

# THE AMERICAN OIL & GAS REPORTER<sup>®</sup>

APRIL 2014

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

## Drilling Technology

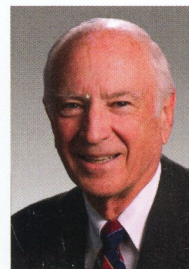
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### Townes Pressler Chairman TAEP

"The idea that seismic activity could be related to or aggravated by injection is one that definitely needs to be studied."

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### Vicki Griffith President TOGA

"We really thought the new fracturing rules would quiet the opposition, but we had to beat another bill this year that would have banned fracturing."

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# Independents Find Gulf Coast Success

By Al Pickett  
Special Correspondent

This may be a “make or break” year for the Tuscaloosa Marine Shale, a 2.5-million acre play that stretches across the middle of Louisiana into southwestern Mississippi, according to Kirk Barrell.

The president and founder of Amelia Resources—a nonoperating partner in the TMS play—says he has been working the Tuscaloosa Trend for the past 23 years, including five with Amoco Production Co. He also writes a blog—tuscaloosa-trend.blogspot.com—that chronicles drilling activities and other news in the region.

“The Tuscaloosa Marine Shale has been slower than most (of the nation’s other shale plays) to develop because of its depth,” Barrell states. “There were some misperceptions early on. It was thought the clay content was too high and the total organic content was too low. People also were afraid hydraulic fracturing would penetrate the wet Tuscaloosa sands that lie below the TMS. Initial wells have cost more than \$15.0 million with a target of \$13.1 million. Operators are targeting \$10.0 million for development.”

However, operators have since proven that the clay is not too high and the TOC is not too low, Barrell goes on, and have proven the TMS can be hydraulically fractured without penetrating wet sands.

“Cost is the final hurdle,” he says. “With companies targeting costs in the sub-\$11 million range per well, this is a make or break year to prove that and repeatability. Pad drilling will save another \$1 million.”

## Attain Repeatability

Jeff Balmer is not willing to call 2014 a make-or-break year, but he says he knows it is an important year as the TMS play expands. “We are focusing on repeatability,” says Balmer, vice president of exploration-emerging plays for Encana Oil & Gas Inc. “So it is an important year, absolutely.”

Encana and Goodrich Petroleum have been the leaders in early development of the Tuscaloosa Marine Shale.

“It will be the combination of what Encana and Goodrich are doing, plus the new players such as Sanchez Energy, Halcón Resources Corp. and Comstock

Resources, that will give us our first full dataset,” Balmer poses. “We will be able to compare apples to apples. If it works, it will be great, but there are still some operational issues.”

It was reported in March that Halcón Resources had acquired 95 percent of Encana’s TMS leases in East and West Feliciana parishes, La., and in Wilkinson County, Ms., a deal that includes at least 100,000 acres. Encana has more than 300,000 acres prospective to the Tuscaloosa Marine Shale.

“The industry will drill 50-60 wells this year,” predicts Robert Turnham, president and chief operating officer for Goodrich. “This year will help us understand if it is consistent. We will prove up one area and then step out and delineate another.”

Barrell says the Tuscaloosa Marine Shale, which covers 2.5 million acres across Louisiana and southwestern Mississippi, ranges from 11,000 to 15,500 feet deep, making it deeper, and more expensive, than many other shale plays. Some companies have drilled laterals as long as 8,000 feet, too, meaning total measured depth can be as much as 20,000 feet in some TMS wells.

“There have been 34 (horizontal) completions (in the TMS) so far,” Barrell counted in mid-March, “so this play still is very much in its infancy. But I believe it will be commercially viable. It is in the same geologic range as the Eagle Ford and Eaglebine shales.”

He reports estimated ultimate recoveries range from 400,000 to 800,000 barrels a well. TMS wells are producing 94 percent oil with gas-to-oil ratios ranging from 300 to 1,000, which is why Barrell says he believes the play is so attractive. The TMS lies above the Tuscaloosa Sand, which he says has produced significant amounts of oil since the 1960s. The deeper Tuscaloosa sands, at 16,000-24,000 feet deep, have produced prolifically in the past, too, according Barrell, producing 3.5 trillion cubic feet equivalent.

