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Case study: Ergonomic design at B&D

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Black & Decker has been a long term advocate of prototyping techniques to help evaluate product aesthetics and ergonomics. The company identified a need for a faster, more cost-effective means of producing early concept models and looked to Zcorp to provide the solution.

The Black & Decker Corporation is a leading global manufacturer of quality power tools and accessories, hardware and home improvement products, and technology-based fastening systems. Headquartered in Towson, Maryland, the company's Power Tools and Accessories Division produces consumer power tools, accessories, electric lawn and garden tools, and electric cleaning and lighting products under the Black & Decker brand, and high-performance power tools, accessories, industrial equipment, laser products, and air compressors under the DEWALT, Porter-Cable, and Delta brands. With record-setting sales of \$5.4 billion in 2004, the company markets its products and services in more than 100 countries around the world.



The challenge

The Black & Decker Corporation has long considered prototyping a critical part of successful product development. The corporation's Power Tools and Accessories Division develops hand-held power tools and has historically employed physical models to design tools that are both functional and comfortable to use. Product aesthetics and ergonomics, how a product looks and feels, are more important considerations for a manufacturer of hand-held tools like Black & Decker than for other types of manufacturers.

According to John Reed, master prototype specialist, the company operates a Design Prototype Centre that makes early concept and industrial design models for use in evaluating product aesthetics and ergonomics. This facility provides Black & Decker with a robust rapid prototyping capability that has served the company well for many years.

" With the ZPrinter, our designers can knock off several concept models during the early stages of the design process, which enables them to improve the look and feel of our products and avoid costly surprises later on "

John Reed, Master Prototype Specialist, Black & Decker

However, as Black & Decker product designers became increasingly proficient with 3D CAD tools in recent years, demand for early concept models grew dramatically, putting a strain on the prototype centre's resources. Reed says meeting the growing need for early concept models using traditional modelling techniques proved to be inadequate because the increased demand exceeded the centre's capacity.

"We used to use a foam-based material to machine concept models or make them by hand," Reed

Solved.



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recalls. "But once we began working more with actual 3D digital models, the time, effort, and expense involved in programming and setting up a CNC machine to produce several iterations of an early concept model became problematic. That's when we started looking for a faster, more cost-effective, and less resource-intensive solution. Instead of creating CNC tool paths for early concept models and taxing CNC programming resources, we needed something the designers could use to

The solution

Reed says he knew his group needed a 3D printer to address its concept model challenges based on research it had conducted several years ago. "We were one of the first large companies to take a serious look at 3D printing," Reed recalls. "At the time we were not thinking about early concept models and evaluated the technology more for producing finished industrial design models. As we became more active with CAD and transitioned from hand-made to digital models, we realized that 3D printing technology represented the best solution for addressing our growing conceptual modelling needs."

After evaluating 3D printing systems from the leading vendors, including 3D Systems, Objet Geometries, Stratasys, and Z Corporation, the company selected the ZPrinter 310 System from Z Corporation. Black & Decker chose the ZPrinter 310 System because it was the fastest 3D printer, affordable in terms of initial purchase and ongoing material costs, and easy to use.

"We wanted a system that was faster, more cost-effective, and less specialized than our CNC mills, so our designers could use it themselves," Reed explains. "The ZPrinter not only had high speed but was also simple to operate. The machine is very easy to set up, and the software is very straightforward. Our designers have really embraced the ZPrinter and are producing more concept models faster than ever before."

Reed says the ZPrinter is so easy to use that when two new designers joined the company, he showed them how to use the system once and they have used it productively and independently ever since.

"With the ZPrinter, our designers can knock off several concept models during the early stages of the design process, which enables them to improve the look and feel of our products and avoid costly surprises later on," Reed stresses. "While a design may look good on the computer screen, there is really no substitute for actually holding something in your hand."



Painted Z Corp model of a DeWALT Auto Levelling Transit.



Z Corp model of a Job Site Security Sensor Housing.

" While a design may look good on the computer screen, there is really no substitute for actually holding something in your hand. Since we installed the ZPrinter, we have been able to reduce model production time by as much as 75 percent in some cases"

John Reed, Master Prototype Specialist, Black & Decker

The result

With the ZPrinter 310 System, Black & Decker produces more concept models at less cost, enabling product designers to optimize design concepts for aesthetics and ergonomics earlier in the development process. Increased use of concept models also allows Black & Decker designers to produce higher quality products. Because the ZPrinter 310 System does not require a dedicated operator, CNC programmers can concentrate on creating tool paths for final prototypes while designers enjoy greater, faster access to concept models.

Black & Decker has also found unanticipated uses for its ZPrinter, such as creating enlarged versions (10 times normal size) of a new screwdriver bit design to illustrate the benefits of the new tip geometry to retail customers.

Early concept models produced on the ZPrinter are helping Black & Decker win the race to market.

“Since we installed the ZPrinter, we have been able to reduce model production time by as much as 75 percent in some cases,” Reed notes. “The feedback from our designers is very positive because this capability helps them do more design iterations in less time and further accelerate product time-to-market.”

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