

### **Permian Basin “Flipping the Playing Field”**

By: Michael D. Harbison, P.E.

The Permian Basin is an oil field located in West Texas and Southeast New Mexico and is one of the largest oil producing basins in the world. The Permian Basin currently produces 2-2.5 million barrels of oil per day, which makes up approximately 25% of North America’s total daily production. This makes the Permian Basin the second largest oil field in the world based on production, with only Saudi Arabia’s Ghawar field producing more per day. The Permian Basin has produced over 29 billion barrels of oil since the first well was drilled in 1921. Its current reserves are estimated to be in the 30-40 billion barrel range, rivaling the enormous Ghawar field. Some believe that Permian may actually contain as much oil reserves as the Ghawar field once it has been fully developed. The Energy Information Administration is forecasting production to continue to grow by 600k barrels of oil per day in 2018. These data points make the Permian Basin a larger producing field than the Gulf of Mexico. It’s no wonder that so much activity is ongoing in the region and future projects continue to be funded.

The Permian Basin oil field has been around nearly 100 years and was said to have fueled the Allied Forces during World War II. What makes Permian such an attractive investment today? Following the recession in 2007/2008, after oil recovered from



**The Permian Basin makes up a large part of Southwestern Texas and parts of Eastern New Mexico**

its lows, the oil industry grew at an incredible rate. Oil prices were north of \$100/barrel. The promise of unconventional oil plays such as oil sands, tar sands and oil shale fueled the oil drilling fire. With that increase in drilling and the large number of projects, the cost of producing that oil (drilling, materials, service industry) also grew considerably. The cost to

produce oil at that time was in the neighborhood of \$70/barrel. With oil prices at \$100/barrel there were still plenty of profits to reap. Eventually in all markets though, the law of supply and demand rules. The additional oil coming on to the market along with reduced worldwide demand still suffering from the recession had a deteriorating effect on oil prices. Oil quickly



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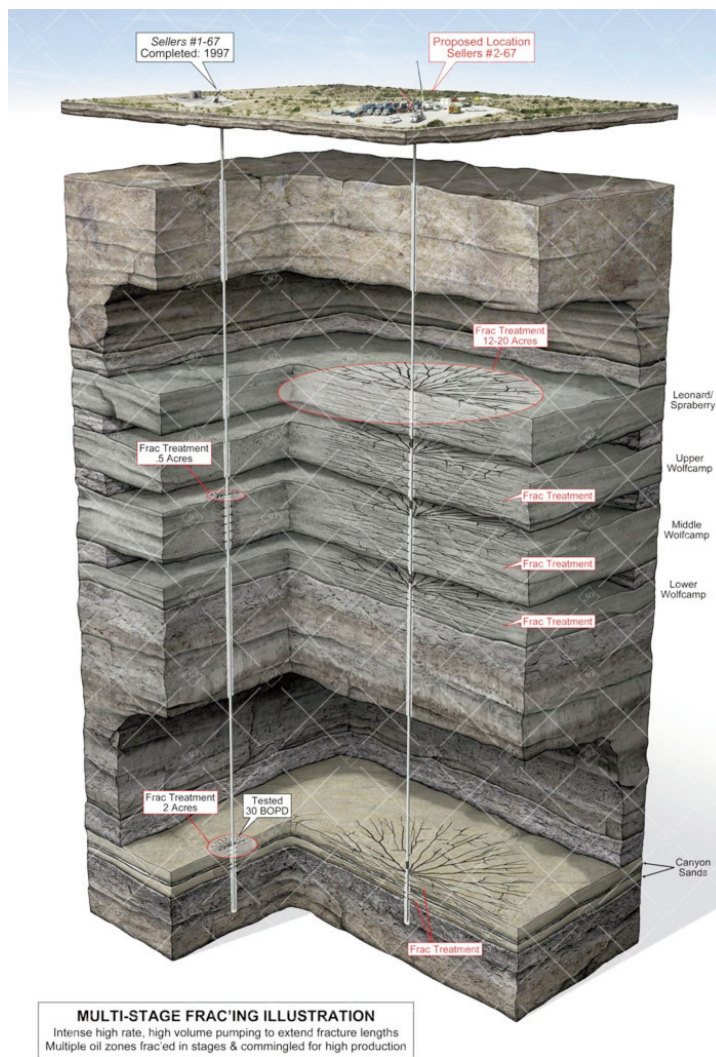
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declined from that \$100/barrel level to \$40/barrel, briefly touching \$27. Producers could no longer be profitable with the higher producing costs per barrel. They were forced to find ways to lower their costs via layoffs, renegotiating service costs and shelving higher cost projects/fields. Enter the Permian Basin Rush.

The Permian Basin is made up of multiple layers of shale rock. Producers found that they were able to tap into these multiple layers of shale in one well via fracking. Fracking is the process of injecting a mixture of sand and water into the well at high pressures, splitting the shale and allowing the oil/gas to escape into the well bore. This significantly reduces drilling costs and increases recoverable oil, which has a knock on effect of lowering the cost to produce that oil. Producers in Permian are now stating that they are able to produce oil in Permian for approximately \$40-\$50/barrel, which is in line with current oil prices. With producers looking for projects/fields that have low development costs and quick turnaround to bring that oil/gas to market, the Permian Basin has become an attractive investment.