Barrell says Amelia Resources became involved in the TMS in 2006 when it commenced evaluating the play. In early 2011, it partnered with Encana Oil & Gas to acquire 60,000 acres. Then in July 2011, Amelia assembled 46,000 acres with Graves Oil & Gas. “We assisted in building blocks of acreage and retained an overriding royalty,” he relates. “In the past year, we also have assisted parties with selling acreage. We still have 140,000 net acres we are marketing.”

## Hybrid Fractures

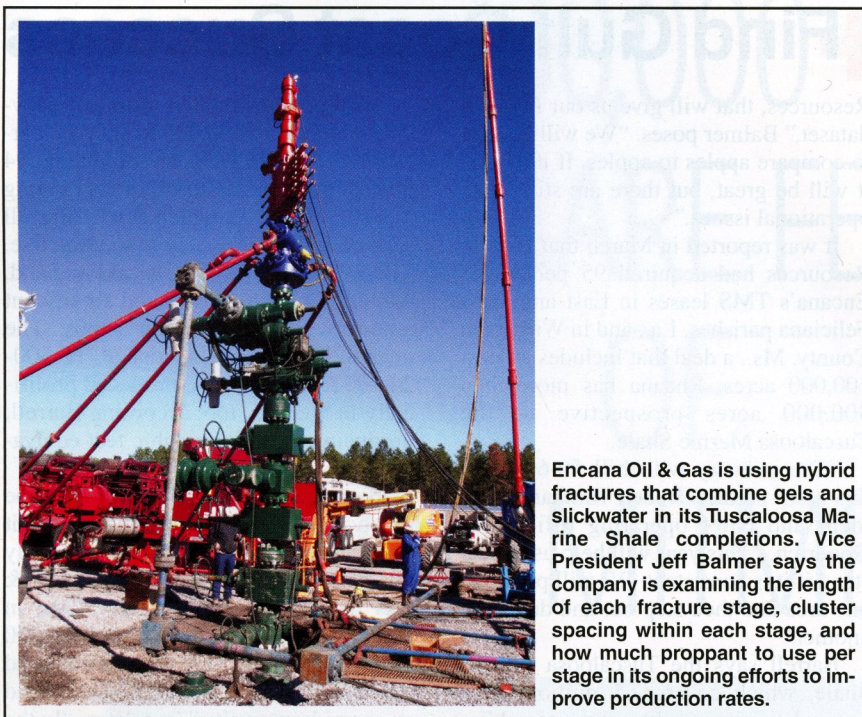
Balmer says Encana entered the Tuscaloosa Marine Shale, which it now considers one of its five core areas in North America, in 2011 with the acquisition of Denbury Resources’ assets. “We brought some wells on in 2012, which gave us our entry into the play,” he recalls.

“We have two rigs running and 12



Encana Oil & Gas Inc. considers the Tuscaloosa Marine Shale one its five core areas in North America. As of mid-March, the company had two rigs running and 12 producing wells in the TMS, and expected to drill nine to 12 wells this year in the play.





Encana Oil & Gas is using hybrid fractures that combine gels and slickwater in its Tuscaloosa Marine Shale completions. Vice President Jeff Balmer says the company is examining the length of each fracture stage, cluster spacing within each stage, and how much proppant to use per stage in its ongoing efforts to improve production rates.

wells producing,” Balmer reported in mid-March. “We are completing our first well for 2014, the Lawson No. 25H01, and we are drilling a couple more.”

He says Encana expects to drill nine to 12 wells in the TMS this year, and will participate in several others. Encana has more than 300,000 acres prospective to the TMS, primarily in St. Helena and East Feliciana parishes in Louisiana, and Amite and Wilkinson counties in Mississippi. Once acreage was secured, Balmer says Encana and the other companies in the play have been cooperating with each other to determine the best completion methods.

“Encana has done a series of investigations on completions,” he points out. “We learned that slickwater fracs didn’t work. The TMS has fairly low permeability and a strong natural fracture system. We discovered that proppant is the key thing we can put in the ground.”

