AUGMENTED REALITY

3D printing helps Pioneer develop AR-enabled car navigation system

"By creating prototypes with an in-house 3D printer, we were able to cut down product development cost by approximately 50 percent."

— Yasuyuki Tobishima, Pioneer Corporation

Pioneer created the Cyber Navi AR-HUD, the world's first automotive GPS navigation system with head-up display, using its Objet Eden250V 3D Printer.

Pioneer Corporation works hard to live up to its name. It introduced the world's first in-vehicle CD player in 1984 and the first hard disk-based GPS automotive navigation system in 2001. Established in 1947, Pioneer, a leading global manufacturer of high-performance digital electronic equipment for cars and industrial markets, still thrives on the introduction of innovative high-tech products to the market.

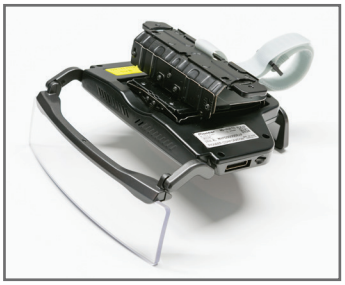
Engineering Reform

In 2012, Pioneer's flagship brand, Carrozzeria, introduced the Cyber Navi AR-HUD, the world's first automotive GPS navigation system with head-up display (HUD), for the Japanese market. Designed to be placed above the driver's seat, the system projects augmented reality (AR) information on a small screen in front of the driver, overlaying the real scenery to track real-time road conditions and routes. This design aims to reduce drivers' eye movement and limit them from looking down at the console where GPS is traditionally placed, minimizing distraction that causes accidents.

The product development cycle for this project presented various challenges to the team. Unlike regular car navigation systems, which are installed in the console panel, the AR-HUD needs to be attached to the sun visor. Hence, it was critical for the designers and engineers to design the device to stay as still as possible for clear projection.

Prior to having in-house 3D printers, Pioneer outsourced its prototyping process. Each design unit created its own prototype for different testing purposes, resulting in multiple prototypes of similar parts. Outsourcing costs were high, and prolonged lead time due to the communication and shipment time between the different business units and the outsourcing vendors.

In-house prototyping lowered costs and lead time on the Cyber Navi project.



A final product of the Cyber Navi AR-HUD.

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Yasuyuki Tobishima, manager of the design unit in Car Electronics Business Management Group and leader of the Cyber Navi AR-HUD project, was determined to find a solution to expedite the product validation process.

“Quality and time are our two biggest challenges,” says Tobishima. “It is important to validate design concepts against product principles for novel products. At the same time, it is crucial to minimize the validation time so that the product can be introduced to the market as quick as possible.”

Inspiration for New Process

Pioneer purchased its first 3D printer, an Objet® Eden250V™ for printing prototypes in-house. The new 3D printer ushered in a new approach for Pioneer’s design and production process. Instead of prototyping their individual designs separately, engineers across business units now consolidate and validate their designs using virtual simulation before 3D printing their prototypes. This new workflow ensures that all mechanical, electrical and software parts are optimally designed and positioned well.

Pioneer 3D printed the first AR-HUD prototype within a day and realized they needed to iterate the outer cast design to steady the device on the sun visor. Designers immediately reworked the software and made a second print, which fit perfectly.

“We can now easily print the prototype, share it among the different units and run all necessary functional tests,” says Tobishima. “By creating the prototyping with an in-house 3D printer, we were able to cut down the development cost by approximately 50 percent.”

Going Beyond

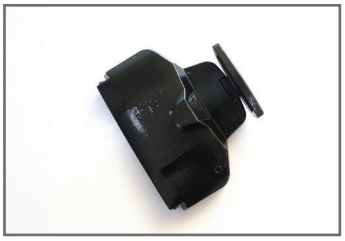
Incorporating 3D printing into the product development proved to be a success for Pioneer. Pioneer subsequently acquired two additional Objet Eden250 3D Printers to explore other advanced applications, including high-mix low-volume production and customization.

An unexpected benefit was the boost in sales, since now sales representatives can use the 3D printed parts to illustrate ideas to the clients instead of presenting PowerPoint slides or concept drawings. Proof of concept and communication has become much more effective since.

Today, Pioneer’s three Objet Eden250 printers are in full operation, and Tobishima says that Pioneer may acquire more printers to attend to all the requests from designers, engineers and sales and marketing departments. “3D printing is easy to use, serving as an effective communication tool and comprehensive solution for prototyping and functional testing. It has given us more than we asked for,” Tobishima says.

Yasuyuki Tobishima, manager of the design unit in Car Electronics Business Management Group.

3D printed prototypes helped validate designs to steady the projector and fit perfectly.



The Objet Eden250 3D Printer enables Pioneer to conduct in-house functional testing right away.

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3D PRINTER / SHOWROOM

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