

Jessie Linder

CHME 391

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Chevron Phillips Internship Experience

My name is Jessie Linder and I am from Cedar Crest, NM. When I was growing up, I knew I would end up in a STEM field. Both of my parents are engineers and I participated in every STEM activity I could. It wasn't until my senior year of high school that I decided on chemical engineering as my degree. Then, it was only a couple months before graduation that I picked NMSU. My interest in chemical engineering started when I was working in a research lab focused on nanomaterials and I realized chemistry was something that really clicked with me. As I started looking into various career paths for a chemist, I was always disappointed in the lack of real-world application and not thrilled about the required PhD in order to be successful. Chemical engineering caught my eye when I read about the large variety of industries which hire chemical engineers. This meant I wasn't locking myself into one path. In addition, a career could easily be started with just a bachelors.

When it came time to decide on a college, I was not originally interested in staying in-state. I felt that I could achieve significantly more if I went to an out-of-state "better" school. However, after touring various universities, I realized NMSU was the only school at which I was looking that consistently took students up to the next level. Many other universities are good at attracting high achieving, 4.0 students, so it is no wonder that when those students graduate, they go on to be successful. However, at NMSU, the average incoming student is just that, average, but the graduating students from NMSU CHME were comparable, if not more successful than those at the "better" schools. This showed me that the department really does work to build you into a great engineer. Currently I am a senior in the department and prior to my summer 2020 internship, I had completed up to CHME 307: Transport III: Staged Operations and CHME 441: Kinetics and Reactor Engineering.

For the summer of 2020 I accepted a process engineering internship position with Chevron Phillips Chemical Company in Borger, TX. During this internship I had two major projects. The first project was to develop a tool to overlay data from a batch process to optimize production. The second project was to troubleshoot pump seal failures on a set of problematic pumps and propose a solution.

The Borger plant manufactures Sulfolane in one of the process units. Sulfolane is a colorless and transparent liquid, mainly used in aromatics extraction, gas desulfurization, pharmaceutical intermediates, organic chemical solvents, and other fields. Some of the Sulfolane is further purified to reduce metals to an electronic grade where it can be utilized in the silicon chip manufacturing process. Sulfolane is produced in a batch process, with demand to push as many batches as possible per day. Raw data analysis identified that batch times and conversion vary significantly between batches but there was no obvious indicator as to why. My project was to build a tool that can overlay the data from the various batches to help identify the key factors impacting batch time variability.

Several years ago, I would have been completely lost on how to start. Now the CHME department has helped me become comfortable with vague project prompts. Starting from my first semester at NMSU, CHME 101 helped me learn how to take a large and semi-defined project and break the project into smaller individual tasks to achieve the end goal. In addition, it was clear this project was going to have some amount of programming involved. This was made much easier by having taken several CHME classes that heavily used MATLAB. As I began the project, I first needed to understand who was going to use this tool and what they needed it to do. This helped me get a list of what data I needed, and how it needed to be compared. Second, I needed to learn the process which entailed printing out a stack of P&IDs. I followed the entire process from start to end and found all the instruments that would help me in my data hunt. After gaining a much greater understanding of the process and my task, I ultimately chose to use excel to manage the data. I utilized VBA to automate the tool. The end result was a spreadsheet where a user would enter a start and end time and all of the batches within that window would be presented in the form of various graphs and tables that compared

conversion, usage of various chemicals, time, temperature, etc. Ultimately, the impact of the tool is to enable engineers to optimize the process resulting in decreased operating cost and increased production rate.

My second project was to troubleshoot a process which had several pump seals that failed significantly more often than expected. My task involved identifying a possible issue and then proposing a solution moving forward. Having taken CHME 323L: Transport and Instrument Lab, I had some experience with looking at optimal and sub-optimal pump conditions. Like the other project, the first goal was to understand the process. After understanding what I was working with, I needed to talk to the most knowledgeable individuals on this issue; the operators who actually work with the pumps. After talking to a variety of different groups and reading various operating procedures, I had determined that the most likely cause for the seal failures was running the pumps dry during product switches. To verify that I had the right cause I needed to compare seal failures with product switch dates. In addition, I talked to the operators about what indicators they used to shut the pumps off and evaluated if there was a better method. Ultimately, I determined that the level indication on the equipment was not sufficient to protect the pumps. I then put together a plan of what level indication I would use and where I would put it before I met with the project group to hand the project off.

A big part of my summer, as would be expected at any plant, was safety. Something I have noticed, is that the overall attitude of the employees directly responsible for maintaining a safe environment is the largest contributor to being safe. One of the things I liked most about CPChem is their willingness to talk about safety. Safety never felt like a taboo word, it was a welcomed conversation on any project, and any safety question I had was met with a thoughtful and educational response about the right way to do something. Starting on my first day, training included discussions about safe work practices by looking at a variety of scenarios and in teams discuss and present what went wrong and how could the incident have been avoided. A direct role I had with safety was helping on an incident investigation. My role in this investigation was to help with the calculations about the condition of the equipment at the time of the incident

to try to determine a cause. During this investigation, it was clear the timeliness and high priority that was placed on addressing the incident.

Beyond the established safety practices, having the internship take place during COVID-19 was a perfect opportunity to see how seriously a company and its employees value health and safety. Every morning everyone had to go through a temperature check, wear a mask both inside and outside in the plant, and there was an alternating work from home/work in the plant schedule to help prevent an entire department from getting sick if one person did happen to bring COVID-19 into the work place. Everyone took these measures seriously which I believe is a big part of why I never saw any negative impact of COVID-19 during my time there, whereas other interns at other companies had stories about large groups of employees being sent home to quarantine.

Another impact of COVID-19 was on workplace communication. Communication at this internship looked very different than what I had seen in the past. The easiest way to get in touch with people was no longer walking to their office or catching them after the morning meetings. Most of my communication was through email or another non face-to-face contact method. To be efficient in this communication I needed to ensure my messages were organized, thorough, and clear. Additionally, communication was very important at the end of the summer when projects were handed off. In the case of the batch optimization tool, I needed to ensure that the end user was happy with work I had done, understood how to use it, and ensure that I left a detailed note about the tool so that when I was gone all of my knowledge from building it didn't leave with me. In the case of troubleshooting the pump seals, I wrote a front-end loading document for my proposed solution and had a meeting with the projects group to ensure that my work that had been done to identify the issue was clear and sufficient in order for them to turn it into a project proposal.