



## Prototyping: Hands-on Design

author of the month: Brook Grisham

Hello from the PCD prototype lab.

I'm Brook Grisham, the director of prototyping at PCD. Given PCD's love for hands-on design, we thought it would be interesting to share a bit of insight into our prototype process and some of the tools that enable us to create almost anything from custom rubber grips to heavy cast metal components.

When I was first given this task of summing up our manufacturing activities, two common themes came to mind. 1: We rarely build the same thing more than once, and 2: Whatever Mike's wild imagination comes up with, the shop always figures out a way to make it (and usually by tomorrow). Beyond that, a little modern technology mixed with a little shop magic goes a long way.

We at PCD pride ourselves on our 'getting our hands dirty' approach to design and development. While there is no substitute for strong

engineering work, we always like to turn the paper design into a proof-of-concept prototype or test bed as quickly as possible. Sometimes this involves simply carving a piece of wood or foam to help the design team better understand their idea.

While it is fun to whip up a quick foam mock-up of a part, the majority of the shop work revolves around making high quality, pre-production prototypes. These devices look and function almost exactly like the final manufactured product, and really do a great job in presenting PCD's designs in the most understandable way. To accommodate the wide range of products we make, our shop contains both a full suite of conventional tools, and an eclectic mix of specialty equipment and capabilities.

Seeing how our business is to explore and create things in the 'unknown' and gray areas of development, we are always eager to dive into new methods of creating

parts, and building our own custom equipment. Off the top of my head, a few PCD-built pieces of equipment are: a CNC router, a vacuum former, a battery tab welder, multiple kilns, and some unique test fixtures for motor testing (to be elaborated on in a future newsletter). On the capability side, we have recently become proficient in investment casting, injection foam modeling, carbon fiber and fiberglass layups, and machining precision parts for internal brushless motors.

Given the prototyping theme of this issue, we've featured below some new developments in prototyping equipment from our technology database and a snapshot tour of items created in our own prototype lab.

On a side note we are also pleased to welcome several few new team members. Since it would take practically a whole newsletter alone to introduce all of the new

faces, we're going to space the introductions out over the next few issues.

**Daniel Baxter**, B.S.M.E, has previously worked with PCD as an engineering intern while he completed his engineering degree at UT Tyler. We are happy to announce that Daniel is now a distinguished graduate and a full time mechanical engineer at PCD. Daniel's excellent design skills and engineering oversight have already proven to be critical in the success of some key projects.

Daniel's timing in joining us full-time could not have been better, as we have been extremely busy with quite a few new and legacy projects. In addition, our laboratory space is really starting to fill up with all kinds of useful equipment, such as our new environmental testing chamber.

Stay safe,

Brook Grisham

## Craftsman CNC Router



For any of you do-it-yourselfers out there, here's a cool off the shelf product which allows you to take a computer generated design and will then automatically cut the design into wood. There seems to be some increasing momentum towards cheaper and consumer-grade prototyping equipment. Maybe we will see more cool new homemade gadgets in the not-so-distant future.

[http://blog.scifi.com/tech/archives/2007/06/26/compucarve\\_make.html](http://blog.scifi.com/tech/archives/2007/06/26/compucarve_make.html)

### ➤ \$5,000 Home 3D Printer



While the previous home CNC router creates parts by reduction (it makes a shape by cutting away material), this home 3D printer creates parts by addition (it assembles a shape by laying down material). What's most interesting about this product is the low price tag of only \$5000.

[http://www.desktopfactory.com/our\\_product/](http://www.desktopfactory.com/our_product/)

### PCD Prototyping Tour

Here's a glimpse of one of our finished products. This part was machined on our Milltronic CNC Mill, which takes our CAD designs and quickly churns out high precision parts.

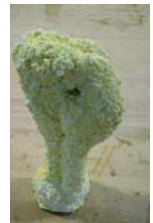


Recently, we were in need of a high strength, lightweight material. To accommodate this need, we chose to use a carbon fiber material molded into the desired shape for this case. Surprisingly, making a prototype out of this material was pretty straightforward and simple.

Here's a couple of shots of our CNC mills. The large Milltronics CNC mill is a major workhorse in our prototype lab, and cuts parts out everything from the softer foams and aluminum, to the tricky powdered metals and hardened steel. The smaller Sherline CNC mill makes creating small-scale precision parts much easier.



Molding and casting are also a big part of our business. On the left, there's a picture of a polycarbonate handheld device which we made from a mold; on the right is a shot of a pre-pour investment cast. You ought to give Mike a shout and ask him about all of the ins and outs associated with making good investment casts!



Product Concept Development brings together experienced scientists engineers and designers to create innovative products and solutions for industry. Our twenty -five acre campus with 20,000 square feet of lab and office space is located on a beautiful and secluded pine covered hill north of Palestine, Texas. We have moved into our new lab / office building that includes a microbiology lab, a motor and electronics lab, a testing lab and a class 10000 clean room . With this new facility and other campus improvements, PCD has tripled its office space and taken a leap forward in growth and expanded capabilities.