

HollyFrontier Navajo Refining CO-OP: Part 1 of 2 (Summer 2019)

Before I begin describing the first half of my experience working in industry I will begin with a small background on myself. My name is Tristan Rheay and I am currently 22 years of age. Home for me is Las Cruces, New Mexico so you could say I was born and raised an Aggie. Going into college I had two peak interests, one being physics and the other being chemical engineering. I began school as a designated physics major that quickly transitioned into engineering physics with an emphasis on chemical engineering within my first year. It did not take long at all for me to realize even with a passion for physics, my calling was in the field of chemical engineering. After entering this field the end goal has always been to work in the petrochemical industry. New Mexico State's CHME program not only surrounded me with professors and mentors a student could only hope to have, but with a community of students that is unmatched to anything I have seen within my four year college experience. At this time I have completed my junior year of the CHME program consisting of CHME 307 and 441.

As previously stated, the professors and mentors in the NMSU CHME department are what any college student would be lucky to have. I was fortunate enough to be extended an offer for a student co-op, an opportunity that in almost all cases would put a student a year behind as they leave to gain valuable experience for an extended period of time. However, through the help of professors and department head, I will be able to continue with my senior year via online classes with no time set back. This is not a normal situation under many circumstances but the NMSU CHME department has and always will go above and beyond for their students making the program world class through my eyes.

During the Spring 2019 semester Navajo Refining which is part of the HollyFrontier organization came to NMSU looking to fill one position for a student co-op that would run from May to December. After going through the career fair, interview, and waiting process I received the offer for this opportunity. Navajo Refining is located in the small southeastern New Mexico town of Artesia. This inland refinery that thrives on the location being inside the Permian Basin that is known for its unthinkable amount of natural gas and oil reservoirs underneath the ground. Navajo Refining is currently operating at a capacity right above 100k barrels per day, being one of the largest refineries within the HollyFrontier organization. In several unique ways I am what I would call a guinea pig, not only for Navajo Refining, but for HollyFrontier as a whole. Upon my arrival in May I was made aware that I am the first student co-op in company history giving me even more motivation to work harder and chase my goals made possible through NMSU's well established CHME program.

Common practice with interns being brought in has consisted of projects to consume their time in efficient and meaningful ways that would give them a taste of industry and what a full time job would entail. However, there was a slight change in said practice that would provide even more vital experience that will lead to deeper understanding and development. For the first time in addition to projects I was given a unit within the refinery to monitor daily and learn inside and out. The unit assigned to me was the Gas Oil Hyrdotreater, within our Mild Hydrocracker division. One of the first projects went hand in hand with the unit assignment, as I was to ensure the accuracy of the latest revisions of the large control diagram (LCD), process flow diagrams (PFD), and P&ID's. This was a perfect first project to begin with, in the sense that it made me dive into the science of hydroprocessing. With resources such unit description manuals (UDM), the process engineering team, and operations I was given all the possible

support with unique perspectives and experiences I could ask for. In mid-August I will be expected to give a presentation over the Gas Oil Hydrotreating unit and all the components associated with it.

The second initial project was a basic refinery overview of all the key units in a process flow diagram layout. This came with a hard deadline and presentation to the entire process engineering team that would be followed up with questions that were expected to be answered. From the initial crude entering the refining process, it was required to know the flow path of all key distillates through all associated units until gasoline blending or storage of final products was reached. This was an excellent exercise as it gives insight to the entire refining process and not only one piece of the puzzle. It challenged me to learn why one distillate is sent to a certain unit and to undergo a specific process, allowing me to further immerse myself in industry experience.

Following the completion of these initial projects and metaphorically having my feet wet, I was given another project that has come with many expectations and is still in progress. This project involves our HF alkylation unit as I am making slight modifications in process flow using existing lines to optimize a regeneration process while simultaneously implementing an analyzer to further enhance monitoring. To begin this project I was given the arising issue and what needed to be monitored, which led to my first step of contacting vendors who could supply analyzers to help solve this issue. The vendors supplied me with data sheets to complete which consisted of components, compositions, temperatures, pressures, hazardous area classifications, etc. Upon completion the vendors would send proposals and quotes of an analyzer best seen fit for the desired measurements and operating conditions. Once the proposals were collected I was expected to set up a meeting with the process engineer overlooking the HF Alky unit, the lead engineer, and manager of tech services (process engineering team) to make a decision on which

