Kohler application engineer Chen Lin examines a 3D printed part.

Better Technology Leads to Greater Innovation

**Kohler Speeds Product Development With 3D Printing**

Founded in 1873, Kohler Co. is a global leader in the manufacture of kitchen and bath products. The company offers a powerful portfolio of brands like Hytec and Fiori that continually set new standards in design, craftsmanship, and innovation. Based in Kohler's China office, designers and engineers at the Asia-Pacific Kitchen & Bath R&D center work to develop and test the latest products, ensuring the high quality that Kohler is known for.

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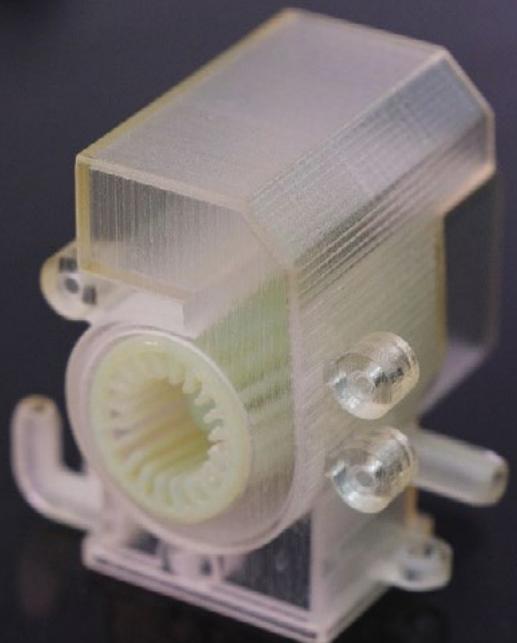
3D printing streamlines the prototyping process on a complex product like the Kohler Numi smart toilet.

A Faster Way
to a Better Design

One such product is Numi, a high-end intelligent toilet. Numi allows detailed user customization, with ambient lighting, Bluetooth capability, and a heated seat. The newest model, Numi 2.0, delivers voice activation with a built-in Amazon Alexa, personalized cleansing functionality, and exceptional water efficiency.

However, these features require extremely complex interior designs, and because there are dozens of embedded sensors and over 600 components, a tiny design change could mean a project overhaul. Before the smartest toilet in the world can be introduced to the market, it requires numerous design iterations to ensure quality and functionality. Kohler used to outsource CNC prototype production, but this was a lengthy, frustrating process that delayed product release. As an industry pioneer in innovation, Kohler wants its products to hit the market as fast as possible.

In an effort to expedite the prototyping process, Kohler turned to 3D printing. Mr. Lin Yunzhi, lab manager at the Shanghai R&D center for new product development and testing, wanted a system that the lab could accommodate in their office. He settled on two Stratasys 3D printers to help with the team's design challenges: the F900® and Objet500 Connex3™.

From Functional Tests to Production Parts

Ms. Chen Lin, an application engineer at Kohler, leverages these two systems to serve different purposes during their design and prototyping phases. The F900 features a large build size and compatibility with manufacturing-grade materials, making it ideal for large parts such as toilet seats. Ms. Chen prints parts like the air duct and nozzle bracket with ABS-M30, a high-strength material ideal for functional prototyping. For parts subject to high vibration, she uses fatigue-resistant FDM Nylon 12™. Most importantly, FDM materials can be used to make production parts as a pilot batch before mass manufacturing, greatly simplifying the verification process.

"It is great to have something concrete in hand, so that you can perform different functional tests that are compliant with industry standards," Ms. Chen explained. "The freedom that 3D printing technology allows us is amazing." Compared to machining or milling, where prototypes with cavities and complex structures require multiple separate parts, 3D printed models can be produced in one complete piece. What used to take one week can now be done within three days. With these time savings, the team can spend more time perfecting their designs to cater to customer requirements.

