

Real Engineering

The 9th grade computer lab was charged with excitement. After months of reading and weeks in the garage, I was about to test the first prototype of my plasma cutter. Well, it was actually just a single manually-controlled axis with a duct-tape-mounted graphite electrode and a hand-wound transformer -- no pressurized gas, three axis gantry, or automatic control -- but still, the contraption I showed my class represented much of my effort towards making a home-grown plasma cutter. Its wiring sprawled out over an entire side of the computer lab, less than a millimeter gap separated the electrode from the sample workpiece, and my entire class, the teacher, and principle gathered around as I prepared to demonstrate the device.

I really should've been less confident about the testing phase and only started demonstrations afterwards, but the excitement of making my first real-world device was too much to bear. I could already see the future: cutting into the semi-saturated plasma-cutter market with a device 1/10th the price, meetings with high-class executives of rival companies like Makerbot and Tormach, and a new workshop in the backyard of my parent's home. The machine would be named: the Cookie Cutter CNC. I had just finished writing the control software: CookieWare and CookieControl. Excluding actual footage, the product release video was nearly complete. The machine's custom-designed XY gantry with servo motors and drivers was assembled and drawing straight lines, and after this momentous plasma cutter demonstration succeeded in front of my class, I planned to connect the electrode and transformer box to assemble a complete prototype of the CookieCutter.

Running with my overconfidence, I was scheduled to give a presentation on this machine the next day, so in my mind, everything had to work perfectly. There wasn't another possibility. Standing there in the computer lab in front of my peers, educators, and whatever social networks they were streaming on, I introduced myself, the project, and the test about to be performed. We all counted down (was I expecting something to blow up?), and I flipped the reclaimed light switch liberating a 120 volt alternating current to flow through the machine's hand-wound transformer.

That was when the lights went out. I heard some switches flip in the electrical box. My teacher was yelling for me to turn the test stand off as my principal unplugged the transformer. A few seconds later, the power came back, and I remember seeing all the computers showing the BIOS screen. It turned out that my hand-wound transformer didn't have enough impedance to prevent a short circuit. I tried explaining, but that didn't change my principal's firm refusal to allow any future tests.

Eventually, the other students resumed their work and the principal left, but I couldn't get over what just happened. Nobody made fun of me, and my teacher even gave me a brief private lecture about how it's important to view these setbacks as brief and educational, but at that moment, I felt like a complete failure. All the engineering projects on my bucket list that used to look so fun and exciting, now seemed like a PhD's thesis project. It was at this point, I knew that I would never complete my plasma cutter.

And I'm even more sure of this today. But that's only because many parts from Cookie Cutter are now repurposed in other projects. I didn't let that embarrassing failure seven years ago hold me back from continuing to learn about, design, and engineer new things. In fact, I went home and finished the product release video demonstrating the Cookie Cutter equipped with a much lower power electrodischarge machining setup cutting aluminum foil. I went ahead with my presentation the very next day and showcased my work up to that point to my class.¹

I'm still discovering the surprises and challenges that engineering brings, but now, these only make the development journey more exciting. Innovation is worth its endeavor even if the solution takes a lifetime to arrive at. As I learned at 15 years of age, real accomplishment doesn't come easy, but with perseverance and caution, it's not impossible. Every step I've taken since then has only forged those principles deeper in my mind as I strive to lead multiple industries with revolutionary products and companies and inspire the generations ahead to do the same.

¹See <https://jacobfv123.medium.com/cookie-cutter-cnc-923c68932ee6> for more information.