

## JANUARY 11, 2024: SEVEN YEAR

Dear customers and friends,

This seventh year of collaborating with small businesses and inventors to solve design, engineering, and manufacturing challenges was another productive one, and I would like to share the highlights with you.

Again, I spent most of my time on upgrades to a [22-year-old machine](#) that performs accelerated testing of pavement for research. Fabrication at [DMS Machining and Fabrication](#) in Barre, VT has taken longer than expected, and everything will be shipping to the [University of Illinois](#) this month. This spring and summer, we will set up the machine, write control software, and help the university start testing pavement. This machine will move a 14,000-pound carriage at up to 10 miles per hour back and forth across an 80-foot test section for months at a time, pressing a truck or aircraft tire downwards with up to 35,000 pounds to simulate heavy truck traffic, longitudinally with up to 7,000 pounds to simulate heavy braking or acceleration, and laterally up to 7,500 pounds to simulate steering/cornering forces. A few months ago, I helped the university researchers set up and validate the data acquisition system that will measure pressure, strain, and temperature in the pavement under test.

[Resonant Link](#), a Vermont-based wireless power company, released a reference design for wirelessly-rechargeable implantable medical devices such as pacemakers. When they came to me for assistance, they had completed most of the electrical design, and were looking for someone to design the housings and mechanical assembly of all the components. Over several months, collaborating closely with their product team, engineers, and technicians, I designed a solution ([short video here](#)) that allows them to demonstrate their technology to customers. This technology has the capability to quickly recharge batteries of implantable medical devices, eliminating the need for surgery, wires, or precision alignment.

Returning customer [QOR360](#), makers of active sitting chairs, released a new chair called "The Tilt!", based on our work together last year. This year, we collaborated to design a new rocker for their chairs to improve performance and reliability, make assembly easier, and reduce supply chain constraints. After many rounds of brainstorming, sketching, CAD modeling, analysis, and testing, we have a new, better rocker design that is backwards compatible with existing chairs.

I also did work for returning customers [Vasa](#), a swim training company, and [PuttConfidently](#), a disc golf training company. They both have new products in the works that I helped design, so keep an eye on their websites for new product announcements.

Two local companies that I had the pleasure to work with are local glassblowing legends [AO Glass](#) and the [IOT Conduit](#), an Internet of Things lab. For AO Glass, I designed a graphite mold for improving the shape consistency of their adorable [Tomte](#) glass gnomes. It was fascinating to work with their talented and creative glass blowers to learn about the manufacturing process and tweak the 3D CAD model to obtain exactly the right shape. It was a fun art/engineering collaboration. For the IOT Conduit, I advised and assisted two businesses for the Energy Program for Innovation Clusters (EPIC) Prize, as part of the IOT Conduit's role as a Connector, who recruits, mentors, and empowers participants.

This year I also worked with a few individual inventors, helping them to refine their ideas, then using Solidworks to create 3D CAD models, and 3D printing prototypes for them to test. One interesting and rewarding project was a laundromat with washing machines that were out of commission from a broken door lock component that the manufacturer had discontinued. To get the washing machines working

again, I designed a new component based on the old broken ones, and had it 3D printed at the [Advanced Manufacturing Center](#) at Vermont Tech, part of Vermont State University. After two revisions with minor adjustments, we had a component that is stronger than the original, and manufactured on-demand.

I again had the privilege to sponsor the local business accelerator [LaunchVT](#) by providing design/engineering as a prize. This year, the teams that won time with me were [DairyDirt](#), makers of sustainable lawncare products, active sitting chair company [QOR360](#), and [Logic Building Systems](#), makers of modular kitchens and bathrooms. I also enjoyed sponsoring Burlington makerspace [Generator's JumpStart](#) program, a business bootcamp for product-based startups. It was a pleasure to meet the passionate entrepreneurs, and provide them with individualized design, engineering, and manufacturing advice. Generator also offered me the opportunity to teach an introduction to 3D CAD modeling class. In this 2.5-hour workshop that I taught several times and will continue to teach, participants learn the basics of 3D computer modeling using an inexpensive but capable program called [Fusion 360](#). After the workshops, I worked one-on-one with some participants to dive deeper into capabilities that we didn't have time to cover in class.

A way that I gave back to the community this year was mentoring two young engineers. One was through the [Coaching and Mentoring for Professional and Student Success class](#) at Cornell University, and the other was an employee of one of my customers. It was a pleasure to pass along advice to them and to answer their questions, and I hope that my experiences can help them be more successful.

Finally, I would like to share an [article I wrote for my local newspaper](#) about how my home, which hosts Forecast LLC, came to produce more energy than it uses. Since 2019, my home and business have been solar-powered and fossil-fuel free, including electricity, heating, cooling, cooking, hot water, and one of our two cars. I hope you find the article educational and inspiring.

Thank you for your support over the years. Please let me know what you have been up to, and if you would like to learn more about the history of Forecast LLC, you can find the previous six anniversary notes on my [website](#).

Keith Epstein  
Forecast LLC  
(802) 862-7101  
(802) 777-0158 (mobile)