" We only need one prototype to validate electronic performance. Hardware development time has dropped from 30 to 50 days with the old methods to a maximum of seven days with Altium Designer. "

Maurício Hüsken, Electronic Designer, Full Gauge Controls

Full Gauge Controls develops and produces digital instruments for control and indication of temperature, humidity, time, pressure and voltage. But its old development process, dependent on prototype-based design verification, was putting pressure on the design schedule and keeping the heat on the design team. The introduction of Altium Designer has reduced the design cycle by as much as 86 percent.

The company's Department of Engineering Development team consists of engineers, electronics designers, product designers, programmers, analysts, and lab specialists. This team provides product development and enhancement across all of Full Gauge's product lines. Upon completing a PCB design, the department had traditionally sent it out to a prototype manufacturer. For each new piece, the time for preparation of purchase order, production and shipping was approximately seven days. The cost was very high, and often the need arose for additional prototypes for further design cycles and tests.

In 2007, Full Gauge attempted to accelerate the process by acquiring a rapid prototyping machine that worked similarly to a computer numerical control (CNC) system. It did speed up prototype manufacturing; and if the product cabinet was ready, engineers could quickly test fittings and clicks.

However, the prototype boards still had to be assembled manually, placing components such as relays, displays, capacitors, and buttons. This manual step is not very efficient and often rework-prone. Moreover, most Full Gauge products are composed of multiple PCBs: a base plate, front plate and often also a top plate. Engineers must validate the interference between the components between plates. Manual assembly of the boards and then the full product erased the time savings of in-house prototyping.

Finally, Full Gauge had to shoulder the cost of maintaining the machine, which included the high prices and time delay of replacement parts shipped from outside the country.

The Solution

Looking for a better solution, Full Gauge upgraded its electronics design environment from P-CAD to Altium Designer. It then integrated the new system with its SolidWorks mechanical design tool to minimize the need for prototyping.

Electronic designer Maurício Hüsken now produces all designs and mechanical files using Altium Designer, while engineers and other personnel in the company use the Altium Designer Viewer to access and query design files and documentation.

"The process of importing the library of P-CAD to Altium Designer was easy and without problems," explains Maurício. Most components came over intact and complete. Maurício then spent time restructuring the library to remove duplicate components and outdated footprints.

During data import, Full Gauge took the critical step of migrating 3D component information in its SolidWorks to the Altium Designer libraries. The company had designed each component in SolidWorks with the maximum possible detail for greatest precision in 3D product designs. With the same data in Altium Designer, Maurício could be confident of an accurate component footprint and achieve the most compact design. The process of importing and adjusting the component information took place over one month.

In this improved process, the product designer draws up the initial design of the office products and exports a file (usually in DXF format) and dimensional format for the PCB. This file is imported into Altium Designer and the components are positioned and verified in accordance with design criteria. The electronics designer then exports the complete file of the PCB in 3D (in .STEP format) to be positioned within the cabinet so all mechanical conflicts can be detected and resolved. "We can detect any type of mechanical conflict, like among PCB plug in towers, display alignment, and positioning holes," says Maurício. This cycle continues until

the PCB is perfectly aligned with the cabinet and all conflicts resolved, a process that generally takes three days.

The engineers also enjoy a significant improvement with accuracy of component footprint information as well. There have been rare cases in which the screen printing was very different than the actual component. "With the addition of 3D design, I can position the component on the footprint and draw its outline to delimit precisely the area that is actually occupied," says Maurício.

Finally, Altium Designer has automated the generation of Gerber manufacturing files, which saves time and minimizes manufacturing errors.

The Results

Full Gauge has successfully adopted a fully integrated process for designing and verifying electronic and mechanical designs for each product. "Now we can eliminate the need to fabricate physical prototypes to validate the product design," explains Maurício. "We only need one prototype to validate electronic performance. Hardware development time has dropped from 30 to 50 days with the old methods to a maximum of seven days with Altium Designer."

More accurate component information is driving down margin-of-error production and rework. "The prototype already looks like a finished product, requiring only minor adjustments." says Maurício. "All our costs have decreased with the implementation of Altium Designer."

As an electronics designer, Maurício lists other benefits that help him design better products:"

- Getting a better sense of space and physical design with the 3D simulation.
- Seeing the layout from different angles and detecting possible problems that may go unnoticed in 2D views.
- With SolidWorks integration, being able to visualize the end product during design, which can speed up client approval.
- Exploring new techniques to facilitate the fit between the plates of the product and eliminate the need for male and female connectors that were previously used.
- Adding approaches to simulation, automation and revision control to further simplify project management.

With the help of Altium Designer, the company reduced design time, improved the development cycle of electronic and mechanical designs, reduced rework, and has enabled the designer to explore more creative electronic designs. Now Full Gauge can develop more innovative products more efficiently, and turn up the heat on its competition.

Product Information

With the help of Altium Designer, Full Gauge can more easily design and test complex products in-house. This includes products such as the PCT-3000, a pressure controller used in refrigeration plants that need control in the suction and discharge stages. It is composed of 26 digital outputs, four analog outputs, five digital inputs, four analog pressure and six temperature inputs. All fittings were carefully tested and the mechanical design was validated even before the physical part was manufactured.

About Full Gauge Controls

Since 1985, Full Gauge Controls develops and produces digital instruments for control and indication of temperature, humidity, time, pressure and voltage. The company is regarded as a center of excellence in technology for refrigeration, heating, air conditioning and solar heating. Full Gauge is internationally renowned because of its commitment to quality and client satisfaction. The company participates in many fairs around the world. It has more than 80 products including thermometers, thermostats, pressure controllers, voltage monitors and remote management software Sitrad. Products comply with national and international guidelines, standards and certifications such as UL and CE in addition to ISO 9001 and ISO 14001.

Full Gauge is based in Canoas, Brazil. For more information, visit www.fullgauge.com