Current situation and prospect of Permian Basins in the United States

Keming Wang¹, Qian Zou¹, Zuoqian Wang¹ and Min Peng²

¹Research Institute of Petroleum Exploration & Development, PetroChina, Beijing; ²Northeast Petroleum University, Heilongjiang

Abstract. The Permian Basin of the United States is a hot spot for global mergers and acquisitions of oil & gas assets, with the transaction value as 20% of the world’s total. Majority of participants in these activities are small and medium-sized US companies. With the decreasing costs triggered by technical advancements, more and more large oil companies have started to acquire oil and gas assets in the Permian Basin. This paper analyzed the features of M&A transactions concerning the Permian Basin, and highlighted the root causes thereof from the perspective of geologic reserves, engineering technology and surface facilities. On this basis, the future situations on the global oil markets were forecasted.

1. Introduction
The Permian Basin in western Texas and southeastern New Mexico, the United States, was named for its thickest Permian sediments in the world, covering an area of approximately 190,000 km². The basin revealed the initial commercial oil flow in 1920. Its oil production peaked at 2.02 million barrels per day (mb/d) in the 1970s, and then declined gradually. In 2000, the total production in the three major producing regions was about 0.13 mb/d, or less than 1/10 of the peak production.

The US shale revolution revitalized the Permian Basin. Since 2007, the production of the Permian Basin has been increasing – to 1.59 mb/d before the plunge of oil prices in 2014. With rebound of oil prices, the transaction count in the Permian Basin began to rise in 2016, accompanied with rapid increase of production. In 2018, the annual transaction value exceeded US$30 billion, as approximately 55% of the US total M&A value in upstream sector [1].

Currently, key producing regions in the Permian Basin include Midland, Delaware and Bone Spring. With breakthroughs in horizontal fracturing techniques, drilling contractors have started to deploy horizontal fracturing techniques to develop conventional oil reservoirs. Majority of incremental drilling and exploration capacities in the United States are contributed by the Permian Basin [1]. In 2019, there are up to 455 drilling rigs in the Permian Basin, providing a capacity 1.5 times of the peak in the 1970s.

2. Features of M&A transactions in the Permian Basin

2.1. The transactions are consistently active, with small and medium-sized companies as key players
Large oil companies, except for Chevron, were pessimistic about the prospects of the Permian Basin, and sold out their assets in the basin at the beginning of the 21st century. As a result, these assets were mostly controlled by small and medium-sized companies (Figure 1). With the breakthrough in
fracturing techniques, some small and medium-sized companies made researches while drilling with the support of high-leverage financing to master key technologies and gain huge profits.

From 2015 to 2018, transactions made by small and medium-sized companies maintained a stable proportion – over 70% of the total [2]. As the oil prices recovered in 2016, large oil companies resumed their attention to the Permian Basin. In August 2015, ExxonMobil acquired a block with area of 48,000 acres in the Permian Basin. In January 2017, ExxonMobil officially declared its acquisition of the US$6.6 billion block (with the production capacity of 10,000 b/d) from BOPCO. In April 2019, BP offered US$50 billion to acquire Anadarko[3].

![Figure 1. Proportion of transactions by sizes of US companies.](image1)

Due to active involvements of large oil companies and continuous climbing of oil prices, transactions in the Permian Basin have been hot (Figure 2), with the count over 30% of the total [2]. Almost all major US oil companies got involved in these activities. They turned their strategies towards the domestic unconventional resources with their strengths in capital, technology and management. At the same time, regional dominant companies expanded their coverage and technical competence to minimize costs, enhance production, and eventually, secure their dominance. Moreover, they reduced the financing costs by selling their partial equities.

![Figure 2. Total transaction value by US region.](image2)
2.2. The transactions are more rational
Since the rebound in 2016, oil prices have been climbing continuously. Under such circumstance, the transaction prices in the Permian Basin recovered rapidly in 2017 to an unprecedented high of US$25,700/acre, which doubled the floor price in 2016. In 2018, the average oil price reached US$65/barrel, or 25% higher than US$52/barrel in 2017 (Figure 3). In contrast, the transaction prices in the Permian Basin increased by only 8%, far below the rise of oil prices. From 2015 to 2018, the transaction prices per acre experienced a course from floor price to historical high and to maintain a steady level. In conclusion, the market players become more rational and cautious. As the investors shifted their focus on long-term values of assets, short-term fluctuations in prices presented no impacts on their judgment on values. Since the investors have more uniformed and more rational assessments on values of the assets in the Permian Basin, the transaction prices of assets have become more rational [3].

