Jaime Marie Velasquez
Ch E 391 Industrial Employment

Summer 2014

My name is Jaime (pronounced Jay-Me) Marie Velasquez and I was born and raised in Santa Fe, New Mexico. I attended St. Michael's High School where I participated in Varsity Cross Country, Basketball, and Track & Field as well as National Honor Society, National Spanish Honor Society, and Concert Band. My mother Deanne teaches kindergarten and has recently completed her master's degree in ESL (English as a Second Language), and my father Larry is a Civil Engineer retired from the NMDOT and subsequently dabbled in launching his own engineering LLC, has just completed his PTOE certification and is currently employed by Los Alamos National Labs. My sister Alicia is currently in Nursing School and has just passed her LPN exam, and will sit for her RN exam in the spring. My childhood experiences were diverse and many, and greatly influenced my love of learning, my eagerness to try new and exciting things, especially feats that scare me or that seem impossible.

Any one that knows just a little bit about me knows that my path to Chemical Engineering has been a tangential adventure. What it amounts to is the undeniable fact that I have this incredible knack for being one of the luckiest people I know. Two years ago, I was a biology pre-med major taking Organic Chemistry, and as fate would have it I sat next to a group of obnoxious chemical engineers whose comradery was infectious, and whose humor might have been as corny and nerdy as my own. Once I investigated further and sat down with the department head, the small size of the program, sense of community, and obvious academic rigor/suicide had me sold. I can honestly say that joining the Chemical Engineering family here at New Mexico State University (NMSU) has been one of the best decisions I have ever made, personally as much as academically.

This semester, I am a junior in the Chemical Engineering program, which means that I have successfully passed Ch E 301 and Ch E 305 (Thermodynamics I and Fluid Transport Operations) and am currently enrolled in Ch E 302 & 302L, and Ch E 306 (Thermodynamics II and Heat & Mass Transport Operations).

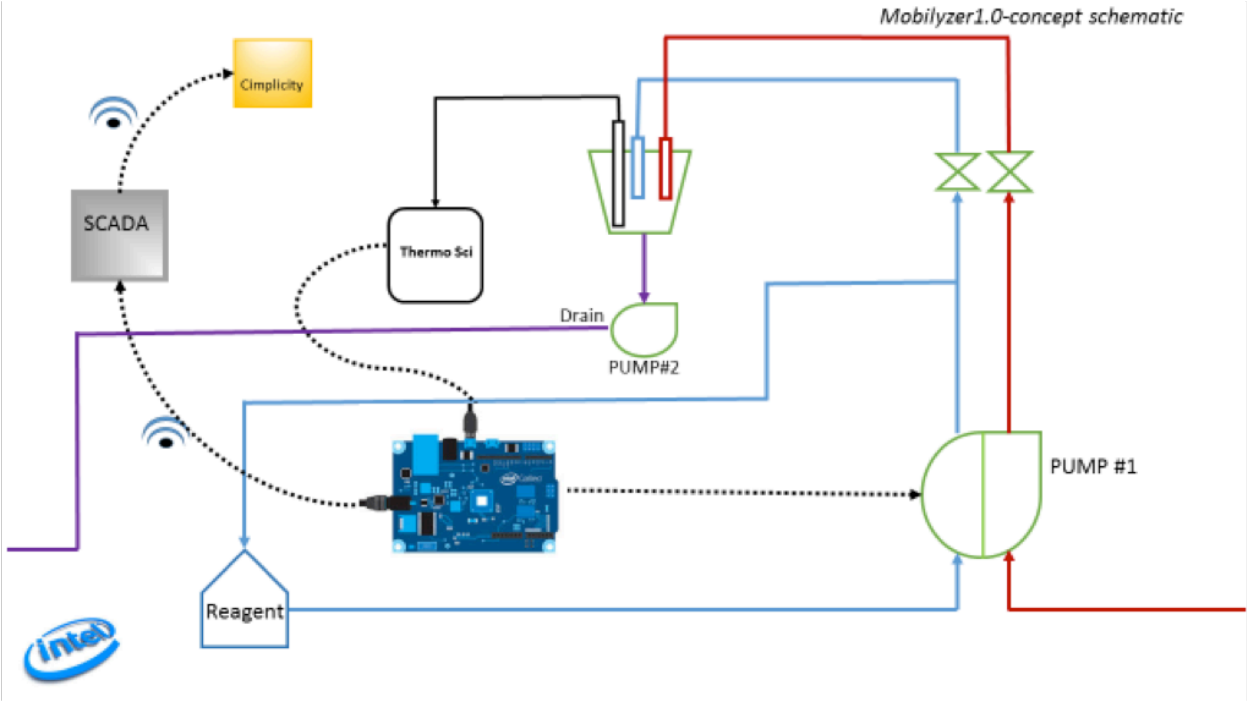
This past summer I had the incredible opportunity to work as an undergraduate technical engineering intern at Intel Corporation Rio Rancho site. My intern experience was very unique in the sense that I was fortunate enough to be recruited for the internship based on my work with New Mexico State University at Aggie Innovation Space, (a low resolution design and prototype facility), and as such I was able to choose which projects I wanted to work on. I sat down with my supervisor Mindy Koch, area manager of the UPW/IWS (Ultra Pure Water/Industrial Waste Systems) group at the beginning of the summer where it was decided that my work would be a mix of technical chemical engineering, technical writing and documentation. We also discussed the opportunity to develop professional soft skills to help me get a feel for which aspect of industry I could see myself being passionate enough about to pursue as a career. The overarching objective of my work was to develop an overview as to how my respective position and function fit in with the big picture of wafer and industrial technology production.

