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## Mike Zeigle

Manager of Trek's Prototype Development Group

# Case Study

## At a Glance

**Company:** Trek Bicycle Corp.

**URL:** [www.trekbikes.com](http://www.trekbikes.com)

**Location:** Waterloo, Wisc.

**Industry:** Bicycle manufacturer

## Challenges

- Reduce rapid-prototyping expenses and accelerate design cycles with in-house system

## Solution

- Objet Connex500™ 3D Printing System

## Results

- Trek now produces 4x as many prototypes as before, leading to better designs and faster time-to-market



# Trek accelerates design cycles with Objet 3D printer

Award-winning bicycle manufacturer now produces 4x as many prototypes as before while speeding time to market

Trek was founded in 1976 with a simple mission: Build the best bikes in the world. The company has won multiple awards for design and innovation. Mike Zeigle is the Manager of Trek's Prototype Development Group, a group of nine pros with a number of tools at their disposal. It includes a machine shop with five CNC machining centers, a full metal fabrication/welding shop, and for a number of years, service bureaus to whom they outsourced... SLA jobs.

Prototyping plays a crucial role in all phases of Trek's product development cycles. Industrial designers, mechanical engineers, graphic artists and marketing staff all utilize prototypes, so Zeigle's staff of programmers, machinists and welders keeps busy. In most cases, they are prototyping bike parts, but occasionally they also prototype tooling mockups and related accessories such as shoes and helmets.

When Trek's annual costs for service bureaus reached \$275,000, Trek's Engineering and Design Manager decided it was time to consider purchasing an in-house rapid prototyping system, and asked Zeigle to come up with some options. Initially, he researched only SLA, SD and FDM tools. He quickly narrowed the field down to SLA, but still had concerns about the machines' cost, space and maintenance requirements. Then a colleague suggested Objet's Connex500™ 3D printing system, a clean, office-friendly machine that produces parts that rival those made with SLA in terms of quality and finish.

Unlike the other technologies Zeigle considered, Objet's Connex offers the unique ability to print parts and assemblies made of multiple model materials, with different mechanical or physical properties, all in a single build. Parts produced on the Objet Connex have smooth and durable surfaces, with exceptionally fine details. The system can print living hinges, soft touch parts and overmolds that other technologies are incapable of prototyping. The superior productivity, high quality output and unique multi-material printing capabilities of the Objet Connex enable users to closely emulate the look, feel and function of an exceptionally wide variety of end products.

According to Zeigle, the fact that the Objet Connex could jet digital materials – meaning, mix two materials together in order to increase durometers – was a key selling point, as was the Objet Connex's ability to combine two materials in one part. "The Objet Connex was the only rapid prototyping machine we evaluated that would allow us to do one build with multiple materials and durometers," says Zeigle. "You can't do that with SLA or other brands of 3D printers, and it really sold us. The Objet Connex changed my perception of 3D printing."

Zeigle and his team were also impressed with the quality of the parts produced on the Objet Connex. "The part quality and finish of the Objet Connex are as good as the SLA parts we used to get from our service bureau," he says. "And we can have a part in just a few hours, versus several days and lots of paperwork when we had to outsource."





## Objet Connex enables breakthrough design for new Speed Concept bike

Zeigle's team uses its Objet Connex printer for virtually every bike Trek produces. Most recently, it played a key role in the company's launch of its new Speed Concept 9 Series bike—a time-trial bike used in the Tour de France and Iron Man Hawaii. Its unique frame design features aerodynamic cross-sections that lower wind resistance and improve speed. Virtually every part of the new design was prototyped on the Objet Connex and then shipped from Trek's Wisconsin headquarters out to a California facility for wind-tunnel testing – where sample frames would be tested at wind speeds of 30MPH or more.

"The designers had several ideas for the aerodynamic cross-section design in particular, and wanted to see the impact on wind resistance," explains Zeigle. "So we printed out multiple parts on the Objet Connex that they could snap onto the main bike frame and then test in the wind tunnel." The team even produced durable accessories such as water bottles and bento boxes on the Objet Connex, to make the testing conditions more realistic.

"The fact that we were able to print multiple iterations quickly enabled the designers to experiment more and still make all their deadlines," explains Zeigle. The end result represented a true breakthrough in bike design called the Kamtail Virtual Foil that's garnered major media attention.

Prior to having its Objet Connex, the Trek team would have produced prototype parts out of aluminum or dense foam using CNC processes in its machine shop and mixed them with SLA parts outsourced to a service bureau. The time frame, says Zeigle, would have been quite different, as it can take a week or more to get a CNC part and several days to get an SLA part. By contrast, lead time for a part made in house on the Objet is usually less than one day. Lupe Ollarzabal, the engineer who runs Trek's Objet Connex printer, says that having the Objet Connex in house has made a big impact on Trek's productivity. "Our Objet Connex enables us to either get a new product to market quicker, or to get a better product to market on time – and in many cases, it's both," says Ollarzabal – whom Zeigle describes as the "go-to guy" for designers who need a prototype part immediately. "Either way, we win and so do our customers. If we're crunched for time, it really helps us."

Trek's designers are thrilled with the Objet Connex – instead of waiting days or weeks for their prototypes, they can now hold a part in their hands in as little as 30 minutes. They are also prototyping a lot more frequently. "75 percent of the prototypes we create are things we never would have prototyped before," says Zeigle. "When we outsourced or had to rely on our in-house milling operation, it was just too expensive and time-consuming to do a lot of prototyping." Zeigle notes that the Objet Connex has also helped significantly reduce tooling mistakes that can add weeks or months to a product launch schedule.

Today, says Zeigle, Trek's Objet Connex printer runs almost continuously. "At first, we had one part time person who ran our Objet printer," he recalls. "Within six months, as designers starting prototyping more, it became a full-time job. If we get any busier, we will be at the point where we'll need to add a shift or purchase another Objet Connex, maybe both. Our current machine runs all day long, all week long, and sometimes into the weekend."

Objet's service has been excellent, says Zeigle, adding,

*"I wish all of our vendors were as responsive as Objet. On a scale of 1 to 10, they're a 10."*



## ABOUT OBJET GEOMETRIES

Objet Geometries Ltd., the innovation leader in 3D printing for rapid prototyping and additive manufacturing, provides 3D printing systems that enable manufacturers and industrial designers to reduce cost of product development and dramatically shorten time-to-market of new products.

Objet's ultra-thin-layer, high-resolution 3D printing systems and materials utilize PolyJet™ polymer jetting technology, to print ultra-thin 16-micron layers. The market-proven Objet Eden™ line of 3D Printing Systems and the Objet24 and Objet30 Desktop 3D printers are based on Objet's patented office-friendly PolyJet™ Technology. The Objet Connex™ family is based on Objet's PolyJet Matrix Technology, which jets multiple model materials simultaneously and creates

composite Digital Materials™ on the fly. All Objet systems use Objet's FullCure® materials to create accurate, clean, smooth, and highly detailed 3D parts.

Objet systems are in use by world leaders in many industries, such as Education, Medical / Medical Devices & Dental, Consumer Electronics, Automotive, toys, consumer goods, and footwear industries in North America, Europe, Asia, Australia, and Japan.

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