![Figure 3. Weighted average acre value vs. WTI price.](image1)

![Figure 4. US onshore annual well count by play: 2016-2023.](image2)
Fear of another plunge in oil prices, oil companies operating in the Permian Basin suspended their high-speed increases in the number of new wells in 2019 (Figure 4) [3]. Instead, they drilled new wells at more steady rates to maintain reliable cash flow in a longer term for purpose of mitigating the potential risks related to oil price decline. The shale oil producers have shifted their business philosophies from “investment is king” to “cash flow is king” now. Many shale oil companies expressed no desire to expand their productivities even in face of continuous climbing of oil prices, but may make cash flow dividends to stakeholders.

For various companies accessing to the Permian Basin, there are still profit opportunities. The key lies in the selection of proper access mode and projects corresponding to their own capacities. Majority of companies purchasing lands and operating in the Permian Basin have assets secured in the region previously [4]. They conducted M&As mainly to acquire licenses adjacent to their existing assets, so that they could drill horizontal wells with more stages for purpose of scale effects.

3. Root causes for active M&As in the Permian Basin

3.1. High potential values
At present, some top-class blocks in the Eagle Ford and Bakken basins account for 61% and 41% of total well count, respectively (Figure 5). Well stocks in undeveloped blocks of the core blocks are expected to be exhausted as early as the mid-2020s [5]. In contrast, the overall development of the Permian Basin is still in its infancy, with great potentials in both reserves and production. Unstructured data volume parsing [6].

According to the report on technically recoverable shale oil reserves in North America released by the Energy Information Administration (EIA) in January 2014, the Permian Basin contains potential pay zones covering a total area of 40,000 square miles, with technically recoverable reserves of 24.6 billion barrels oil, 79 trillion cubic feet (TCF) gas [4], and 6.3 billion barrels natural gas liquids (NGL). Typically, Spraberry and Wolfcamp have the largest technically recoverable reserves. The production in the Permian Basin involves high proportions of fluids with crude oil and NGL accounting for 70–80% of total volume. Thus, produced fluids have relatively high values. As reported by the United States Geological Survey (USGS) in November 2016, Wolfcamp alone contains technically recoverable reserves of 20 billion barrels oil, 16 TCF gas and 1.6 billion barrels NGL[7]. According to the Wood Mackenzie, the Permian Basin in the United States is estimated to contain recoverable reserves up to 150 billion barrels. IHS predicts that the Permian Basin contains potentially recoverable reserves up to 20–160 billion barrels equivalent, which is comparable with those in Saudi Arabia [8].
A huge amount of well sites are available in the Permian Basin. According to the Wood Mackenzie, there are over 200,000 available well sites with economic value in the Permian Basin under oil price of US$50/barrel, which are equally shared by Midland and Delaware. Even at the drilling speed of 7000 wells/year (given 400 rigs, with 20 days to spend for drilling one well by one rig), these well sites are sufficient to support the development for 8–9 years. Generally, pay zones in the Permian Basin are relatively shallow. Many blocks are being developed at the depth of 3000 ft. In addition [4], the pay zones in the Permian Basin are multiple and thick, with rich oil contents. Vertically, these are over 10 target zones, such as the A, B, C and D zones in Wolfcamp. In view of thicknesses, the pay zones in the Permian Basin are up to 1300–1800 ft, while those in Bakken are approximately 10–120 ft, and those in Eagle Ford are approximately 150–300 ft [8]. It can be seen that the Permian Basin is superior in overall development – one vertical well can penetrate multiple pay zones, revealing extremely high drilling and production efficiencies.

3.2. Lower costs driven by technical advancements
A few years ago, the development of the Permian Basin was not economically viable in cases with oil prices below US$70/barrel. Since 2014, the development costs in the basin has declined rapidly. The break-even prices in Midland and Delaware dropped 50% in 2018. Up to the present, the production of resources in parts of the Permian Basin, such as Midland, with break-even prices below US$45/barrel accounts for 30% of total domestic production with break-even prices below US$60/barrel in the United States. Technical advancements are key contributors to the significant reduction in development costs in the Permian Basin [9].

