As part of the Silicone Process Technology division in Waterford, NY, my assignment consisted of several core projects and numerous smaller, support tasks. The silicone family is the foundation of numerous products such as sealants and adhesives, rubber, and foam products for use in numerous applications such as construction, electronics, and personal care. The Waterford, NY site is the largest Momentive location in the United States and is home to over 1000 employees.

My projects were extremely immersive and collaborative in nature, and by the end of the term, I had worked to some degree with almost half of the entire Technology department in Waterford, as well as another dozen or so mechanics, technicians, contractors, and manufacturing engineers out in the plant. My supervisor was the NPI (New Product Introduction) Leader for the Waterford site, and my office-mate, who acted as a mentor, was an NPI engineer. However, most of my projects did not involve introduction of new processes but rather modification and continuous improvement of existing ones. Over the course of the term, I was able to develop an excellent relationship with my supervisor. Not only did I report to him, but I was also able to work directly with him on several projects, and this level of collaboration made my work experience much more enjoyable.

Most of my projects focused primarily in an area within the plant that, in which liquids and solids are fed continuously to process equipment and mixed to form a product. My focus was improving the capacity and capability of the mixing equipment by making modifications to core components of the machines. These projects included building and installing a modified funnel that would improve solids feed intake by eliminating several design flaws in the existing model; working with the equipment vendor to develop a new design that would better suit the properties of current grades.

Another project required me to use torque deltas and corresponding heat transfer calculations to gauge the effectiveness of using wider outlet piping so as to reduce backpressure and subsequently the temperature of a product that was bordering on the threshold temperature value for product degradation. After wider – and consequently, much heavier – pipe was determined to be a plausible solution, I had to work with the building maintenance leader to create an efficient method for the operators and mechanics to easily transport, install, and dismantle the significantly heavier pipe whenever this product was run. I also worked on several other projects that were designed to improve capacity and rates such as the installation of a new filler feeder and a feeder controller upgrade.

One of the biggest problems facing several of the products is variable product stability. Unfortunately, product stability experiments need to occur over months, if not years, depending on the product. In the past, variation in product stability seemed to be somewhat of a random occurrence. For example, one batch of product would have product stability two or three times greater than another. My goal was to develop an accelerated aging test based on first principles of fluid mechanics that would allow us to develop a correlation between the accelerated aging and real-time aging. This project was extremely collaborative and I worked with chemists, engineers, and an engineering consultant who was also a Six Sigma statistical analysis expert to develop a “Design of Experiment (DOE)” that would allow us to use the accelerated aging test as a tool to determine which factors of the product formation in the plant would lead to changes in product stability.
The final major project that I worked on was a lab-scale process design for a solvent-less continuous process to produce a product. This project was designed to assess the initial feasibility of converting a process that was currently run in batch cycles to a continuous process. My task was to apply principles of heat transfer and fluid mechanics to size static mixers, heat exchangers, chillers, determine required temperatures for the cooling/heating fluids, and to make recommendations regarding which vendors to choose in order to produce ~1000g/hr of product a specified temperature.

One of my learning objectives was to improve my verbal communication and presentation skills and I was given ample opportunity to do so throughout the term. I gave several presentations including a large presentation at the end of the term detailing my endeavors throughout the co-op session in front of twenty of my peers. On a smaller level, I also served a support function by pushing smaller projects to completion by obtaining the required approvals and signatures needed for the project to continue. This involved obtaining an intimate understanding of the processes in question so that I would be able to answer all questions posed by the various specialists who needed to sign off on the project. These smaller support tasks helped build my knowledge of silicone chemistry, which proved to be very helpful when I worked on larger-scale projects.

On the first day of work I attended a safety training seminar and afterwards I had to pass a quiz to ensure that I was aware of plant safety. These training sessions were quite useful as I often spent a lot of time out in the plant. The hallways of my office building were reminiscent of the halls in Baker Lab, with laboratories flanking the corridors. I was immediately outfitted with steel-toe boots, a lab coat, and a hard hat. I was also given prescription safety goggles. Lab coats, safety shoes, and the goggles were mandatory when working in the lab, and going out into the plant required wearing a hardhat. I shared a comfortably large – and newly renovated – office with a PhD chemical engineer who had begun working at Momentive in July. Immediately, she served as an excellent mentor and we would have regular, informative discussions on our current projects. Additionally, there was never any hesitation on my part to call one of the chemists or engineers whenever I needed assistance because they were all willing to offer help whenever I requested it.

