

## **JANUARY 11, 2023: SIX YEAR**

Dear customers and friends,

For the past six years, I've been assisting small businesses and individual inventors solve design, engineering, and manufacturing challenges. This was another year of collaboration, variety, fun, and successes.

Much of my efforts this year were focused on continuing the design of upgrades to a [20-year-old machine](#) that performs accelerated testing of pavement for research. We released manufacturing drawings for most of the components to [DMS Machining and Fabrication](#) in Barre, VT, and are currently finalizing the rest of the design. We will then write the control software and deliver and commission the machine in Illinois this Spring. 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 up to 7,500 pounds to simulate steering/cornering forces.

I had the opportunity to work with [Med Associates](#), a Vermont-based manufacturer of equipment for neuroscience research, on the design of a new dispenser for rodent (mouse and rat) food pellets. The previous pellet dispenser was not as reliable as customers demanded, so Med Associates asked me to design a new one with greater than 99% reliability, based on a conceptual design that they had prototyped. After a few rounds of design, manufacturing, and testing, we achieved greater than 99.9% reliability (less than 1 failure out of 1000). The new pellet dispenser has very few parts, which keeps cost down, and is simple to assemble and disassemble, which makes it easy for customers to clean it regularly, thus improving reliability. Through this project, I learned a lot about how the different types and sizes of pellet materials move and flow, and I enjoyed collaborating with the Med Associates design and manufacturing teams to deliver a design that exceeded their goals and was complete in time for an important trade show.

[HempTone Music](#), formerly known as BugOut Guitars, a small hemp composite guitar manufacturer in Randolph VT, needed some assistance designing a mold for fast, accurate, and consistent manufacturing. Based on sketches from their master guitar designer/maker, I created a 3D CAD (Computer Aided Design) model with SolidWorks, then used the model to design a 3-piece heated aluminum mold. [KAD Models](#) in Randolph manufactured the mold parts on their 5-axis CNC equipment, and Bugout built the first guitar with it recently. It came out looking and sounding gorgeous!

Several customers who I have worked with previously asked me to help them again this year. With [LogOx](#), we designed and implemented cost reductions and feature enhancements of their existing product for processing firewood and doing tree work, and worked on cost reduction of a prototype of a new tool to prepare it production. I worked with the swimming trainer company [Vasa](#) to design and implement a few changes that reduce cost and make assembly easier. [PuttConfidently](#) released ChampCap, the disc golf training tool that I helped design, to production, and they have a couple other products in the works that I helped design. [QOR360](#), a Vermont-based active sitting company, needed help to address durability testing failure of a new chair. First, we performed destructive testing and data collection of some prototypes. Then I analyzed the failures and performed manual stress calculations and Finite Element Analysis (FEA) of the existing design. After several rounds of design, FEA, and

manufacturer collaboration, we were able to strengthen the chair in key places to pass durability testing without sacrificing the unique aesthetics. It is always a pleasure to reengage with past customers to help them solve new problems and achieve new goals.

[Brightwater Tools](#), a spin-off of the [Rich Earth Institute](#) in Brattleboro, VT, designs and manufactures equipment for nutrient recovery from human waste. To help them on their journey from prototype to production, I did an on-site design review of one of their products, a miniature urine pasteurizer. We followed up with a video call several weeks later to answer questions and dig into details that were uncovered during the review. I learned about a fascinating field, and they gained some confidence in their design and found some opportunities for improvement.

Besides the work with these companies, I helped a few individual inventors with design/3D CAD modeling, 3D CAD software training, and breaking down a large design problem into manageable short-term goals and tasks. These small engagements are always interesting.

To train the next generation of manufacturing experts and help businesses explore new manufacturing capabilities, the new [Advanced Manufacturing Center](#) at Vermont Tech is now operational with metal and polymer additive 3D printing, advanced 5-axis CNC machining, EDM processes, heat treatment, post-processing, metrology, and metallurgy. Two of my customers were able to utilize their manufacturing and testing services this year, through introductions that I provided.

Thank you for your support, interest, and collaboration over the past six years. If there is anything I can help you with or you would like to discuss, please don't hesitate to contact me. To learn more about the history of Forecast LLC, you can read the previous anniversary notes on my [website](#).

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