With inefficient wells closed, operators can concentrate on high-efficient wells in core blocks. Also, they have improved dramatically the number of fracturing stages and completion speed. While more fracturing stages are adopted, volume of proppant and sweep coverage at each stage are promoted. Since 2014, the number of fracturing stages per horizontal well in the Permian Basin has increased by about 35% [4], while the volumes of proppant and fracturing fluids have doubled. Operators universally apply the fast completion techniques, which help enhance the average per-well production by approximately 120% in core blocks. At the same time, the drilling time reduces from more than 20 days in 2014 to less than 10 days now.

3.3. Sophisticated transportation facilities
Whether or not the production of the Permian Basin may have significant impact on crude oil markets depend on desirable transportation capacities to satisfy demands of the region. Currently, the Permian Basin has production capacity of approximately 4.2 mb/d, and the pipeline transportation capacity is 3 mb/d [4]. With the pipeline throughput as 70% of the pipeline transportation capacity, the outbound capacity is deemed somewhat limited. Since the production in the Permian Basin is increasing fast, it is urgently necessary to expand the transportation capacity. For now, two pipelines, namely Enterprise Channel (500,000 barrels) and LBC/Magellan (400,000 barrels)[10], are under construction. Thus, the transportation capacity can grow in line with the production. Up to the end of 2019, the transportation capacity in the region is expected to become more sufficient with all pipeline expansion projects going into operation.

4. Forecast for production in the Permian Basin and its impacts on oil prices
Shale oil, characterized by shorter lifecycle and faster decline, can be seen as the most flexible component in global oil production. In other words, it may present significant impact on incremental supply of marginal crude oil. Currently, the floor prices of crude oil on global markets are determined by OPEC, whereas the ceiling prices are controlled by the United States.
Figure 6. US oil production by source: 2018-2030.

According to the IHS estimate, the US oil and gas production is expected to reach 16.7 mb/d by 2030, of which 3.5 mb/d [4] is contributed by the Permian Basin with its total production up to 5 mb/d (Figure 6). For now, the Permian Basin is considered as the key engine to drive the production increase in the United States, and may eventually affect the supply-demand balance in global oil and gas markets. The demands of major oil importers, represented by China and India, have entered a bottleneck stage, and will uncertainly witness a significant increase in the future. As a result, the considerable production release may inevitably affect the supply-demand balance in global oil and gas markets, and eventually lead to sharp decline of oil prices. The production costs in core blocks of the Permian Basin have been reduced to levels below US$30/barrel, which is sufficient to sustain long-term price wars with the Middle East countries. In other words, the next plunge in oil prices is expected to last a longer time. As a response to such potential circumstance, the US oil and gas producers are actively promoting their levels of cash flows and cutting the production costs.

5. Conclusions
In the future, the Permian Basin of the United States will continue to maintain the trading heat, but the trading price will be very rational. At the same time, large and medium-sized oil and gas producers will gradually occupy a dominant position, relying on huge resources, technological progress and efficient management methods to rewrite the oil price rules. In the past, the law of shale oil and gas price balance was: oil price rising - profit improving - shale oil increasing - oil price falling. With the rise of the Permian Basin, it will change from the past oil price regulator to the oil price determiner. In the future, the oil pricing power will be in the hands of the United States.

References
[1] IHS, Global Upstream M&A Review and Outlook--Houston - April 2019 - 63 slides
[2] IHS, Upstream M&A Monitor–Private Oil Companies 4Q18
[3] IHS, chevron acquires anadarko for US$50 billion.2019 5
[4] IHS, US Oil Supply Forecast - Q2 2019
[5] Wood Mackenzie, a low case for lower 48 how does the permian evolve
[6] Wood Mackenzie, strategy update- chevrons 2019 analyst day dominated by massive permian upgrade
[7] Wood Mackenzie, the edge- permian consolidation intensifiesand more to come
[8] Wood Mackenzie, permian corporate takeover screening tool
[9] Wood Mackenzie, q2 2019 us independents earnings recap
[10] Wood Mackenzie, Permian M&A Webinar: Our Top 10 Permian takeover targets