Working in a chemical plant where numerous hazardous chemicals are used led to a number of unique situations that gave me an interesting picture of the dangers of working in a facility of this nature. In early November, an unexpected Hydrogen chloride (HCl) release resulted from a line rupture inside a production building, forming a massive HCl cloud – the largest in 20 years – that caused the adjacent highway to be temporarily shut down and for us to be placed under lockdown in our building for an hour while the cloud dissipated and the wind took it in the opposite direction. Though nobody was injured, and while our building was never in any serious danger, it was quite an interesting experience to see how such an event is handled in the real world – and it’s certainly an event I probably will never forget.

Other unique experiences involved having to deal with the company’s transition from being GE Advanced Materials to Momentive Performance Materials. Although it had been almost a year since the company became Momentive, the transitional period was still ongoing and this led to numerous minor annoyances such as a problematic e-mail and server migration. However, this gave me a more in-depth
view of the inner workings of a company. I also received all of the company-wide emails and attended the quarterly financial meetings, so I got a firsthand look at how a large business operates financially.

Momentive did not provide any assistance for my housing search, but rent is fairly inexpensive in the area and I was able to sublet a large, fully-furnished luxury apartment for $500/month via Craigslist. Momentive did, however, cover moving costs at an excellent rate, and this helped to cover all of the money spent on gasoline throughout the entire term. Clifton Park, the town of my residence, is a suburb about 15 minutes north of Albany, and my apartment complex was within one mile of a Price Chopper, a Super Walmart, Target, Office Max and a host of other department stores and restaurants. The town of Clifton Park is quite nice and my commute to work only took about 15 minutes each way. I was also about 15 minutes away from the Crossgates Mall in Albany, which is one of the largest malls in New York. Many weekends I either drove back home to central Massachusetts or drove to Cornell, as my location was equidistant and relatively close to both.

There wasn’t really all that much to do outside of work, and I spent most of my time on the computer, at the gym, or watching TV. I went to several movies throughout the term with a fellow chemical engineering co-op at GE Energy as well. While the writers strike hindered my ability to watch new episodes of my favorite shows, I was able to watch sports to my heart’s content.

Overall, my experience was excellent. While the silicone industry isn’t exactly glamorous in nature, I was put to work on useful projects and I was able to see the results of many of my projects by the end of my term. I was constantly challenged and at any given time I had several different projects to work on. Although I occasionally had to work overtime to complete all of my work, my projects were fulfilling enough that I had no reservations about doing that. The employees are all extremely friendly and helpful, and the atmosphere made it an easy decision for me to come back to the same function for the summer term.
As I wrote in my first job summary, one of the biggest problems facing several of the products made in a particular area of the plant is the issue of product stability variations. Because product stability experiments need to occur over months, if not years, depending on the product, an accelerated aging test was required in order to develop a correlation between the accelerated aging and real-time results. Through the use of Six Sigma tools such as “Design of Experiment (DOE)” we could determine which factors of the product formation would lead to changes in product stability.

Due to the study necessitating a correlation between accelerated aging and real-time aging, the samples had to sit for 6+ months before the data could be analyzed and correlated. This coincided perfectly with me returning for the summer, and I was able to pick up right where I left off. This project involved me learning and using advanced statistical tools to design and analyze models. I received formal and informal training in the use of two statistical programs, Minitab and Design Expert, that helped me analyze the data generated from the experiments that were conducted. I learned to read and understand ANOVA analyses, infer data from diagnostic charts, and apply model transforms as necessary. I also learned to read process data for the production machine.

One of the best things about my projects was that several of my projects informed the main product stability study, and I was able to see resolution in my main project because of the work that I had done on the smaller ones. During my first term, I also worked on process capability improvements and was able to implement physical changes to realize such improvements. Because of the work that I had done during my first term on improving the capability of the production equipment, many of the concerns that were previously present were no longer there. As such, the tradeoffs that once existed between different product quality attributes became obsolete. This was proven when a DOE was conducted out in the plant and the product quality remained relatively constant as different factors were changed.

