Gasification is an old technology that has recently garnered a lot of attention because it can harness energy from the vast amount of coal in the US and abroad. Gasification is the process of applying heat and pressure to organic materials, in this case coal, and harvesting a mixture of carbon monoxide and hydrogen called syngas. This syngas can then be put through a traditional gas turbine to produce energy.

One of General Electric’s main subdivisions is Infrastructure. The Energy Division is part of Infrastructure, and Gasification is a part of Energy. I was on the process design team within Gasification. GE has a contract for a gasification plant in Indiana. The plant is divided into “subsystems” based on the order and function of the equipment. My mentor was in charge of an area that major equipments including the radiant syngas cooler, the slag crusher, and a high-pressure steam drum.

My main task was the Critical Component Review (CCR) for the Slag Crusher. A Critical Component Review is simply a review required for all components deemed to be critical to operation of the gasification plant. The slag crusher is one such equipment. Slag is the left over gunk from heating the coal under high pressure. The Slag Crusher takes slag and crushes it up prior to disposal.

Basically I was executing a thorough consistency check on the Slag Crusher to make sure that all the Slag Crusher parts would fit together, and that the unit would tie into the rest of the plant correctly. This meant reviewing about 80 technical drawings and many pages of specifications. I would mark down inconsistencies, mistakes, and clarifications and they would be sent back to the vendor for review. After several iterations of this process, we have recently received final revisions of many of the drawings and have sent them to the original customer.

Many of the documents I reviewed are standard documents that exist in the engineering phase of any chemical plant. I reviewed Purchase Order Specifications (PO Spec) that mentioned exactly GE wanted from a vendor. There were Process Data Sheets (PDS) that detailed all process information pertaining to an equipment. The Basic
Engineering Design Data (BEDD Document) outlined all plant utilities available and geographical conditions. I also worked with Piping and Instrumentation Diagrams (P&ID) that illustrate the fine details of the equipment including connection sizes and controls. Utilizing all these documents and other data, I made checklist for the CCR review. Learning how to use all these different types of documents is a requirement for many chemical engineering jobs and is a valuable skill to acquire.

Even outside of the technical realm, I learned a lot about the work world during my stay. For example, prior to this work experience, I underestimated the amount of communication necessary in an engineering job. The Slag Crusher was contracted out to a vendor in France. That vendor contracted out the required hydraulic motor to a vendor based in Sweden, but we worked with their Ohio office. We of course, were working the original customer, and the equipment had to tie into the infrastructure provided by a fourth company. This meant that we were constantly communicating through email, telephone, as well as more formal information requests with all concerned parties. Keeping track of the “scope of supply” for each company was a challenge. In addition, I familiarized myself with the document control system. Getting access to all the necessary systems and libraries was a task in and of itself. Documents must be uploaded to the appropriate databases, keeping in mind who needs to be notified of the change and what databases they have access to.

Gasification is the perfect place for anyone studying chemical engineering. The gasification plant is a huge chemical plant, and nearly everyone working on it was educated as a chemical engineer. This was a great opportunity as it allowed me to see what real world chemical engineering work was like. In my view, the most important thing I learned was what is valued in an engineering work environment.

My main source of training was my mentor. He was the person I went to for information whenever I had a question regarding the chemical engineering aspect of the job. I also had access to GE MyLearning site that hosts many online courses to familiarize myself with different aspects of GE business. Throughout my stay I got to know many people and I found them to be kind and willing to help me out without exception.
The Gasification offices are located in Houston, Texas. I was raised in Houston and lived with my parents during this co-op, so I did not have to go through the process of looking for housing etc. Houston is big city and there is a lot to do. Living in Houston pretty much requires a car as it is a very spread out city. The GE office itself is located near the Galleria and you can find any kind of food within a five-minute drive. Also, Rice Campus is less than twenty minutes away.

The best part of this job is that it is a clear window into the day-to-day work of typical chemical engineers. It shows how engineers fit into a large company and illustrates what skills are valued. I came here not really knowing what to expect or what I wanted to do for a living. I now feel that I can make a much more informed career choice. This co-op has given me a sense of where I want to go and how I can get there.
John Ligos  
NetID: jjl65  
Mechanical Engineering  
GE Energy  
Fall 2008  

Work Assignment:  

As a Co-Op student at GE Energy in Schenectady, NY, I worked as a member of the Systems Design and NPI team of the Generator and Electrical COE Group. The group, as a whole, is responsible for the design of GE’s electrical generators that are driven by gas and steam turbines at power plants around the world. The Systems Design and NPI team is specifically tasked with the optimization of generator system performance of new units and the modification and upgrading of existing generator models. The team specializes in the analysis of the electromagnetic, ventilation, and heat transfer in the generator, as well as in being able to identify and apply innovative concepts and ideas to optimize generator performance and reduce costs. The Generator and Electrical COE group is part of GE Energy, which falls under GE Infrastructure, one of the major businesses within General Electric.  

