF) OF GAS DURING A THREE-DECADE SPAN. THE PROBLEM, AS IN MANY OF THE HUNTON FIELDS ON THE CHEROKEE PLATFORM, WAS VERY HIGH WATER CUT.

Chernicky, president of Chernico Exploration, had an unconventional approach. He believed that high-volume submersible pumps could dramatically improve production from the Hunton reservoir. Sustained water production at very high rates would eventually dewater the reservoir, increasing oil and gas yields. "I first saw the technique being used by Ames Oil & Gas in 1979 in northeast Oklahoma’s Pawnee Lake Red Fork Field. It really opened my eyes."

Chernicky was intrigued enough to later try the dewatering technique in Lincoln County, in Mount Vernon Red Fork Field. He was responsible for an 80-well project that proved the concept was feasible. He then decided to test the method on the deeper Hunton interval in nearby Carney Field.

"Early on, I saw evidence that the Hunton in the Carney area might be a candidate for dewatering. But, the main reason I started working there is that it was only four miles away from..."
my existing Redfork project. It was essentially an experiment that just kept expanding.”

The results were so encouraging that Chernicky decided to embark on a full-scale development. At the time, he was working as director of exploration for Altex Resources Inc. Then, in 1998, along with partners John F. Special and Chris McCutchen, he formed New Dominion LLC, which is headquartered in Stillwater. The companies remain alliance partners, essentially marching together in the Hunton play.

In less than two years, New Dominion drilled or reentered 28 Hunton wells and developed recoverable reserves of 2.2 million barrels of oil and 16.2 Bcf of gas at Carney. By June 2000, daily production from its project area was more than 2,000 barrels of oil and 12 million cubic feet of gas.

Today, New Dominion operates more than 140 Hunton wells and produces 4,000 to 5,000 barrels of oil and 35- to 40 million cubic feet per day. This year, the company has already drilled or recompleted 20 Hunton wells and plans another 20. Altex, working with Chernicky’s guidance, also has a commanding presence in the play. That firm produces about 3,000 barrels of oil and 20 million cubic feet of gas per day, and it expects to drill or recomplete as many as 70 wells in 2001.

Presently, more than 250 wells are active in the Hunton dewatering play, producing an aggregate of about 11,000 barrels of oil and 70 million cubic feet of gas per day, estimates Chernicky. Recoverable reserves of more than 15 million barrels of oil have been established in the greater Carney area alone.

“The Hunton activity has been an unbelievable shot in the arm to central Oklahoma. Tax revenues are up, royalty checks are arriving in owners’ mailboxes, and trucks are moving up and down the highway.”

**Retrograde oil cut**

What’s so intriguing about the Hunton play is that it is much more than simple high-water-cut production. After the high-volume pumps have been placed on a group of wells, the over-

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**THE NUTS AND BOLTS**

A successful Hunton dewatering project requires several crucial elements, explains David Chernicky, co-founder and exploration director of New Dominion LLC, based in Stillwater, Oklahoma.

First, picking the correct type of reservoir is essential. A high-water-saturation, solution-gas reservoir with bimodal porosity is the ideal candidate. A detailed geologic assessment can identify the most promising areas.

Given that, operators must have access to abundant and economic electrical power to run the submersible pumps; they must also have an extensive and economic water disposal system capable of handling many thousands of barrels of water per day. A high-volume gas gathering and processing system is also necessary, and often that piece of the infrastructure has to be added from scratch.

Too, a number of wells are needed to effectively dewater an area. As in a traditional waterflood, the wells are drilled in a pattern of overlapping circles.

Dewatering requires substantial infrastructure and heavy up-front investments, Chernicky notes. Although the projects are often set up in areas that previously produced from the Hunton, Chernicky usually drills new wells.

“We use existing wells in less than 5% of the cases. Oftentimes, the old well was plugged and abandoned, or was used for disposal. About 10% of our production comes out of recompleted wells, but those wells account for probably 60% of our production problems.”

Indeed, operations have to be run by top field hands, as the production process continually presents complex challenges.

Chernicky estimates a typical Hunton dewatering project will produce at economic levels for five to 10 years. These are shorter-lived than more conventional reservoirs because the fluids are being pulled at much higher rates, compressing the productive life.

“IT’s a niche play that requires considerable work.”
all fluid volume declines and the percentage of oil and gas to fluid produced actually begins to rise.

The formation behaves somewhat like a coalbed methane reservoir. The water injection process lowers reservoir pressure and allows the oil and gas stored in the tighter portion of the reservoir to bleed into the wellbore.

