Interview Assessment 2

Name of Professional: Randal Oberle

Profession/Title: Engineering Fellow and Chief Engineer of Product Development

Business/Company name: Raytheon

Date of Interview: October 26th, 2017

Assessment:

Earlier this week I was given the rare opportunity to sit down with Mr. Oberle, an Engineering Fellow and the Chief Engineer of Product Development at Raytheon. Prior to meeting with Mr. Oberle, I had prepared several questions pertaining to the field of mechanical engineering which were still unanswered from my last interview with Dr. Kovacevic. I mainly wanted to know more about what impact recent developments in additive manufacturing were generating in the field of engineering while also learning more about the field of mechanical engineering in general.

When we first began the interview, he explained his duties at Raytheon which included supervising the creation of various printed circuit boards. He explained how he had previously been a mechanics design engineer, a product engineer, a section manager, and program manager before becoming a fellow at Raytheon, the second highest position there is. Mr. Oberle also explained how the circuit boards produced at Raytheon were analog rather than digital boards which are typically found in consumer electronics. He explained that while digital boards could be faster and more efficient than analog boards, but that analog boards were typically more reliable and could last up to 30 years in storage. Analog boards were also less prone to interference which made it especially important for weaponry such as missiles. This is especially important when products such as these boards would be used in various military applications such as when used in guided missiles. Dr. Oberle also explained that the analog boards used microwaves or RF waves to guide missiles by using the waves which reflected back as a form of radar detection. He also mentioned other forms of missile guidance such as IR, infrared or heat-seeking, and laser-guided. He explained how the boards were made up of several components such as transistors, resistors, various switches, and processors which had been getting more powerful over time, but as a drawback they had also been producing more heat as a result of the higher voltage needed. He explained how the heat produced by the processors would have to be removed by passive heat sinks rather than active heat sinks as the electrical traces were made up of very fragile one-one thousands of an inch gold wire which would be easily destroyed by any airflow moving over them. He also explained that the heat could be transferred to a cold plate via a copper block or heatsink where it could then be cooled by a form of fluid such as deionized water, antifreeze, or another form of non conductive fluid.

When asking about how the boards were designed and manufactured, he explained how they used various CAD software such as AutoCAD, CREO, and HFSS in order to design the board, design the electrical paths on the circuit board, and measure the structural capabilities of the board. He also explained that the design process included three types of engineers: a systems engineer who determined what a customer wanted, a design engineer to match the customer's specifications, and an electrical engineer to maximize the performance of the product. He also explained that once a board had been finalized, then it would be created using CNC milling machines which would cut the copper electrical paths out on the circuit board while also drilling the holes needed for various components. He also mentioned that RF and analog control boards are typically in low demand and have been replaced by digital boards in consumer electronics which make it much more difficult to find manufacturers for such boards. He talked about how many manufacturers were moving offshores to find cheaper prices and manufacturing costs. When asked about how additive manufacturing has affected his field, he explained that recent developments with SLA printers—sometimes called stereolithography or resin printers—allowed a printed part to be plated in copper, then have the original resin material burned away in order to create a metal part. This greatly improved the ease of manufacturing, but primarily for small scale production and in the prototyping state where Mr. Oberle specialized in. Large scale production of parts would still be left to traditional manufacturing techniques.

Overall, I learned greatly about the broader field of mechanical engineering while still learning some info on my specific topic of additive manufacturing from this interview. While Mr. Oberle's career was not primarily focused on the manufacturing side of products, it did relate to the design side which I was still interested in. From this encounter I was presented with some new questions such as "how effective is metal plating on SLA-printed parts?" and "could additive manufacturing also benefit printed circuit board manufacturing in the future?". In future interviews I will try to answer these questions, but hopefully with someone who works more closely in the field of additive manufacturing.