Career Episode 2

Three Forks Formation Petrophysical Analysis

A) Introduction

[CE 2.1] I conducted the project "Three Forks Formation Petrophysical Analysis" in the Department of Petroleum Engineering at the University of North Dakota, USA.

Project Title: Three Forks Formation of Petrophysical Analysis

Duration: [Date] – [Date]

Location: University of Dakota, USA

Position: Petroleum Engineering Student

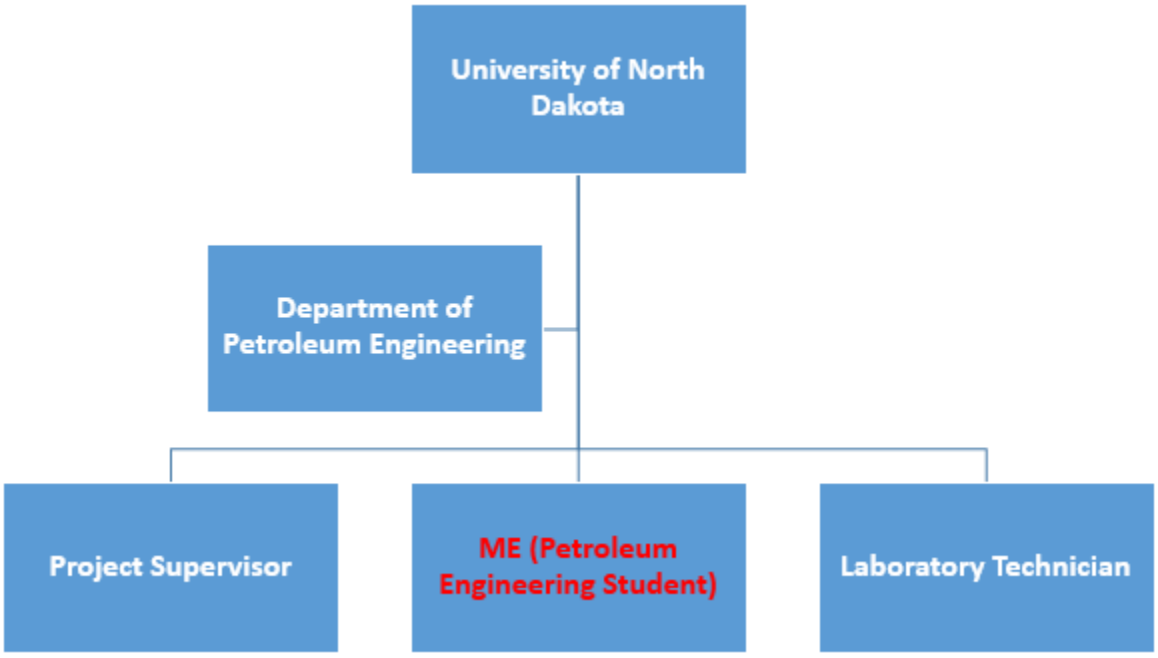
B) Background

[CE 2.2] The Three Forks formation which was mainly located in North Dakota has been receiving extensive attention in recent years because of the productivity of hydrocarbon. In April 2013, the United States Geological Survey reported an estimated 4 billion undiscovered barrels and these were mainly recoverable oil. Furthermore, there were various researches carried out for formation analysis and it was required to analyze the petrophysical for better understanding and developing the formation. There was the core data taken from the North Dakota Oil and Gas Commission (NDIC) website which allowed the facies distribution understanding.

[CE 2.3] The project aim was the analysis for the flow unit determination and it was the challenging process because of the tight carbonate reservoirs complexity. I applied the technique using my Petroleum Engineering understanding which was the most optimum one for determining the flow units in the reservoirs and established the facies distribution relationship with the logs and flow units. I adopted the Stratigraphic Modified Lorenz Plot model with the utilization of the core data. It assisted in illustrating the data in the cumulative storage capacity.

[CE 2.4] I used the computer modeling group (CMG) which was the reservoir simulation software after the flow unit determination. I analyzed and determined the three Forks formation production zone and PETRA was used for analyzing the higher logs amount from the NDIC website. This was for minimizing the potential error from the obtained core data.