So, he says, Encana is using hybrid fracs instead: a combination of gels and slickwater.

“The gels transport proppant into the formation better,” Balmer contends. “We also are looking at stage spacing (the length of each stage) and cluster spacing within each stage. How much proppant we use per stage has a significant impact on production.”

Once Encana went to hybrid fracs, Balmer says its TMS wells began expe-

riencing initial production rates of more than 1,000 barrels a day. “We would love to see wells with 30-day IP rates of 850-1,000 bbl/d,” he adds.

Balmer notes Encana “shoots for 7,100-foot laterals.” He calls the TMS “operationally challenging” because it is deeper and high pressured. “It can be operationally challenging when you add stratigraphic sequences,” he details. “We brought in two rigs, but we are not starting from scratch by poking holes in the ground. Encana is very good at getting better and better.”

Current well costs are \$13 million as Encana drills in a variety of places to delineate its acreage, but Balmer says he believes costs will come down as Encana begins pad drilling and doing simultaneous fracs. He also praises the commitment to the oil and gas industry by state governments in Mississippi and Louisiana, including a severance tax abatement in Mississippi.

### Eagle Ford Comparison

The Tuscaloosa Marine Shale is the same geologic age as the prolific Eagle Ford Shale in South Texas, according to Goodrich Petroleum’s Turnham, who notes Goodrich operates in both.

“We are in the oil window of the Eagle Ford, which is 85 percent black crude,” he states. “The TMS is 92-96 percent oil. It is deeper, at 10,000-15,000

feet true vertical depth, but it is high oil content. We are performing similar frac jobs, although we use more proppant in the TMS because it is overpressured. The TMS has a self-contained interval, which is a good frac interval. It is pressured up with natural fractures. If you cut the fractures, you make oil and gas while you are drilling. That is unusual.”

Turnham notes the Lower Tuscaloosa was a conventional sand play, and Goodrich has 1,200 vertical wells on its acreage, giving the company plenty of subsurface well control.

“The TMS was the source rock for the Lower Tuscaloosa Sand,” he says. “Over time, a seal developed. The TMS is actually a combination of shale, sand and silt. In some places, it is a highly laminated true shale. That and the vertical fractures are creating the higher early production.”

Turnham says Goodrich began putting its TMS acreage together a couple years ago, acquiring 135,000 acres by buying out five operators who had been drilling vertical wells in the Tuscaloosa Sand as well as the lower Wilcox formation. Goodrich now has a little more than 300,000 acres.

“Most of our acreage is in Mississippi (Wilkinson and Amite counties), which is the updip,” he reveals. “We wanted to be in the oil window, like the Eagle Ford. It turns out it is all oil. We have drilled as deep as 14,500 feet, which has a little more gas. But it really is unique to be at that depth and still be in the oil window. We think it is because (the TMS) is self-contained. The resource is there.”

### Making It Profitable

Early wells cost more than \$13 million each, according to Turnham, who says Goodrich has “pretty much resolved its drilling issues.” Drilling in the highly fractured lower portion of the TMS caused what he calls a “rubbleized” zone that would fall in on the wellbore when the bit was removed. He says the company has solved that problem.

“Knocking that \$13 million down to \$10 million is a high probability,” he forecasts. “I think there will be 50-60 wells drilled industrywide in 2014. With increased activity, the service companies will become more competitive. Pad drilling and becoming more efficient can cut 10 days off drilling times. We knocked \$3.8 million off our initial cost in the Eagle Ford.”





Goodrich has three rigs operating in the play, but Turnham says he expects that number to increase to five rigs by the third quarter. He says the company drilled or participated in 10 wells in 2013, but if it executes its plan, that number will grow to 33 or 34 wells this year.

Goodrich's most productive well to date is its Crosby well in Wilkinson County, Ms., which had a 24-hour IP of 300 barrels and a 30-day IP rate of 150 bbl/d. "It made 160,000 barrels in the first 11 months," he adds.