There has been a flurry of investment activity in the Permian Basin over the past couple of years.

**The Permian Basin is made up of "Stacked" shale which allows for fracking several zones at once increasing production.**

ExxonMobil, the United States' largest oil producer, recently purchased \$5.5 billion worth of land in the Basin, essentially doubling their assets in the region. Noble Energy bought fellow producer Clayton Williams Energy for \$2.7 billion. Many producers have sold less profitable fields in order to purchase the more lucrative lands in Permian. More than \$25 billion of mergers and acquisitions have transpired over the past year with more on the horizon. Fifty percent of the United States rig count currently is operating in the Permian Basin, so it is easy to see just how well thought of Permian is. The amount of activity and increase in oil production has made the U.S. an exporter of oil for the first time in a long while. Shell Western E&P has also been extremely active in the region over the past few years.

In 2014, Shell approached NELSON to assist them in designing a Central Processing Facility (CPF) and a Saltwater Disposal Facility (SWD). Shell, at the time, was utilizing primarily limited processing facilities at their well sites and pumping into existing pipelines or trucking to tank farms nearby. As their well count grew, it became apparent that a centralized complete processing facility was more economical. Shell was producing 31kboe per day. Shell's intent was to design one facility that could be used in multiple locations throughout the field to leverage land availability and planned pipeline infrastructure. The CPF premise was to design a 5000 bopd multi-train facility with the initial capacity to utilize two trains (10 kbod) with expandability for an additional train (15 kbod).



The facilities were designed to handle three phase fluids (oil, water, gas) and separate them into individual streams. Oil was processed into tanks prior to being pumped into a new pipeline. The gas was separated, compressed and sent to a gas pipeline. Some of the gas was used for fuel consumers within the facility. The water was separated and stored in on site tanks prior to being pumped into a pipeline to the newly constructed Saltwater Disposal Facility. The facility was designed utilizing a modular concept in order to minimize construction on site. All equipment as well as the pipe racks were designed to utilize shop fabrication to the extent possible with transportation limits setting the size designed. The first CPF facility came online in 2015. It has since been expanded to include the third train and plans are ongoing to increase the capacity from its current 15 kbod to 20 kbod by adding additional heat to the process.

Production wells in Permian contain fairly high water cut percentages. This results in large volumes of produced water that requires disposal. The produced water can be trucked away for disposal elsewhere, utilized for the fracking process or as in the case for Shell's field development, injected into disposal wells. The injection wells are for disposal only and not pressure maintenance, as the formation does not lend itself to high pressure water injection maintenance.



**CPF facilities were designed with a modular concept including pipe racks to minimize field construction.**

The design intent was to provide a number of saltwater facilities throughout the field. The produced water must meet certain quality specifications prior to being injected into the wells. The SWD facility was also designed to recover any oil that may still be contained in the water. This oil once separated was pumped back to the CPF's. Once water has been filtered and the remaining oil captured, water is injected into the disposal wells via high pressure water injection pumps. The initial SWD's were designed to accommodate 20,000 bbl/day with the potential to increase capacity to 40,000 bbl/day in the future as the well's water content increases. The first SWD came online in 2015 and plans are ongoing to increase that facility to 40,000

bbl/day in 2018.

Shell Western plans for a number of additional CPF and SWD facilities and decided to adopt a "Design One, Build Many" philosophy. Once the two original facilities were constructed and operating, Shell along with NELSON and the construction contractor undertook a facilities improvement workshop. Those improvements were incorporated into a "Generic" facilities design that could be implemented throughout the Permian Basin. These designs were completed and Shell Western has since constructed several additional 15 kbod CPF's and 40 kbbl/d SWD's. The improvements resulted in cost savings across the facility's engineering design, equipment costs and construction costs, as well as reduced schedule (time to bring the facility online from the onset of funding). Given the success of the current facilities and the allure and continued promise of the Permian Basin, Shell is continuing this philosophy and has a number of CPF and SWD facilities planned for implementation over the next couple of years.

Over the past few years, many unconventional oil fields have shown great promise for the oil producers, but none have been as productive as the Permian Basin oil field. Given the recent investment activity, the current drilling rig usage and new planned projects, it is apparent that Permian is here to stay and will be a large player in the U.S oil production profile for years to come.



**Central Processing Facility (CPF) where oil, water and gas are separated.**

## Saints Annual Kickoff Run - 2017



Front Row L to R: John Draper, Rachel Delatte, Marissa Brett, Cami Munson, Michelle Maggiore, Luan Tran, Martin Patterson.  
Back Row L to R: Ian Walsdorf, Michelle Jones, Derrick Millet, Justin Bertheaud, Randall Biciste, Louis Randazzo and Jared Nunez.  
Congratulations to Megan Gohres (not pictured) who finished first in the Women's 5K Division.