Indeed, the mechanism for the dewatering technique appears to be relative permeability. In Carney and nearby fields, the Hunton exhibits two types of porosity—matrix porosity, with small pore throats and discontinuous compartments, and secondary porosity, characterized by large pore throats, vugs and fractures.

Water is carried in the higher permeability and porosity streaks. Aggressive production of the reservoir, which easily flows thousands of barrels of water per day, eventually drops the reservoir pressure enough so that gas expansion can push the oil residing in the tighter matrix into the wellbore.

"On a rod pump, it would take years to lower the pressure in the fractures and high perm streaks enough to allow the bulk of the oil in the matrix to flow into the wellbore," says Kurt Rottman, an Oklahoma City consulting geologist who has studied the play extensively. "The high-volume pumps allow a pressure differential to extend far enough into the reservoir so that the oil trapped in the lower porosity zones can be produced."

The process was so successful that one well in Carney Field that was initially completed with an oil cut of less than 1% was producing at 25% oil cut after 18 months. Two wells on one lease, operated by Altex, produced 277,000 barrels of oil and 624 million cubic feet of gas during a 48-month period. From August 1997 through January 2000, Hunton wells in the Carney area produced 3.1 million barrels of oil and 9.2 Bcf of gas.

An expanding play

The successes at Carney have caused a great many companies to closely examine the peculiar play. Unquestionably, the Hunton could hold sizeable potential, as it covers more than 2.2 million acres in central and western Oklahoma.

Further, the Hunton may be just the tip of the iceberg. The technique could work in any reservoir that has similar characteristics to the Hunton, notes Rottman. "Dewatering has the potential to revitalize many older areas, and operators need to be aware of the technique."

New activity is now focused in the Hunton trend in Seminole, Okfuskee, Okmulgee and Hughes counties. Operators have been testing the dewatering technique at various places, mainly in and around old Hunton producers. With their leaseholds largely in hand, players are highgrading these areas based on recent drilling efforts. More than fifteen operators, mainly from Texas and Oklahoma, are active in the play. New Dominion and Altex have been joined by companies including Marjo Operating, Buckeye Petroleum, Elder Operating, Ricks Exploration, Parsons Engineering, Montgomery Exploration, Belco Oil & Gas, Lance Ruffel Oil & Gas Corp., and Carmac Energy Corp.

Some extensions of the Hunton have been more successful than others, notes Chernicky. "The Hunton production is probably about 90% stratigraphically controlled and 10% structurally controlled. There are many stratigraphic changes that affect the quality of production as you move from one area to the next."

Sound geology is the premier requirement for operators looking at Hunton dewatering projects—the correct location is everything. "There are reservoir limits to the play, and those are still being determined," says Rottman. "You must demonstrate oil saturation in the reservoir that is sufficient to be economic."

Dallas-based Western Petroleum Resources Inc. is one firm that seeks to expand the play. The private company is participating in the St. Annes Project in Seminole County, says president Keith Griffitts. Ricks Exploration and B&W Exploration, both of Oklahoma City, operate the venture.

The companies assembled a 2,000-acre leasehold and started drilling in November 2000. Like others, they looked for an area with previous Hunton penetrations that could be deepened, recompleted or twinned. Records from old wells with high water production rates and oil and gas shows were analyzed to pinpoint the desirable prospects. Some were drilled as far back as the 1950s; many date from the '70s and '80s.

To date, the partners have completed four new 4,500-foot wells, recompleted four existing wells, and built necessary infrastructure including disposal wells. New wells are completed with seven-inch casing, because of the large volumes of fluid that will be produced, and the 100-foot-thick Hunton is perforated at one shot per foot. Costs per well run about $550,000, and they are drilled on 160-acre spacing.

Dewatering is considered successful when fluid volumes have declined to the point that operators can switch from the submersible pumps, which consume $4,000 to $5,000 per month apiece in electricity costs, to the far more economical standard-beam pumps. The wells should then continue to make 100 to 350 barrels of fluid per day; in time, the water, oil and gas volumes will gradually decline.

The water is disposed in the Wilcox or Arbuckle intervals beneath the Hunton. A 6,800-foot disposal well costs about $90,000 more than a producer, because it is deeper and requires larger tubing and casing strings.

Griffitts is optimistic about the project. "In the past, operators either produced the Hunton briefly, or many times never produced it at all because of the water volumes. There is a large reservoir of oil and gas that lies untouched in this formation."