The company's early wells have been highly profitable, too, Turnham reveals, because the company is getting light, sweet pricing, less \$2. This means it has been receiving \$100 a barrel most of the time. He says the royalty burden is less in that region, too, averaging 18.5 percent. He also praises the severance tax abatements offered by Mississippi and Louisiana.

"We are targeting 6,000-foot laterals," Turnham continues. "If everything is going well, we will go longer. We are doing 25 frac stages, which means spacing is about 270 feet a stage."

Turnham laughs when he considers the skeptics who claimed the TMS wouldn't work. "In 2005, we were drilling vertical wells in the Cotton Valley in East Texas," he recalls. "We started drilling horizontal wells and people said we couldn't do that. Then we were early in the Haynesville Shale, and people said we wouldn't get 7 billion cubic feet. Then we started drilling in the oil window of the Eagle Ford, and people said oil wouldn't flow through shale."

"Everyone has always known there was oil in the TMS, but the knock was its high clay content," Turnham continues. "People couldn't believe you were drilling in the TMS with that clay content. I would ask, 'Have you looked at the data?' The portion of the clay that swells is very low. There have been no negative effects because of clay. We worked through all the geologic issues. No one questions the resource is there; now the question is repeatability."

Even at \$13 million a well, Turnham claims Goodrich can make a 28-57 percent rate of return in the TMS. He contends EURs will be 600,000-800,000 barrels a well in the play.

### Moving In

Houston-based Halcón Resources is one of the new players moving into the

Tuscaloosa Marine Shale play. Even before the reported deal with Encana, Halcón had announced it had established the TMS as a third core area and would spend 10 percent of its 2014 drilling and completion budget there.

Chief Operating Officer Charles E. Cusack III says Halcón also is active in the Bakken Shale in North Dakota and what it calls "El Halcón" in Brazos and Burleson counties near College Station, Tx., a new Eagle Ford Shale core area on the east side of the San Marcos Arch that was deposited at the same time.

Cusack describes the TMS as "the Eagle Ford Shale, but with a different name. It is the same rock and the same deposits."

Halcón has 307,000 net acres and moved two rigs into the play this spring. Cusack says 77 percent of the company's acreage is located in southwestern Mississippi and the eight parishes in southeastern Louisiana known as the Florida Parishes, which it is calling the "eastern TMS."

Halcón has drilled two wells on its legacy acreage on the western side of the play, but the well that it spudded in March in Wilkinson County, Ms., will be its first in the eastern TMS, according to Cusack, who says the company plans to drill 10-12 gross operated wells this year. "That number will be results driven," he acknowledges. "We are very fortunate to

have acquired a premier position in the play."

Cusack says Halcón's acreage in the eastern TMS is in a well-defined core, since it includes more than 300 penetrations from older wells. He lauds Encana and Goodrich as the leaders in the play and says they have been helpful in developing the best completion techniques.

"One of the keys is avoiding trouble," he states. "There is only a limited sweet spot to drill within the interval."

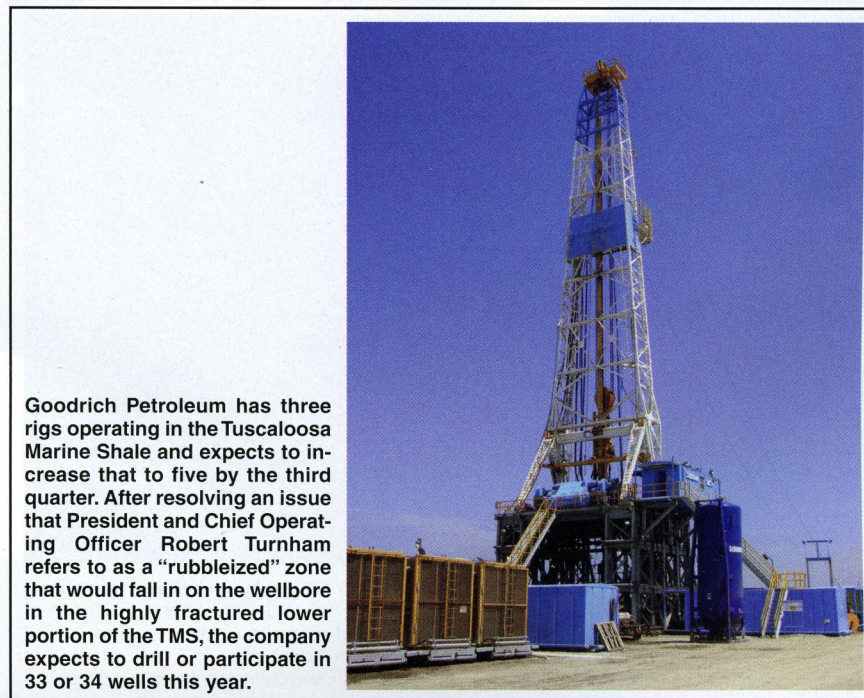
Although well costs start at \$13 million, Cusack says he believes that number will come down with consistency. "We have first-class Flex rigs and experienced crews that have worked in Brazos County (in the Eagle Ford)," he explains, adding that the company expects to see the same rapid improvement it realized there.

