

South Dakota School of Mines and Technology
Cooperative Education Student Report

Submitted in Fulfillment
of the Requirements of
CP 297

Employed By
Zucker
at
Scottsbluff, NE

Prepared By
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31 August 2010

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Attention: Dr. David Dixon, CBE Department Co-op Coordinator

Subject: Cooperative Education Student Report

I am pleased to submit this "Cooperative Education Student Report," in fulfillment of the requirements of CP 297.

The information in the attached report is based on my experience working for Zucker in Scottsbluff, NE from January 2010 through the present.

I worked on a wide variety of projects throughout my time with Zucker. Much of the information dealing with the projects is classified as intellectual property, and I cannot go into specific details. I did my best to provide a general overview of my entire experience, despite this restriction. My employers evaluation form will be forwarded to you in a separate letter.

If you have any questions, please do not hesitate to call. My phone number is listed above.

Sincerely,

Justus Liebig

Enclosure

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ABSTRACT

“Cooperative Education Student Report”

by Justus Liebig

Accepting a co-op with Zucker in Scottsbluff, NE was one of the best decisions that I have ever made. In the eight months I was working I learned more than I could have ever imagined. I had the opportunity to work on many various projects throughout the plant, each one teaching me something new. The wide variety of projects allowed me to work in many different areas of the plant with a diversity of people. Through my experience I developed many invaluable skills, such as people and problem solving skills. I will be able to come back to school with not only heightened technical skills, but also with friendships and many fond memories.

1. Introduction

For the past eight months I have been working for Zucker in Scottsbluff, NE. When I decided to accept a co-op in October, I can honestly say that I had no idea what to expect. Looking back, I believe that deciding to come and work in Scottsbluff was one of the best decisions I have ever made. Working in an industrial setting has allowed me to experience first hand what life may be like for me after I graduate college. I have spent the majority of my time here working on various capital projects throughout the plant. Project management has allowed me to learn more about chemical processes in general and also to develop many skills that will be invaluable in the future. I believe that I have truly grown not only as an engineer, but also as a person.

2. Project Management

Project management and engineering encompasses much more than I originally thought. During my first few weeks here I met with my supervisor and received a list of projects to work on. Each project had a completion date goal. For the most part, the project completion goals were months away. Initially, I remember wondering why my supervisor thought it would take so long to get these projects completed. About a month later I looked back on the completion dates and thought that there was no way I would have the projects completed by the required date. Each project presented different problems and complications, as well as opportunities to work in different areas of the plant with different people.

2.1 Condensate Recovery System

In terms of technical skills this has been my most challenging project. In an effort to reduce costs and sewer loading, there has been a plant wide initiative to figure out what exactly is being sent to the sewer and how to eliminate or reduce some of these things. During this study a few different condensate sources and potential uses for them were found. My project was to figure out how to best move the condensate from point A to point B. I began this process familiarizing myself with systems. The best resource for information on the systems was usually the plant technicians. They were able to tell me what worked about the current system and what would work better. From this point, I was able to do the necessary engineering for the project. This included everything from calculating pressure drops and determining if the existing pump and piping were adequate, to sizing water filters to ensure the system would not become clogged. After I had figured out exactly what was needed to implement the new system, it was only a matter of gathering quotes to figure out approximately how much the job would cost and getting it approved.

2.2 Chiller Replacement

This project involved finding a replacement for a chiller that was in pretty bad shape. The chiller supplied the air-handling and was in effect, the air conditioning for the entire building. This project was tricky because everyone had a bit of a different idea of what exactly was needed. It was clear that we needed a new chiller and that we did not want to buy the same kind that we had already. I got proposals from various companies and figured out which chiller was not only the most reliable, but would also be fairly

easy to install and reasonably priced. We ended up deciding to go with a company that we did not work with very much. Once the type of chiller was figured out, the main concern was installation. The current chiller would have to be taken out of service and drained before the piping tie-ins could be made for the new chiller. Disconnecting the current chiller meant that the building would have no air conditioning throughout the entire switch. I did a lot of planning to make sure that the switch would go as smoothly as possible. I had the pipe fitters and electricians do pre-fabrication work before we took the original chiller down. Also, I had to find a date that a technician from the chiller company could come on site to startup the chiller. As it worked out, the building was without air conditioning for about two and half days. Hopefully, the new system will be reliable enough to make those two days worth dealing with the heat.

2.1 Other Projects

Clearly there is no way that I can go into detail about all the projects I have worked on. The condensate recovery and chiller replacement were only a few of the projects that I have spent time on. Other projects that I worked on include installing a conductivity probe to detect leaks, installing a safety shower and eyewash station, installing wall fans and louvers for increased building ventilation, working on insulation improvements, profiling the ion exchange beds, and installing a fall protection platform. While not every project required the technical skills of the condensate recovery or the planning behind the chiller replacement, each project added to my growth as an engineer by providing another opportunity to further develop necessary skills.