[CE 2.5] Project Hierarchy:

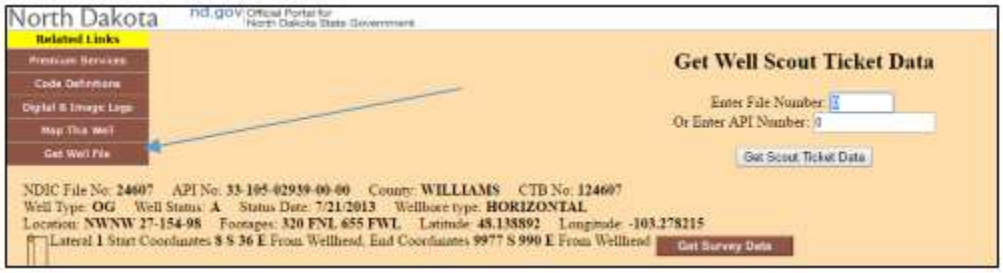


[CE 2.6] My responsibilities were:

- I selected the file which was not easily searchable in the PDF format and it took a considerable amount of time for reviewing the data.
- I worked on determining the three Folks formation characteristics over the target countries.
- I determined the three Folks formation characteristics as the complete over the target countries.
- I made usage of the lab data particularly for calibrating and determining the related errors in the field data.
- I carried out an analysis for obtaining the pronghorn member and did thorough research on the related concepts.
- I analyzed the spike values in the gamma readings and it resulted in the member identification after the lower portion of the Bakken.
- I did thorough research on the gamma-ray log which was particularly of the low quality and identified from the true resistivity.
- I obtained the factor in the model provided with the parametric flow rate and implemented for the drilling process of each layer.
- I conducted extensive research using my Petroleum Engineering knowledge for completing the production simulation for a period of 10 years.

C) Personal Engineering Activity

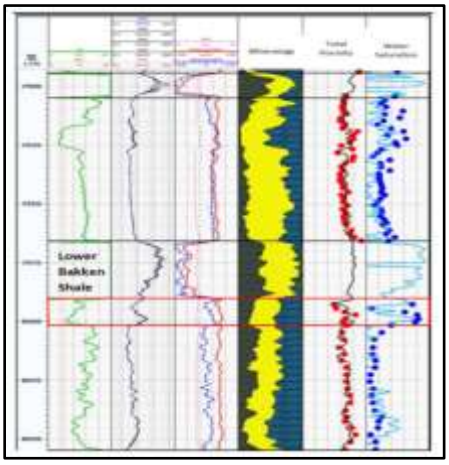
[CE 2.7] I managed to obtain the main data from the NDCI website and it was within the target countries. I found the NDIC website core data within the good scout ticket data portion. I stored the actual data within the file. I obtained the file which was unsearchable PDF and took time for review as well for the needed data. I presented the data in the tabular format when available and the collected data was then compared against the raster logs for correlating the formation of the top. I transferred the data to the excel after the steps were completed for carrying out further analysis.



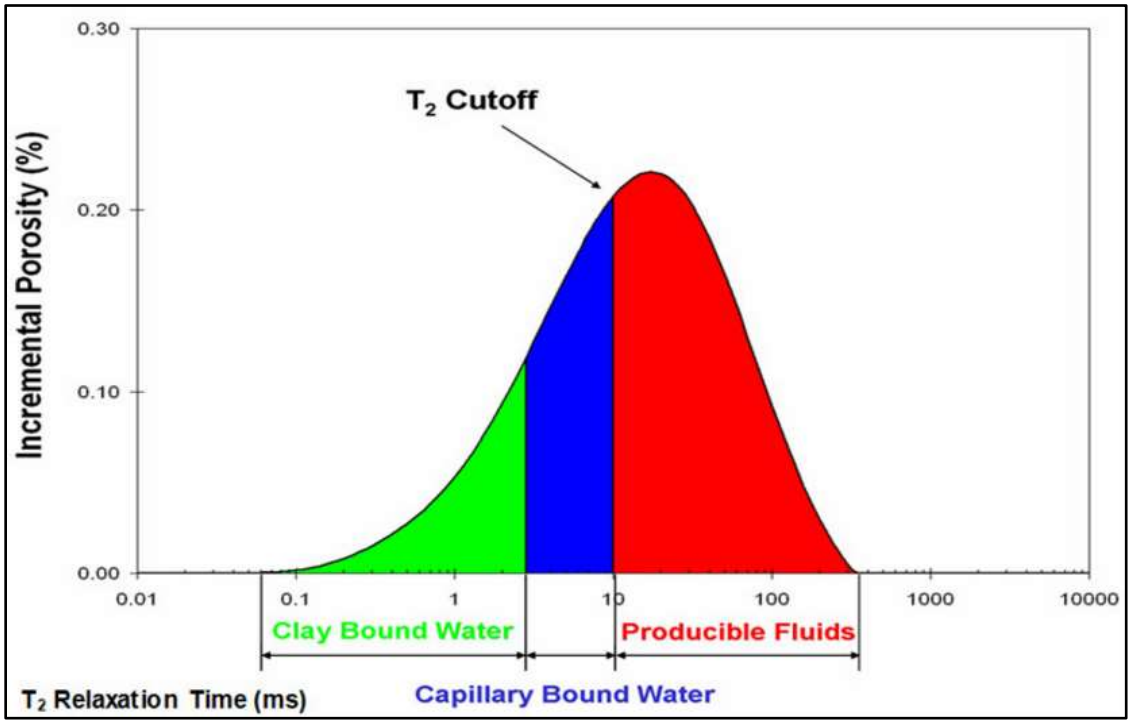
[CE 2.8] I made usage of the log files which was based on the lab data for avoiding the potential error in the research analysis. I determined the three Folks formation characteristics as the complete over the target countries. I utilized the lab data for calibrating and determining the possible errors in the field data. I made usage of the well logs when it was completed for understanding the three Folks formation lithology. It was for calculating the reservoir properties of the four target countries. I obtained the .Ias and raster format for the well logs from the NDIC website in the premium services station. I focused on the petrophysical data logs for calibrating the raster los and this was utilized for programming the formation tops of the three Folks formation and its members. I transferred the log data into PETRA where it was evaluated for the properties of the reservoir and contoured from the top data formation. I presented the log data formation as shown in the figure.

