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

As previously mentioned before in Part 1 of this experience my name is Tristan Rheay. I am 23 years of age and from Las Cruces, New Mexico. It is more than safe to say Chemical Engineering was the right career path for me after this experience with HollyFrontier and years progressing through the NMSU CHME program. Entering the petrochemical industry was always a goal of mine and this CO-OP put me in the best position to make that goal into reality. At this time I have completed the first half of my senior year consisting of CHME 412/448/452. I will be returning to the NMSU campus for my final semester to begin my capstone project. With the help of Dr. Rockstraw and professors I was able to take my courses online in order to graduate on time and not fall a year behind while working.

When summer had come to an end and initial projects were completed, the expectations in my performance increased accordingly. However, at this time I was comfortable in the work environment, gained confidence in what I was learning and practicing, and developed a decent understanding of how to find what I needed on my own. I was motivated daily to dive further into the industry and get the most out of the experience. Part 1 mentioned my initial projects of revising LCDs/PFDs, understanding and presenting basic knowledge of a gas oil hydrotreating unit, and implementing a moisture analyzer into the HF alkylation unit. Since then my projects have been much more in depth and included revising all P&IDs for the gas oil and kerosene hydrotreating units, implementing a new coalescing vessel, creating a retroactive monitoring page, and assisting where necessary.

As learned in CHME 448 and in industry, it is common practice to have large process hazard analysis (PHA) reviews every five years. With one of these PHAs approaching for the

hydrotreating division, I was tasked with revising all P&IDs for the gas oil and kerosene hydrotreating units. This pushed me to not only understand how the process flowed on paper but helped develop a deeper understanding of how it works in the field. I was able to learn things such as why relief devices, valves, and chemical injection points are in certain locations. This task also allowed me to venture into the kerosene hydrotreating unit that I was unfamiliar with and compare and contrast from what I was familiar with. I was able to sit down and have discussion with operators about the physical equipment and what they look for and do in various scenarios. Reviewing all these P&IDs helped me to understand hydrotreating as a whole from a new perspective.

The second project mentioned during this term of the CO-OP was not planned and stemmed from a much smaller task. When I was asked to contact vendors to find a new media for a coalescing vessel that would efficiently remove water it was found the current vessel is undersized. This led to the decision to replace the vessel entirely. Many considerations had to be taken at this point such as: the ability to replace the vessel with the unit online, if a new, larger vessel would fit into the location of the current, if any piping modifications would have to be made, metallurgy constraints from process fluid, etc. All of which required me to contact more vendors and drum manufacturers in order to have an adequately sized and spec'd vessel for this service. This project is still developing at this date but has been nothing except a learning opportunity.

Having the ability to monitor units daily and instantaneously is key to understand performance and stability. Using a data historian known as PI, I was able to create a standard format that will be used across the refinery to do just that. This page captures data such such as instantaneous values, min/max targets, 24 hour min/max values, and comments of expectations if

a data point is outside of target range. All the instantaneous value are retroactively formatted to display as one of two colors according to target ranges. This allows anyone from the engineering department, operations, or corporate to quickly open the page and understand if the unit is operating correctly. The format of this page was reviewed and modified several times within the process engineering group to create an agreed upon, standard format. To ensure the team and any new member understands how to customize a page on PI to reflect their respective units a walk through presentation was also created on how to do so. All units within the refinery will soon have one of these pages created which will help the department as a whole reach a goal previously set for the year.

One of the biggest highlights of this experience was that if I wanted to learn more outside of assigned projects, it was encouraged. The workload was entirely dependent on the work I was willing to put in. Being able to assist elsewhere and not being limited to a project list led to valuable knowledge that only helped me develop as an engineer. I learned useful practices such as creating excel spreadsheets for projected leaks, flare component compositions, spec sheets and much more. I was able to become familiar with Aspen HYSYS which gave me some modeling experience in industry. There was a time frame where I was even able to watch and learn the role of a process engineer during a unit shut down and catalyst replacement. The opportunities to become involved in so many divisions across the refinery were practically endless and allowed me to become familiar with all departments and more personnel.

With every fiber in my being I believe an oil refinery exercises all subjects learned through the CHME curriculum. From the beginning courses such as energy balances and thermodynamics, to heat transfer and fluid mechanics, through kinetics and separations, and even economics and controls. Every single year of my chemical engineering education and the

understanding of chemical process concepts was utilized to the fullest extent. The emphasis that the CHME department puts on being able to solve any type of problem and understanding the process of various chemical engineering units carries over perfectly.

Safety in the workplace is more than something that should be expected, safety should be a culture. Through this experience at a refinery I learned first-hand the importance to ensure safe work practices. I want to note that through the time span of my CO-OP there were several refinery/chemical plant explosions/fires in the news across the country. However, every day I felt safe going into the plant knowing the culture at this refinery and the drive from every single employee to work safely each day. Responsibilities in regards to my work, to name a few, included tasks such as: wearing proper PPE, communication with operations while in the plant, risk assessments, environmental impact evaluations, and coming to work each day with safety topics in mind. When in the plant it was vital to wear the proper PPE which at a minimum is fire retardant clothing, hard hat, hydrogen sulfide monitor, steel toe boots, and ear plugs. Additionally, operators had to be aware that I was in the plant and where I entered their division. They are aware of any potential hazards or work being done and it was my job to get the approval to whether it was safe to be in the area or not. Each division had an area to sign in, gain permits, and radio to call an operator if necessary. Anytime a process is modified or new equipment is needed it is the process engineer's job to complete a risk level analysis (RLA) and move through the MOC process accordingly. This considers safety of all employees at the plant and ensures everything is understood by all parties and has been evaluated to mitigate any safety threats. I learned safety within the refinery was not the only consideration to be taken, the community around the plant and environment are also huge factors. Detection systems in the flares and fence line are heavily monitored and anytime they go out of compliance action is taken

to immediately correct the issue at hand and data is gathered to understand the extent of the situation. Every day all meetings were kicked off with a safety topic and quick discussion around it. This is a practice that constantly kept safety in consideration and offered an opportunity to gain insight of safety precautions to be taken that were not previously considered.

Communication in the workplace is extensive and just as important as safety. There are so many different departments, divisions, contractors, and personnel that it is key information is conveyed correctly. As mentioned in a previous paragraph this included talking with operators to ensure it was safe for me to enter a unit. Every morning the process engineering team would sit down and discuss all divisions and their operating conditions. Any arising issues or threats would be communicated and plans would be put into place. Discussions with division foreman and subject matter experts were common if there were any issues, recommendations, or possible changes to be made. Anytime incidents occurred on company property an incident report was immediately written up and emailed to all employees. I constantly checked for these emails as they could include anything from hydrogen sulfide monitor hits, blocked off areas, and unit issues. All of which that are essential to be communicated quickly. The communication is constant across the refinery admin building and has to be to ensure all the departments are aware of operations, plans, and targets.

All in all, this experience with HollyFrontier at the Navajo site was phenomenal and connected all the dots from school to industry. It ensured me that working at a refinery was where I wanted to be. With that being said, I was offered a full time position following graduation in June 2020. I accepted the offer and cannot wait to begin my career as a Process Engineer!