In the end, I was able to offer recommendations on how to improve product stability based on strong evidence. I was able to develop a correlation between accelerated-aging and real-world data and I identified critical production variables to improve product stability and quality.

Unlike my previous term in the fall where I was the only co-op/intern, there were nearly thirty interns working at Momentive this summer – although almost all of them were either in manufacturing or finance. While I rarely interacted with the other interns on projects, Momentive did an excellent job organizing events and training exercises for all of the interns. The formal training included the introductory courses on Lean Manufacturing and Six Sigma that are taught to employees seeking their Six Sigma Green Belt. Outside of work, the interns scheduled a weekly dinner at local restaurants, and there was a large intern event that took place in the middle of July.

One of the major negatives about working during the summer is that many of the full-time employees use their vacation time during these months. Out of my 10+ work weeks this summer, my supervisor was away on business or vacation for three of them, while several members of the team also were on vacation for week-long stretches. In contrast, I do not recall anyone that I worked with using their vacation time until the end of December during my first term.
Momentive offered some short-term housing suggestions for the summer, but instead I subletted a room in a house that I found through Craigslist. Momentive provided a housing subsidy of $125/week that covered almost the entirety of the rent I had to pay. Momentive also covered moving costs once again, and the money that I received for mileage covered most of my gasoline expenditure for the entire term. I found that living in a house was much nicer than living in an apartment, and the two roommates that I had were really enjoyable to live with, even though they were in their thirties. I once again lived in the town of Clifton Park and the commute was about 15 minutes to work via back roads. Note that a car is required to work here – there is no way you can get around this area without one.

There was a large Planet Fitness two minutes from where I lived, as well as public basketball and tennis courts nearby. There was also a large swimming pool at the house that I stayed in, which was a luxury in the summer heat. I didn’t really take advantage of the location as much as I probably should have, and I spent most of my free time either at the gym or sitting around the house. However, there are plenty of things to do in the area: many coworkers would go to AAA baseball or arena football games; some frequently went waterskiing on Lake George; others would go to the racetrack in Saratoga. It is also very easy to go to New York City from Albany by train. Because I worked a large number of weeks during the first term, I was able to go on a family vacation to Italy for two weeks at the end of July, which was an excellent experience.

Because my focus during this summer was on the product study, I did not do much chemical engineering work during this term. I was familiar with the chemistry of the applications that I was studying because of my experience from the first term, and I was able to make informed decisions regarding the planning of experiments because I understood the chemistry. I found that knowing how to do statistical analysis is critical as an engineer – and I found I enjoyed doing it as well. Weekly courses taught by a Six Sigma consultant were offered to the technology department this summer, and I plan to further my knowledge by taking some statistics classes when I return to Cornell.

My overall experience with Momentive was excellent. Throughout the course of both terms, I was able to absorb tons of information through stories of past experiences that my coworkers would tell me about. These stories were invaluable because they were a true representation of the working world and would never be taught in any college class. It was after hearing some of these stories and experiences that I was able to make or augment decisions regarding my own academic- and career-path.

My experience with my supervisor was extremely collaborative during both terms. Many of the job summaries that I have read for other companies indicated that many supervisors were people that the co-op student saw once or twice a week for a brief meeting. In my case, I worked directly with my supervisor on many projects, and it was this collaboration that allowed me to learn more – especially when I took the opportunity to lead projects like the product stability study.

It was an interesting experience working in a chemical plant, and because I was in the technology department, I got significant experience working in a lab setting, an office setting, and even a plant setting – needless to say, all three are quite different. One of the most critical components of the co-op experience was learning to manage relationships, especially out in the plant. I learned to exhibit leadership qualities because I was able to manage relationships effectively. Further, by showing that I
was capable and interested, I was able to garner the respect of my coworkers. My coworkers treated me as a professional engineer and not just a co-op student, and, as a result, I was able to take meaningful projects with critical business implications and see them to completion.