[CE 2.9] I obtained the top data formation from the NDIC website and it was mainly determined for reducing the errors in the simulation. I identified the formation top manually for the formation of the three forks and the first member bottom was also analyzed. I obtained the three forks

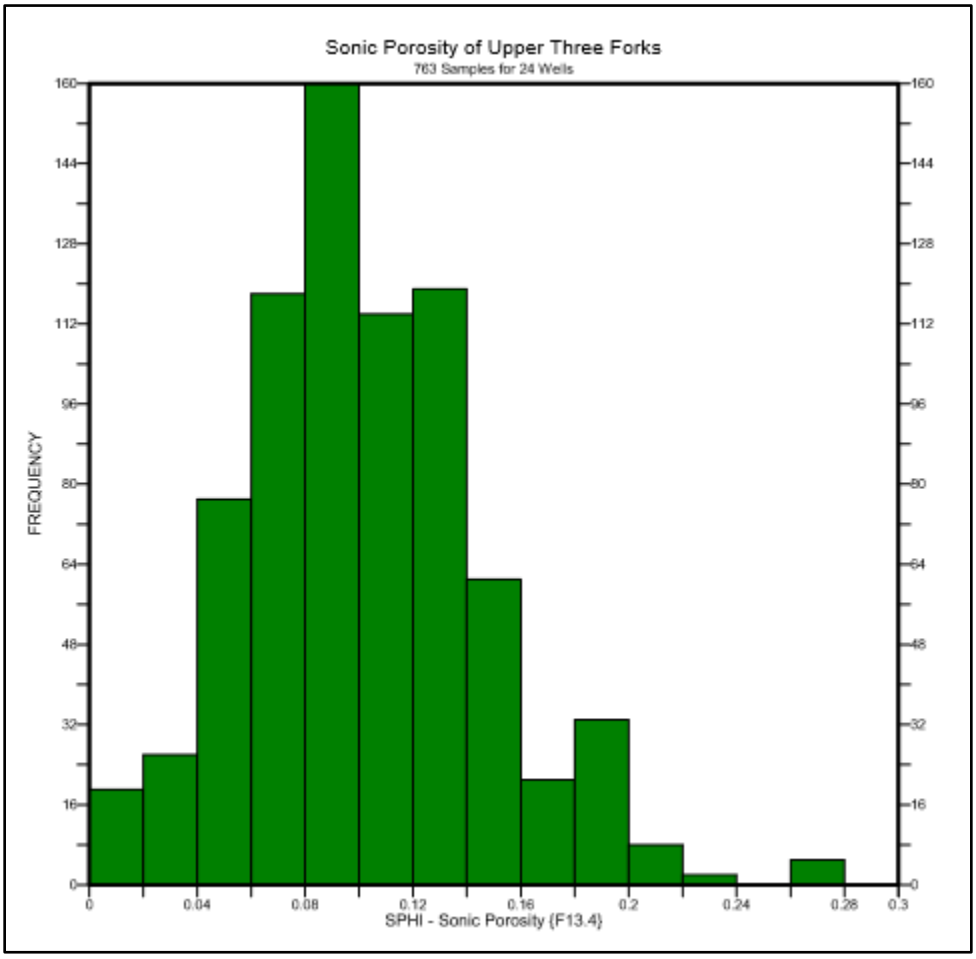
formation from the marked drop in the signaling of the gamma reading at the end of the formation of lower Bakken. I obtained the pronghorn member after the lower Bakken for conducting further research. I analyzed another spike in the gamma readings which resulted in identifying the member after the Bakken lower portion. I also worked on identifying the bottom and top of the upper three forks as demonstrated in the figure.