3. Lessons Learned

Some of the most important lessons I have learned during my time here are not even things that I can describe on paper. Overall, I have more confidence in my ability to be an engineer. I have learned a lot about different chemical operations and project management. However, it is the skills that cannot be taught in the classroom that will be the most valuable to me. Among these skills, are people and communication skills, problem solving skills, and, of course, real life chemical engineering skills

3.1 Real Life Chemical Engineering Skills

When I first got involved with my projects, my thoughts were “How hard could that be?” It was not until I really started working on things that I realized everything was much more involved than I initially thought. First, it had to be determined exactly what was needed and how that was going to be accomplished. Often times, a project would involve more than one area of the plant, and the effects on all areas had to be considered. To accomplish this feat, certain people needed to be contacted, and more often than not everyone had a different idea about what should be done. After it was decided exactly what was needed, how the project was going to be carried out had to be determined. Quotations for equipment and installation had to be obtained. Paperwork had to be filled out. Finally, the whole project had to be approved by numerous people before anything could happen. In the end, most projects ended up taking about five times as long and costing ten times as much as I would have originally thought.

At first, I was pretty frustrated by this whole process. I was not exactly sure what my role was in getting everyone involved and on the same page. I felt like I spent most of

my time waiting around for other people to get back to me. However, after a while, I realized that this was just the way things went. Also, once I got more experience, I was better able to predict what the hold ups on a project would be. Doing this allowed me to deal with the problems earlier, and as a result I would not spend nearly as much time waiting around. These real life engineering skills are not something that can be taught in the classroom. Thus, I am thankful for having had the opportunity to learn how to deal with project hang ups.

3.2 People and Communication Skills

In school some professors start out the semester by putting up a list of things that employers look for in students. It never fails that people and communication skills are number one on that list. After working here I finally understand why. I was shocked by how much of my time I spent dealing with people. I worked with everyone at the plant from operators to the facility manager. Whether it was meeting with people about their ideas for a project, seeking advice from area experts, working with vendors and contractors, or getting with people for project approval, I quickly realized that everyone had slightly different ideas and needs. It was important to be able to find a solution that worked for everyone, while being careful not to step on anyone's toes.

Dealing with people was the part of the job that was simultaneously the most challenging and also the most satisfying. There were days when I was so frustrated after dealing with some people that I would have to leave the plant for a while to calm down. Conversely, there was nothing quite as rewarding as the big goofy grin on the

technician's face after the fan that he wanted was finally installed. Fortunately, most people went out of their way to help me and ensure that I had a good experience.

3.3 Problem Solving Skills

Working for Zucker has also provided me with the opportunity to truly develop problem solving skills. Nothing ever goes exactly as planned. It is important to be flexible enough to deal with all of the unexpected things that come up. The time I most relied on my problem solving skills was when the chiller was being installed. For the most part, things went fairly well until we went to pump the refrigerant back into the system. When we drained the system, we had pumped the refrigerant into a tote and were trying to pump it from the tote back into the chiller. After we had about half the tote pumped back into the chiller, I walked outside to make sure everything was going okay. Immediately, I see refrigerant shooting out of the chiller about four feet into the air. I probably stood there for about five seconds in shock before running back inside to shut off all the pumps. It turned out that there was a small air vent on top of the evaporator that had not been plugged off during installation. After this was fixed, we had to pump the refrigerant from the chiller dike back into the tote and start over. This time things were going really well. We finished off the tote and were working on a new drum when one of the contractors ran inside waving his arms and shouting my name. I ran outside to find glycol pouring out of the bottom of the evaporator. The problem this time was that the "permanent" drain plug had not been installed, and once the pressure got high enough, it blew the temporary plastic plug out. It was the same drill again, running to maintenance for parts, pumping the refrigerant back into the tote and finally,

pumping it from the tote back into the system. Needless to say, it made for quite a day. However, I did learn exactly how important it was to be able to deal with whatever happened and not get too stressed out about it.

4. Conclusion

I would not trade my experience here for anything. I have learned so much that I will be able to take with me. On my return to school, I believe that classroom work will be more meaningful because I will be able to relate what I am learning to the real world. I also believe that when I do graduate, my transition into the workforce will be much easier because of my experience here. I feel more confident in my ability to be an engineer and have acquired the knowledge to clearly define a future career path for myself. However, just as important as all of the knowledge and skills, are the friendships and fond memories.