I worked on five different projects over the course of my summer internship. In the realm of technical engineering, I worked on the Hydrogen Fluoride (HF) Sensor project, as well two energy conservation/cost reduction projects in the Ultra Pure Water and Industrial Waste Systems group. On the more research and technical development (R&D) side on my internship I was the project lead and project manager for our intern project. The scope of this intern project was to launch an Internet of Things (IoT) industrial based innovation space much like our own Aggie Innovation Space in five weeks. In addition to the technical engineering and R&D, I also had the opportunity to work with Intel Corporate Affairs and the NMSU College of Engineering to design and organize the first Galileo Design Challenge. For this event NMSU's Aggie Innovation Space hosted a workshop about microprocessor basics led by Intel engineers. The participants were then challenged to "go off and do something wonderful", to quote Robert Noyce, one of Intel's founders.

The HF Sensor Project is a working prototype developed for Intel MakerFaire, a festival celebrating ingenuity and innovation of the Maker movement. The scope of the HF Sensor Project is to replicate the basic functionality of the Applikon (which is a sophisticated chemical analyzer) mechanism to sample and verify water quality/concentration of fluoride out in the field. The sensor is to be an effective low-cost mobile water tester and troubleshooting tool. The issue with just using the Applikon for this application is that it is much too large and by no

means mobile. There are also cost considerations, as the Applikon is $100K, whereas the existing prototype for the mobile device is approximately $1500 to date.

My involvement with this project entailed mapping out the system, documenting the sequence of operations (SOO) for the device and developing the schematics for the project. I also conducted market research and purchased a peristaltic pump from vendors to drain the sample once the sample had been analyzed and the data was documented. Additionally, I worked with the technicians to learn cold work and hot work tubing techniques to fit the pumps to the valves. Below is a schematic I developed to document how the device should work, as well as indicate what we would like it to do in the future as it is developed.



Essentially, we were able to program and code the Intel Galileo microprocessor to communicate with a Thermoscientific analyzer that sampled and tested HF concentration from a pH probe as well as an ammonia probe. To date, the Galileo logs data onto a microUSB. Eventually the hope is to develop an APP interface to communicate from the Thermoscientific to the data acquisition software programs that Intel utilizes. In this way, if there is an HF concentration issue, a system engineer or a technician will be able to take the mobile device out into the field, tap into streams to test samples quickly and efficiently, and then use a tablet with the developed APP to verify the data received and make adjustments accordingly.

This sensor device could essentially be adapted to test any type of sample; water, Fluorine etc., which has both consumer and commercial value. Broadly speaking, the development of this type of sensor technology could translate into being the next big consumer/residential cost savings investment. For example, sensors of this type could potentially be installed with flow meters into household appliances: dishwashers, washers, toilets, etc. Data would communicate between the sensors and a laptop, phone, or tablet where an App logs the data and displays where excess water is being expended in the household daily, weekly, monthly, or annually and where savings could be realized. This is especially applicable in New Mexico where water conservation is as integral to our future as it is a part of our cultural awareness of our resources.

The energy conservation projects I worked on focused mainly on optimization of resources as well as reduction of inefficiencies in the water systems. The scope of the first project was to reroute and change the varieties of water fed to the cooling towers. By utilizing reverse osmosis water as the primary supply to the cooling towers, and supplementing this stream with ultra-pure reclaim water the efficiency of the cooling towers was raised considerably. Ultimately, the idea was to develop a final inlet water stream with lower conductivity characteristics due to lower ion concentration resulting in less chemical neutralization at the cooling towers. This also means that the cooling towers have to blow down much less frequently, which saves a significant amount of water.

It is estimated that this project will result in approximately 400,000 gallons/year of water savings. Personally, I contributed to the project by participating in the Functional Acceptance Testing (FAT) upon completion of the construction phase, editing/revising the systems of operations (SOO), as well as working with the coordinator to update Maximo (project log system) to include assets for associated preventative maintenance tasks.

The scope of the second energy conservation project I worked on was to identify, document, and recommend isolation of laterals in the Softer Water Systems (SWS). Under the directive of the SWS owner, I began with an extensive list of all the tools that connected to this particular variety of water. If on any one lateral there were fewer than five tools connected, I marked it as a candidate for possible reroute or isolation. After generating this list that I pulled from Excel data, I physically walked the various subfab areas to verify that the data was

accurate. Upon completion of my internship, I submitted my findings and suggestions to the system owner. I enjoyed this project because it was a great opportunity to get up away from my desk and familiarize myself with an industrial plant configuration. As an industry leader in energy conservation and cost reduction, Intel emphasizes finding inefficiencies and striving for faster, cleaner, safer modes of production. On this project, for every two laterals that are effectively rerouted and isolated this translates to approximately 1 million gallons/year of water savings.