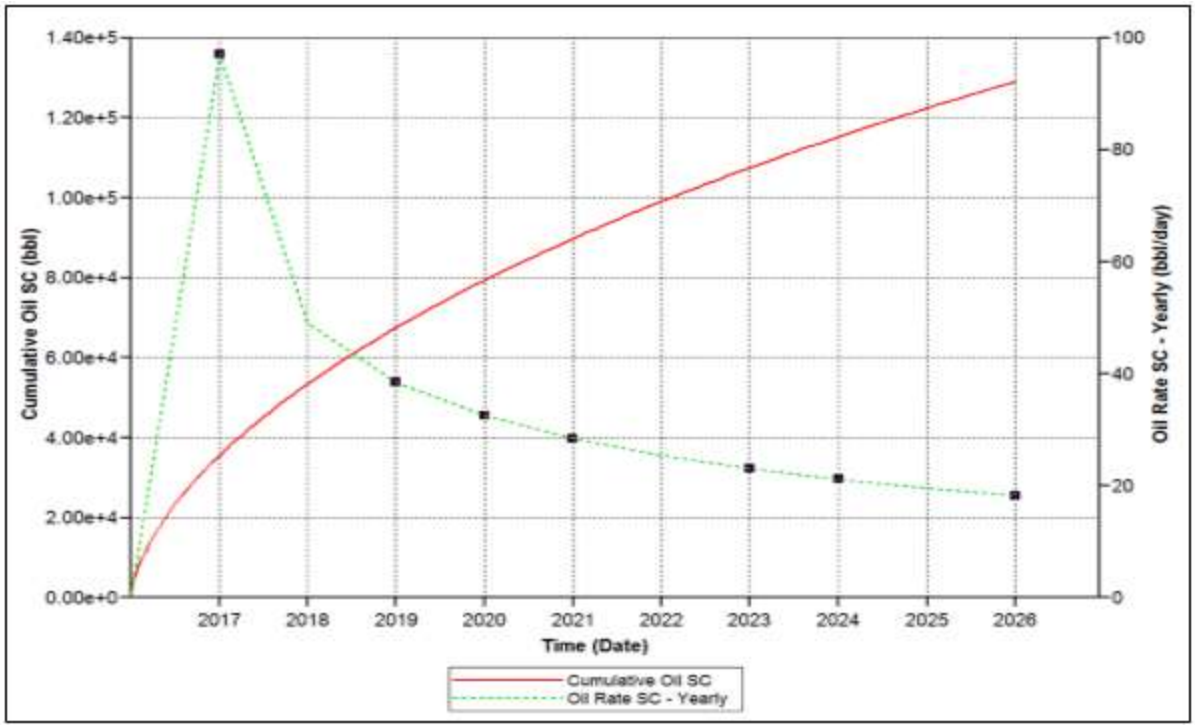
[CE 2.10] I identified the upper three forks member bottom by the marked and moderated for the increment in the gamma reading. I noted that the reading was increased by 35 API on average over the 10 ft. and it was dependent mainly on the three forks formation thickness. I researched the gamma-ray log which was of low quality and was identified from the true resistivity. I obtained the decrement in the resistivity which was below the upper member and mainly because of the enhancement in the water saturation.



[CE 2.11] I analyzed the 38 well log suites from the targeted countries in North Dakota. I obtained the appropriate results from the analysis which was utilized for both feeding the other portions of the work. I obtained a larger picture of the three forks formation in the target countries. I determined the porosity of the formation with the utilization of the sonic log. I took the sonic log for 24 wells and these were isolated well to the formation of the upper three forks.



I obtained the results from the petrophysical analysis based on the three forks and it included the optimized log analysis utilizing the flow unit zonation and PETRA. It was used in the reservoir model creation for comparing the obtained flow units. I determined the factor in the model with the parameters flow rate and it implemented the setup for drilling through each layer. I completed the simulation for the production, particularly for the 10 years. I made sure that these simulations were run on the separate 3 base cases and these cases were drilled for producing the flow units. I obtained the below-noted production units.



D) Summary

[CE 2.12] I obtained the upper three forks as the most feasible layer within the formation based on the analysis carried out in the project. I noted that few of the results were not conclusive and further research was required to obtain additional information. I emphasized further research on creating the flow units in the oil saturation values seen in the results for the upper three forks horizontally. I enhanced my Petroleum Engineering knowledge in a significant manner with this project execution.