Halcón's target is 7,200-foot laterals, according to Cusack, with 24-28 frac stages, meaning each frac stage is approximately 300 feet.

### Buda Limestone

Dallas-based Gulf Coast Western LLC has joined Everest Resource Co., Vistar Oil Texas, BlackBrush Oil and Gas LP, and others as companies that have started horizontal drilling programs in the Buda Limestone, which lies just below the prolific Eagle Ford Shale in South Texas.

Matthew H. Fleeger, chief executive officer of Gulf Coast Western, says his



Goodrich Petroleum has three rigs operating in the Tuscaloosa Marine Shale and expects to increase that to five by the third quarter. After resolving an issue that President and Chief Operating Officer Robert Turnham refers to as a "rubbleized" zone that would fall in on the wellbore in the highly fractured lower portion of the TMS, the company expects to drill or participate in 33 or 34 wells this year.





company has acquired 3,500 acres in Wilson County, Tx., which is 20 miles southeast of San Antonio. This is an area that has seen activity not only in the Eagle Ford Shale, but also historical vertical drilling in the Buda Limestone and horizontal drilling in the shallower Austin Chalk formation.

"This area has been heavily drilled vertically in the Buda for years, and is not far from where a couple hundred Austin Chalk wells were drilled (in the early 1990s)," observes Rod Einspanier, the generating geologist with EINC Energy Inc., which put together the Wilson County deal for Gulf Coast Western.

He calls the revitalization of the Buda Limestone "a technology-driven play" that was overlooked by those drilling in the Austin Chalk.

"We are going back into a proven vertical area," Einspanier explains. "But we now have advanced capability with a gamma ray tool behind the drill bit that keeps the drill path in the sweet spot."

Like the Austin Chalk formation, Einspanier says the Buda Limestone is naturally fractured, which means it will be less expensive to drill.

Fleeger says he believes the cost to drill Buda Limestone wells will be 60-70 percent less than Eagle Ford wells because the Buda wells won't have to be hydraulically fractured.

Says Einspanier, "A lot of shale wells

are so tight, it is like throwing a baseball against a pane of glass to smash it. In the Buda, the fractures are there already. We had only a 10-foot window in the Austin Chalk and didn't have the ability to keep the wellbore in a specific range. In our acreage in Wilson County, we have a zone that is 60-90 feet thick, and we have the ability to know exactly where we are."

He adds that there is a lot of Eagle Ford activity south of Gulf Coast Western's acreage in Wilson County, but says there is a regional fault and the Eagle Ford thins to the north of the fault, making the Buda Limestone an attractive target.

"The horizontal wells producing in this area are experiencing impressive rates up to 500-1,000 bbl/d oil, which has spurred significant interest in drilling," Fleeger offers.

He says Gulf Coast Western will be a nonoperating partner after putting the deal together and will use San Antonio-based Kaler Energy Corporation—an experienced South Texas driller—as the operator. Drilling was scheduled to begin in March, and Fleeger says the partners plan to drill six-eight wells this year.

