



TAMING THE LOBO

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Technical improvements in seismic interpretation and fracture design have turned the Lobo Trend from a marginal play to a strong moneymaker. Major technological breakthroughs in seismic interpretation and fracture stimulation designs have provided invaluable tools to gas producers trying to develop gas reserves more efficiently. One of the most visible beneficiaries of those improvements is the geo-pressured Lobo Wilcox Trend in South Texas.

Laredo Energy is actively involved in the acquisition and development of natural properties in South Texas. Currently the company has part or full interest in 7,500 acres in the Lobo and is actively seeking more properties to acquire

Discovered in 1973, the Lobo is one of the largest gas-producing regions in the United States. Extending throughout Webb County and into Zapata County, this play has produced more than 6.4 Tcf gas equivalent from more than 4,200 completions. The hallmark of Lobo geology is the complexity caused by high-density faulting, a regional unconformity and multiple localized unconformities. Further adding to the complexity is the fact that some of the faulting does not extend through the regional unconformity. Operators typically find the Lobo sand package between 8,000 ft and 13,500 ft, with a fault-block size averaging 60 acres and a net pay thickness from 50 to 150 ft.

The Lobo sands generally are recognized as tight gas sands with permeabilities ranging from 0.1 md to 10 md. The sands require fracture stimulation to produce at economic rates. A typical well initially produces at 2 MMcfd of gas or greater with a decline of about 60% during the first two years. At that time, the production, about 800 Mcfd of gas, will begin a much shallower decline rate of 10% to 15% for the remaining life of the well. This hyperbolic profile of production is typical for tight gas sands. Therefore, it is clear that improving the geologic interpretations and the reservoir stimulations is paramount to this trend's success.

In the early development of the Lobo, geologists relied heavily on 2-D seismic and well control to pick well locations. Neither method was sophisticated enough to image the complex faulting that had occurred in the area. Most operators viewed this area from a statistical point of view, assuming that because the area was so faulted, each well would penetrate a new fault block and drainage would not be a concern. Early studies yielded average ultimate recoveries of 1.5 Bcf of gas per well with a 70% success rate.

During the early development of the Lobo, the fracture stimulation was also far from adequate. The frac designs at that time were only using conventional sand proppants in low concentrations due to the frac fluid's inability to carry more proppant into the fractures. Many jobs were massive in overall pounds of sand pumped. However, this type of proppant and concentrations pumped resulted in basically ineffective fracture systems due to crushing or imbedment.

3-D Seismic Contribution

The major component of geologic risk in the Lobo is the complex faulting that often hides or removes pay intervals. As a result, operators frequently could not detect faults occurring at a relatively oblique angle to a 2-D seismic line. If they couldn't detect and map the faults, they ran the risk of a wellbore with completely or partially missing pay zones. The application of 3-D seismic technology enabled geologists, geophysicists and engineers to be more precise in their location selections. While 3-D seismic has been viewed by some as an industry panacea, the reality remains that its use is still highly interpretive. As with any tool, seismic success rests on the operator using it.

The Laredo Energy team of Lobo geologists, geophysicists and engineers has working knowledge of more than 1,000 wells in the area and has developed an extensive database throughout the trend. Since they know the territory, the geologists can more clearly visualize the faulting and deposition. They have found that the fault block sizes vary widely, ranging from less than 60 acres to more than 500 acres. This realization helps exploitation in two ways. For the larger reservoirs, engineers can assist the geologists in strategically placing the necessary number of wells to properly drain the reservoir.

In areas of complex faulting and smaller reservoirs, they can pick locations that haven't been drained by existing wells. Deposition also is defined more clearly, enabling geologists to pick locations that maximize sand thickness, resulting in higher ultimate recoveries. Similarly, through the use of 3-D seismic, the geologists began to see subtle changes in the reservoir from one area to another. Certain sands produce better in one area than in another. Some may not even require stimulation. In short, 3-D seismic has greatly improved understanding of the Lobo geology.

Frac Enhancement

Coinciding with the seismic technology surge, fracture stimulation techniques improved dramatically. Probably the biggest factor for frac enhancement was the development of frac fluids that could carry larger concentrations of proppants. Cross-linked gel systems can now carry concentrations of 10 to 12 lb of proppant per gallon of fluid. Couple this with improved proppant strengths, resin-coated sands, ceramics and bauxite proppants, and the new techniques minimize crushing and imbedment problems. This allows much greater conductivity, which means better flow rates and higher ultimate recoveries. With fault blocks characterized more accurately, the frac job sizes also can be sized more economically. In areas where depletion has occurred, or reservoir quality is not the best, gas assist fluid systems (foams) help clean up fractures quicker and leave less

fluid in the formation. Hence, the fracs of today have allowed the Lobo to be even more profitable.

Looking to the Future

The net result of the applications of 3-D seismic technology and fracture stimulation enhancements is the ability to manage assets more effectively.

With gas prices around \$2/Mcf, the Lobo still remains a profitable play, with the average cost to drill and complete a well around \$1.1 million (in 2000). Laredo Energy's team of geologists and geophysicists, using their knowledge of the reservoir and fault blocks, are unraveling the geological complexities of the Lobo, and they are placing a greater emphasis on the reservoir engineering aspects of the play. Sound engineering with quality geology should result in a profitable operation.