analyzer would be the best option. Following this meeting I was expected to markup a P&ID with all proper flow paths to and from the analyzer, valves in proper positions, and pipe specifications. This step was recently completed and approved and will be followed up by creating the project request paper trail. My next steps and expectations include talking to several more departments to ensure all necessary power requirements will be available, all necessary parts and pieces of equipment for installation are on site, and an effective location to place the analyzer can be designated. Through the duration of this project I have been given several other projects that are to be completed by the end of my co-op experience. These consist of a chemical improvement plan in the unit I am monitoring, developing a plan to test PSM limits on the unit I am monitoring, updating and revising LCDs, PFDs, and P&IDs for our crude units, and completing a steam balance on the entire refinery.

Safety is without a doubt in my mind one of the biggest priorities and cultures in the HollyFrontier organization. There is nothing more driven and focused on than safety at the refinery as a whole. My first week consisted of over 10 hours of safety trainings and certifications. New onboarding full time employees in the process engineering team are required to go through a 40 hour training. The first topic of every meeting whether it is between the process engineering team, management, operations, or the lab must be a safety topic for the day. No meeting will continue forward without a safety topic discussed to be wary of on a daily basis. Safety becomes all so real when you go out into the field, all precautions must be taken seriously as they are enforced heavily. Steel toe boots, fire retardant clothing or coveralls, hard hats, H₂S monitors, safety glasses, and ear plugs must all be worn at all times when going out into the field around all the equipment in operation. Restrictions are taken very seriously even when it just comes to vehicle operation. Texting and driving, not following posted speed limit signs, as well

as not wearing a seatbelt can lead to immediate termination. Every division in the refinery has a sign in sheet that must be signed with time of entry and departure each time you want to enter a unit. Even further to enter the HF Alky unit where one of my projects was located there is an additional clean room. In this room it is required to attach a face shield to the hard hat, put on designated rubber coats, and designated gloves. Once all this gear is on there is another sign in sheet that must be signed at entry and departure. Other massively important implementations are things such as lock out tag out (LOTO), work permits, and constant 24/7 DCS monitoring to name a few. There is nothing with higher value than safety at the refinery. Several management members have made the point to me that at the end of the day as long as all employees are going back home to their families and loved ones, it was a successful day. To see this as a co-op student it really adds an endless amount of value to the company, and pushed me personally to ask myself every day what can I do better to maintain this high level of safety.

The role of communication is crucial in every sense of the word at a refinery. If everyone is not on the same page and well informed of daily operations there are many safety and process hazards that could occur. Strictly analyzing the role of process engineering, there is a morning meeting daily to discuss all units in the refinery and any potential threats or issues arising. Following this meeting, someone from process engineering will attend a meeting with management and division foreman to discuss the daily refinery target sheet and any important issues. Beyond this the process team is required to keep in contact with their specified divisions and monitor them via an online process book that provides 24/7 constant data. Communication continues with operations who are always out in the field maintaining the units physically and have the most experience being around them. It is extremely important to keep an open channel of communication with all departments whether it be operations, projects, economics, etc. to

ensure all messages and data is communicated effectively without any discrepancies. This open channel and drive to ensure everything is operating how it should be allows for any discrepancies to be sorted through immediately. At the refinery it is very common to have an “open door” policy and everyone is always willing to help or answer questions to the best of their abilities if they are not tied down at the time. This ideology has made the transition from student to working in industry incredibly easy. Although it might be frightening at first, the realization of how friendly and willing to help each person is has made the entire experience that much more enjoyable and full of practical knowledge to being back to senior year.

Two months in the books at Navajo Refining and five more months to come it is more than apparent that the learning curve is steep for a process engineer entering a refinery. That being said through the teachings and guidance of not one or two but all NMSU CHME professors I feel very well prepared and equipped for the challenge put forward. Whether it’s utilizing concepts out of heat and mass transfer, fluid mechanics, separations, kinetics, and so many more I have confidence in myself for the challenges being addressed. Although being in industry is very different than being in a classroom, the base understanding of the processes taking place would not be there if it was not for the preparation provided by the CHME department. I strongly believe without the guidance from the department I would not have the level of success I am having now.