"We are very confident in what we have seen," he concludes. "We think we will get good results."

### Bonanza And Orange Dome

Gulf Coast Western has been expanding aggressively in recent months. It has se-

cured more than 40,000 acres in South Louisiana and began a 3-D seismic survey of the area it calls its Bonanza project. Fleeger says the seismic will provide detailed data on acreage in Evangeline and St. Landry parishes that includes the Upper Wilcox, Lower Wilcox, Cockfield, Sparta and Frio formations.

"It will be primarily directional drilling because this area has extensive faulting," he comments. "We expect to start drilling in the fourth quarter. This area has a large number of formations—all potential pays."

Fleeger says Gulf Coast Western started putting its acreage together in the Bonanza project in 2012, but decided it couldn't pass up the Buda Limestone opportunity when Einspanier brought the deal to the company. "We knew we needed to act quickly on that," he explains.

Now, the company is moving forward aggressively with both its projects. The 3-D seismic acquisition on its Bonanza project is under way and processing is expected to be completed in the second quarter.

"There has been significant development in this area in the past 10 years resulting from 3-D surveys," he relates. "Ours is one of the last large acreage positions in the area that has not been surveyed and, consequently, does not have 3-D data available for evaluation."

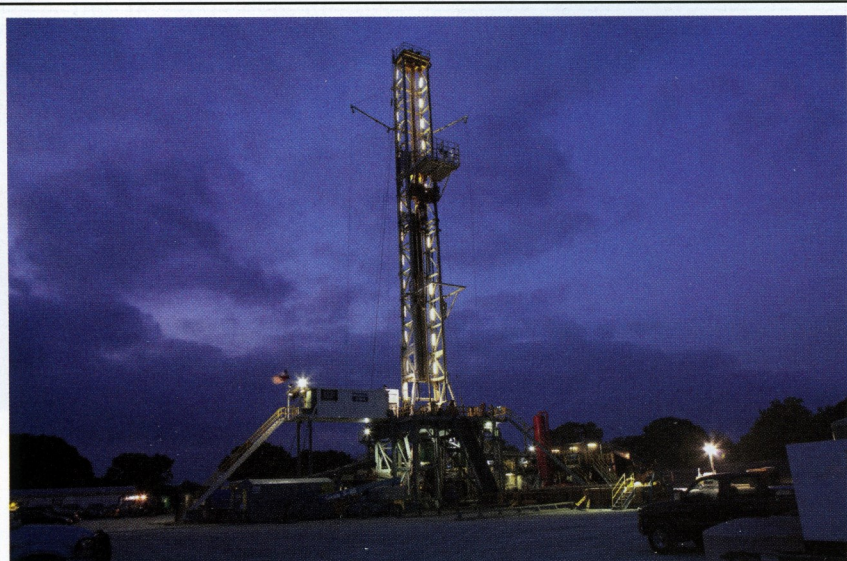
Gulf Coast Western and its operating partner, Alpine Exploration Companies Inc., also announced last fall that they had completed and placed three wells in production in the Orange Dome Field in Southeast Texas, neighboring the famed Spindletop Field, site of the first oil well in Texas.

Fleeger says Gulf Coast Western expects to continue developing acreage it has under lease in the area.

"For years, many thought this was a depleted field," he muses, "but we became convinced there was still excellent development potential after seeing the 3-D data. We were able to leverage the expertise of our development geologists and geophysicists in conjunction with those at Alpine to achieve success where others have not. We continue to have high expectations for our Orange Dome Field operations."

### Lower Smackover Brown Dense

Another emerging play in the Gulf Coast region is the Lower Smackover Brown Dense, located in southern



Houston-based Halcón Resources moved two rigs from its Eagle Ford Shale operations into the Tuscaloosa Marine Shale this spring, where it has 307,000 net acres. Chief Operating Officer Charles E. Cusack III says, "We have first-class Flex rigs and experienced crews." The company has drilled two wells on its legacy acreage on the western side of the TMS, and spudded its first well in the eastern TMS in March in Wilkinson County, Ms.