During my rotation, I worked primarily with a small group within the NPI team, the Aero and Heat Transfer group. One of the lead engineers within this group was my assignment leader who assigned and supervised the three major projects that I worked on during my rotation. However, throughout the course of my rotation, I worked with and got to know the other members of my group who were more than willing to offer advice and assistance, as well as pass down work if they needed help with another project. I also had the opportunity to work with members of the Generator Requisitions team during my work on a new heat exchanger specification for the generators, to be used by the Requisitions team in ordering heat exchangers from external vendors.  

My first few weeks involved some smaller projects, such as the analysis of fluid flow in ducts to support work being done by members of the team. This project allowed me to become more familiar with Microsoft Excel and Visual Basic, which are common tools used in many analysis applications. In addition to these smaller projects, I sat in on a few team meetings and design reviews, as well as read reports, or design practices, detailing the analysis and design of key systems within the generator itself, especially the ventilation and cooling systems. This allowed me to gain a better understanding of how the team functions and the types of assignments I was going to have.  

One of the main projects of my rotation was the revision and release of a new heat exchanger specification to be used by the Generator Requisitions team to spec and order generator heat exchangers from external vendors. The main purpose of the project was to standardize and document the heat exchanger ordering process in order to prevent quality mistakes and support the global sourcing of heat exchangers. My first assignment was to develop an Excel tool to generate the heat exchanger specifications from the data output of a computer model. However, as the project moved forward, I became more involved
in working out the logistics of the new ordering process, and I had the chance to work with members of the Requisitions team and some of the heat exchanger vendors to ensure that the changes to the ordering process and specification met their needs. During my final few weeks, we were in the process of releasing the first of many new heat exchanger specifications.

My other two projects were much more analysis based and I mainly worked with my colleagues within the Aero and Heat Transfer group. The first was the development of a tool using Visual Basic to mine a database of generator design proposals, and analyze the heat exchanger performance for each generator design. The tool was specifically designed to employ a few methods to quantitatively analyze by how much a particular heat exchanger was over-designed for a given application. This information could ultimately be used to design a heat exchanger that meets the necessary specifications, but does not have significantly more performance capability than needed. Overall, this would result in cost reductions and a more optimized heat exchanger. The second project involved the modeling of the fan blades used in the ventilation system of the generator. My task was to develop a tool using Visual Basic, capable of generating a number of different airfoil and fan blade designs from a user's input of various design parameters. The tool then generates the necessary input files for a CFD analysis program that one of my colleagues uses to analyze the fluid flow around the blade and the overall performance of the fan blade itself. Overall, the tool will help to reduce the time and effort involved in designing and analyzing generator fan blades. I also had the unique opportunity to assist one of my colleagues with some of his work at General Electric's generator fan test facility at Rensselaer Polytechnic Institute. It was great to see something I was working on and learning about, and to experience a more hands-on side of engineering that I could not get in the office. Overall, both of these projects allowed me to develop some important technical and problem solving skills, while at the same time allowing me to gain a better understanding of the design process and engineering that goes into designing some of the complex systems within GE's generators.

Learning and Development:

The work I was tasked with was directly related to my major in mechanical engineering. One of the great advantages of this opportunity was that I got the chance to see how some of the principles of heat transfer and fluid mechanics from class are applied in engineering practice. I also greatly appreciated how members of the team were more than willing to help and to talk about many of the interesting projects they were involved in. I have enjoyed my work and could certainly see myself pursuing a career as an engineer in the energy industry.

After talking to numerous team members at GE, I have decided that I want to continue my education after I graduate. I am interested in pursuing a master's in mechanical engineering in graduate school, or applying for a position in one of General Electric's leadership programs where I can pursue a master's degree while working for General Electric. Overall, this has been a very worthwhile experience, as it has given me a better idea of what I would like to do after graduation and a better sense of what to expect when it comes to pursuing a career as an engineer.
Life Outside of Work:

For housing, there are limited availabilities in Schenectady that offer short term leases. Finding housing around nearby Union College may be the easiest option. However, according to a couple of my friends at Union, off campus housing is not nearly as popular as it is at Cornell, so finding housing can be challenging. I found a nice apartment complex about a block away from Union College, and less than five minutes from the GE plant. Using one of the housing search sites suggested by the Co-Op office is a helpful start, but contacting past Co-Ops is the best way to go. Also, GE does offer a $600 a month stipend for housing if your permanent address is outside a 50-mile radius of the GE campus.

There will most likely be a bunch of other Co-Ops working in Schenectady during every rotation. A group of us would go out to dinner once a week to try some of the many restaurants in the surrounding area. Many of us also played volleyball and soccer regularly after work, taking advantage of the very nice athletic fields and workout facilities at GE.

While you can get by without one, having a car is nice. Hiking and skiing in Vermont, trips to New York City, and visits back to Cornell are all within driving distance. Most weekends I did not stay in Schenectady, as I took advantage of the opportunity of not having schoolwork to visit family and friends at home and to travel back to Cornell to play for the club lacrosse team.

Evaluation:

Overall, my Co-Op with GE Energy has been a great experience. I have most enjoyed having the opportunity to work with and learn from the members of the NPI team who were always willing to share their experiences and expertise. I also feel that I will return to school in the spring with more focus and a greater appreciation for what I am learning, and where I would like my career in engineering to head.