Manufacturing Engineer- Career Readiness

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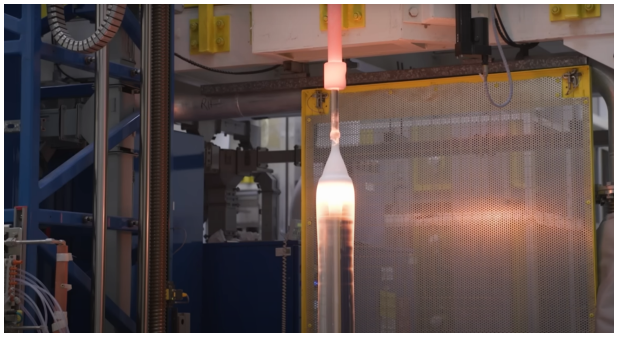
Team 952H

Location: Lutherville, Maryland

The career we selected was a manufacturing engineer due to its engaging work, strong application of the design process, and our ability to find ourselves in this field in the future. We gathered research on this job through an interview of a team member's relative; manufacturing engineer supervisor Venu Padala. Manufacturing engineers at the company he works for, Corning Inc., go through an intricate process to sustain a healthy business. They buy raw chemicals which they then put through machines to make glass. They turn the glass into optical fiber, which is then sold to companies primarily who create cables with it. To make their company better, Corning focuses on cost, capability, and capacity. The value of their input versus their output, the endurance or strength of their product, and how much they can increase their input. ©YouTube, unable to take inside photos due to strict IP.

Manufacturing engineers use the design process, or scientific method as they call it, through DMAIC (Define Measure Analyze Improve Control). The defining step is identifying the problem, what could be causing the problem, and the scale of the problem. Like our experiences in VEX, they begin the scientific method with getting a full comprehension of the problem at hand. They identify a new major problem or area for improvement each year. Like us, we learn about our new game, or problem, at a designated time each year at the world championships. The next steps, measure and analyze, are like our steps of brainstorming and creating solutions. Just as we produce designs and mechanisms for our challenge, they create

hypotheses for theirs. They create a hypothesis tree to format all their potential ideas and narrow it down to the top choices. We enhance a similar process at VEX, finding the best ideas and narrowing down from there in our engineering notebook. The main difference, we noticed, was how they selected their top choices. Our process involves finding the highs and lows of each design and mechanism, weighing variables such as motor cost and space, and finding the best choices from there. At Corning, they try to single out the worst options first before choosing the best. This “process of elimination” method, while different from our own, is still used for the same general purpose. Another element of the measure step is testing your hypothesis using as few resources and time as possible. The business runs 24/7, so any lost time or resources in the process of solving a problem will cost the company. Like us, we have a limited number of parts and time. While we do not lose the parts, the time is extremely valuable in a game lasting only one year. They use this data in the analysis step to understand and comprehend it. This has similarities and differences to our process, considering we do not need to take our data from tests (considering we do not run tests) to create a solution. This is mainly because manufacturing companies have many more variables involving their work, making comprehending the data much more difficult. That said, our team still uses data and information from prototypes and failed designs to create our best robot. The improvement step has direct correlation to our innovative step, as we both attempt to make the solution work better in any possible way. For them, they implement their solution by getting money from those who will supply it. With this money, they can make improvements to reduce costs, increase efficiency, etc. We constantly attempt to innovate our design to increase speed, scoring, and efficiency. Their last step, control, is the implementation of their design. This is ensuring that the solution is being used everywhere necessary and being documented as well. The documentation not only helps for organization, but

also to assist them if it provides needed information for a future problem. In VEX, we document all our progress in our engineering notebook for the same purposes; keeping our work organized and recording information we may need in the future.

Both our team and the manufacturing engineers at Corning revisit steps of the design process. When speaking with Mr. Padala, he said that most revisits of the scientific method come at the beginning stages but do occur throughout the entire process. The largest thing is finding the correct root cause of the problem, being extremely important with the fact that it impacts all future steps. When testing and analyzing data, many times it will not make full sense with the data taken from the problem, causing them to retake the tests and data. Even when developing and making improvements, they can find flaws in the solutions which causes them to return to testing and analyzing. Our team constantly moves back and forth between the design process steps just as they do at Corning. Finding the root cause of a design flaw can be difficult with factors such as gears, chain, and multiple moving mechanisms. We are sometimes forced to restart the entire design due to various reasons. We have times when we must start over due to major design flaws or no room for improvement. In the engineering field, we always try to create successful designs and improve them wherever possible. This comes from the design process, bringing us together with companies such as Corning.

Our experiences in robotics currently prepare us for a future career as a manufacturing engineer. While we do not use the same parts as them or even are achieving the same objective, we share the same goal and thinking process. This is to design and improve, which are skills that are necessary in the engineering field. Learning how to think in a problem-solving way with an innovative mindset will bring us to our careers. Having the experience of going through a similar

design process and thinking in the exact same way as them, we consider ourselves prepared for a future career such as a manufacturing engineer.