More than halfway through my internship, the Corporate Services site manager Brian Rashap, approached myself and three other interns with the challenge to design, plan, and launch an innovation facility for employee use. Essentially, he gave us a budget, an outdated conference space, a deadline of five weeks, and told us to "build an innovation space". This directive presented certain obvious logistical challenges such as time in regard to product research and shipping lag-time. As a team we dealt with this constraint by meeting often and trying be as nimble and efficient as possible. In our initial meeting, it was decided I would serve as the project lead based on my experience at the Aggie Innovation Space. Collaboratively, we then delegated out specific tasks in order for each individual to have some form of a sub-project ownership. My tasks included overall logistics, managing and apportioning the project budget, researching 3D printers, purchasing, and maintaining a schedule.

Our vision was to create a space for engineers and technical professionals to "go play". On the practical side we purchased powerful computers, tablets, electrical equipment such oscilloscopes, potentiometers, breadboards, soldering stations, vices, and basic circuitry items. On the research and development side I focused on purchasing two worthwhile 3D printers, consumables, and complementary software. On the creative side we bought modern thought provoking furniture, a laser mouse and keyboard, modular magnetic rapid prototyping units, a Tetris lamp, projector, SmartPen with video and recording capabilities, mini-solar panel phone chargers, and literature that supports creative thinking, brainstorming, and development of innovative ideas.

By then end of the 5-week period, the work-orders were completed, the gadgets and 3D printers had arrived, and barring a few back orders on furniture, we successfully implemented a facility that now houses quality equipment/technology that reflects Intel's values and spirit of

innovation. Because this project belonged specifically to the interns, I was able to take on a new position and challenge in which I learned project management skills, corporate budgeting, and effective methods to communicate with vendors. Personally, this was one of my favorite experiences of the summer because it was a project that was given to undergraduate and graduate interns to problem solve their way to completion and delivery.

Lastly I got to be a liaison and coordinator of marketing for Intel's Galileo Design Challenge Competition at NMSU in the Fall 2014. The scope of this project was an early semester event to promote and foster innovation using Intel technology. In August, Intel hosted a workshop at NMSU to introduce basics of Galileo functionality and give attendees a "kit compiled of goodies (Galileo board, sensors, relay, Wi-Fi card). This workshop was followed by a 3-week window for student teams to work on, troubleshoot, and develop creative innovative projects with Intel instructors with additional resources and support by Aggie Innovation Space and NMSU Faculty. I was involved in the beginning planning throughout the summer at Intel, and returned to school to support the event on the NMSU side. I helped develop the contents of the "kits" given to participants, market the event with posters, and coordinated virtual trouble shooting sessions with Intel engineers.

What I was most impacted by and most impressed with during my internship was the constructive feedback I received. I felt empowered and supported to challenge myself and try new things knowing I would probably fail on the first attempt. I was in a learning environment where the emphasis was on growth, not on correct answers, and it was an environment in which I thrived, and learned an incredible amount in a very short time. I learned that apart from cost considerations, workplace safety is of utmost importance and taken very seriously. As an undergraduate I was also challenged to focus on developing work life balance. The emphasis of their message was that this is your life, and for the approximate 40 hours you spend at work, you should take pride in what you do, but it is also just as important to enjoy and explore outside of work. As a part of Intel's employee onsite conveniences, I attended noontime Zumba with other female engineers, one of whom actually teaches the class. I also attended a summer wine tasting and food pairing series put on by the onsite café chef.

I feel very fortunate to have had such an incredible introduction to industry this past summer at Intel Corporation. I had the opportunity to work with extraordinarily talented

professionals across disciplines, and contribute to projects that I cared about and felt motivated, excited, and driven to complete. Unbeknownst to me, it was the perfect avenue to test the chemical engineering technical skills I have been developing in my coursework. It was also a great learning environment to develop and sharpen those intangible skills not found in university curriculum that determine an employee's worth to a company as a detriment or an asset. As an engineer in training, I witnessed firsthand how powerful interpersonal communication skills, time management, prioritization, and teamwork can be in effective project management, and overall office environment. It seemed as though everyone on my team was motivated and happy to be at work, and inspired to support or develop the next big technology. All my preconceived notions about working for a big corporation were completely inaccurate; I found my peers, colleagues, mentors, and superiors were personally invested in my projects, professional development, and any other items worth discussion.

In close I will say that in just a few short months as an undergraduate technical intern I found out what is "Inside Intel". At the heart of the cutting edge technology are kind, motivated, generous people. Good people are what is "Inside Intel", and it was an absolute honor to learn from them and gain some industrial experience on my path to becoming an up and coming successful chemical engineer.