Perfecting the Design

While the Kohler team uses the F900 for functional prototyping, they leverage the Objet500 Connex3 for more sophisticated design verification. As the first multi-color, multimaterial 3D printer in the world, the Objet500 Connex3 can produce parts requiring multiple mechanical and design qualities in one print. After creating the CAD file, Ms. Chen translates the digital design into printed concept models with vivid colors, accurate textures, and varying opacities that provide a perfect visualization of the final product.

Ms. Chen is particularly satisfied with parts printed with VeroClear™, a transparent PolyJet™ photopolymer. Transparent, highly accurate parts created with VeroClear and the Objet500 Connex3 help the design team visualize water flow within the toilet prototype, allowing for instant concept verification. "At this point, I couldn't imagine what my day looked like before we bought 3D printers," she said. "Now I can better focus on the design process and I am doing my job better than ever before."

While Stratasys' solutions have reduced the prototyping process time by more than 40%, Mr. Lin also noted a significant cost reduction of 50%. After the success of 3D printing prototypes, the lab has also experimented with creating printed parts to test tooling and water temperature. When a piece of equipment is broken, engineers can print screw connectors to replace the broken parts. Thanks to the Stratasys 3D printers running around the clock, Kohler can count on making its product deliveries on time.
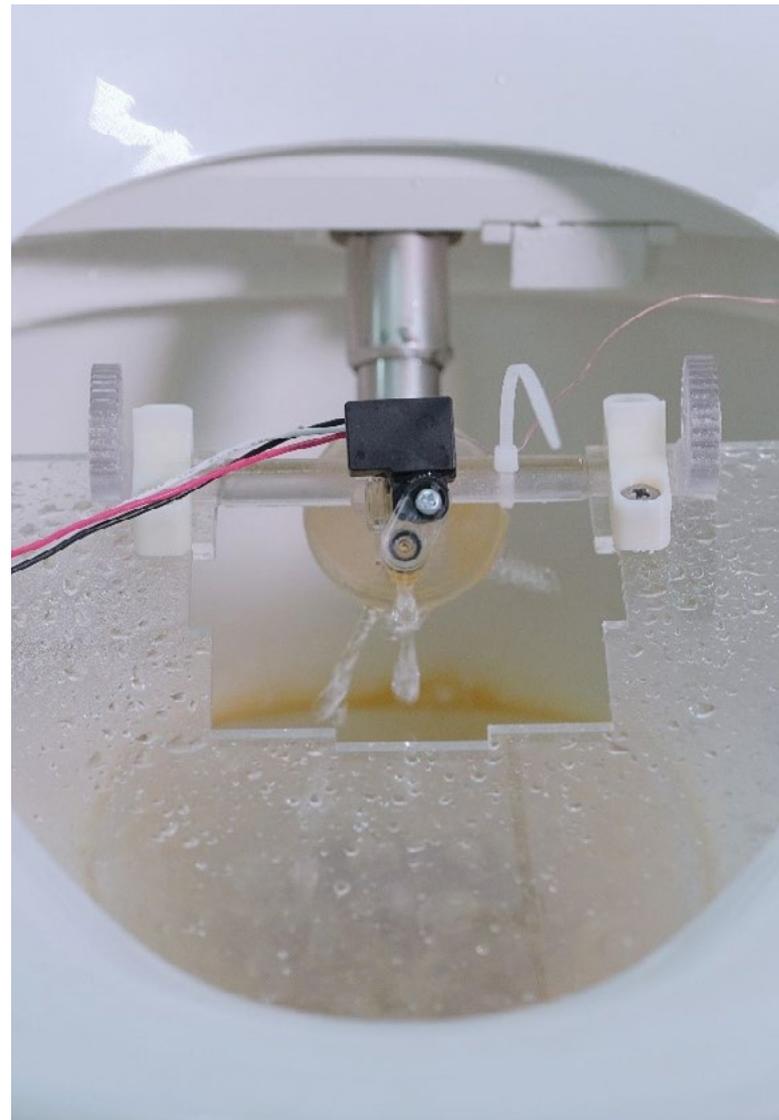
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Transparent PolyJet VeroClear material lets Kohler engineers view water flow through this prototype part.

Stratasys Objet500 Connex3

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