

Multi-jet modeling helps rush new design to market

Sometimes stereolithography is not the ideal choice.

By Laura Carrabine
Senior Editor

Today hearing instruments have become so small," said Cameron Hay, Unitron Hearing president and CEO, "that controls are being reduced to a size where the targeted audience has trouble using them." The product's small size provides a challenge for production equipment, too.

Hay and his engineers turned to Evolve Design Solutions Inc. (Ottawa, Ontario, Canada), a product design consulting firm with manufacturing and plastics expertise that specializes in product development services. It recently designed the Smart Control, a handheld remote control hearing instrument for Unitron Hearing. It was developed as a hearing system accessory for Unitron's premium and advance category hearing products. "Smart Control is the ideal device to overcome the size problem," continued Hay.

Since low eyesight, loss of finger sensation, and arthritis are common factors associated with the end user age group (67 to 70-year old individuals), the design had to meet objectives such as incorporating tactile, elastomeric user interface touch areas, a large button keypad, color and graphics contrast, and an illuminated keypad.

As a result, Evolve focused on developing an innovative and distinctive device with international appeal, one that was user friendly, compact, ergonomic, intuitive, easy to use, and technologically advanced.

Approaching the design

Unitron Hearing (UH) supplied Evolve designers with a concise design brief at the outset of the project, along with a physical 3D CAD model for the AA battery, antenna, and the electronics PCB minimum surface area. Initially, the design-

ers' job was to explore concepts, develop, and deliver three separate, new handheld remote control designs in 3D CAD and 3D physical prototype format. From these concept directions, UH selected a final ID concept direction for Evolve to refine, develop, and finalize for production. Evolve sent final deliverables in the form of an ID 3D CAD solid model to UH's engineering group in Kitchener, Ontario. With this model, Evolve included all the specifications for production materials, plastics, elastomeric over-molding, silicone keypad membrane, colors, finishes, and graphic treatments.

Software tools

"We were given all the electronics and physical mechanical components to package the Smart Control in 3D CAD Pro/Engineer software and STEP format which were easily imported into SolidWorks, our 3D CAD software platform," says Aldo Balatti, director of Evolve's design engineering. "Most of the ID conceptual and refinement work was done with digital hand sketching and digital rendering sketches produced with Wacom digital pen/tablets, as well as 3D CAD solid modeling and screen rendering captures. The color study images were done with the help of 3D CAD screen capture images from PhotoWorks and Adobe Illustrator and



Photoshop.”

Evolve designers created and delivered three new handheld remote control designs in 3D CAD using SolidWorks. In addition, a 3D rapid prototyping model was created for each design concept for users and audiologists review and comment. Untron Hearing used the focus group feedback and their proprietary new design evaluation matrix to select the final concept direction to be developed and refined by Evolve for production. Evolve worked with one of its collaborative prototyping companies to produce the high-resolution, multi-jet manufacturing (MJM) 3D printing parts.

Evolve used SolidWorks and delivered the final ID 3D CAD solid model back to UH's engineering group in Switzerland which was imported as a STEP file into Pro/Engineer. The Swiss UH engineering group was responsible for finalizing the product mechanical and design engineering for production.

Balatti notes, "This was our first project working with UH and the timeline was very fast paced. In all, the project went very smoothly without any glitches or problems. Untron Hearing was extremely pleased with the final results and, as a result, we have worked with them on other new projects."

Ergonomic issues

Based on common factors associated with the end-users age group, a simple and ergonomic shape was designed to comfortably fit in the hand. A finger recess

The Smart Remote was designed to comfortably fit in the hand and includes interface touch areas for additional tactile grip.



detail was incorporated at the rear to give the user an identifiable feature to aid in holding while operating the keypad – allowing for easy grip for any size finger. This feature is further aided by the elastomeric user interface touch areas, which give additional tactile grip. The illuminated and tactile feedback keypad provides all the functions at the user's finger tips. The layout of the various shape keypad buttons was designed for the user to easily and discretely adjust settings without looking or while keeping it in their purse or pocket.

Each one of the three proposed ID concepts were exported as fine resolution STL files and produced as high-resolution, multi-jet modeling (MJM) solid 3D rapid prototyping parts built with 0.0015-in. layers to retain a smooth surface, and all the precision of the features and details to eliminate hand sanding and finish-

ing post work. The SLA process was not selected as the standard process since it only creates parts with 0.006-in. and 0.004-in. layers. Evolve has been using the MJM process for more than three years to create high definition and precision 3D rapid prototype

models for most of its product development applications. All three MJM solid concept models were painted in a flat medium gray paint.

Multi Jet Modeling is a quick, high-definition rapid prototyping process used for concept and design validation modeling. The system



Evolve designers created and delivered three new handheld remote control designs in 3D CAD using SolidWorks software.

generates plastics models which are more accurate than stereolithography. The machine uses a wide area head with multiple spray nozzles. These jetting heads spray tiny droplets of melted liquid material which cool and harden on impact to form the solid object. The process is commonly used for creating casting patterns for the jewelry industry and other precision casting applications.

When Evolve was completing the ID detailing, colors, finishes, and production specifications, Untron Hearing requested a metallic effect for the main housing body for the Smart Control remote to showcase the technologically advanced product. The product has thermoplastic elastomeric over-molding user interface touch areas on the top housing. While using a metallic

paint and lacquer was an option, the process would have added complexity, time, a higher reject rate, and extra cost to the part. Since Evolve had experience using Visual Effect decorative molded resins from Sabic Innovative Plastics (formerly GE Plastics), Evolve suggested a more eco-friendly approach using a new Visual Effect EF technology system which only had been used in Asia at the time. UH approved Evolve's recommendation after reviewing the Visual Effect EF color samples and, subsequently, painting the housing parts was eliminated.

Additional Smart Control features

Apart from the wireless communication and low energy consumption, Untron Hearing introduced Smart Control, a button that

alerts users when it is approaching minimum and maximum settings. The other addition is the Learn Now button that logs the preferred sound settings. The compact product is powered by a single AAA battery. This one-way communication wireless remote has a lock/unlock keypad selector switch, left/right/both hearing instrument (HI) selector switch.

Blue and red LED indicators show communication to the left (blue), right (red), or both HIs. The illuminated feedback keypad provides fingertip function. The layout of the various shaped keypad buttons was designed to easily and discretely adjust sound settings. The keypad features interface button selections such as volume up/down, program change, telephone button, home button, and Learn Now button.

There's also a smart molded-in key ring opening. Large, contrasting colored icons are present on the keypad, as well as printed on the remote control's body. All functional elements of this product help make it intuitive, reliable, and easy to use and operate.

Since its completion and roll out to the market, the Smart Control has generated strong brand recognition with its industrial and mechanical design, as well as received positive acceptance from consumers and audiologists. This remote control is the first in the hearing instrument industry to add new important functions to the hearing system that allows hearing impaired users to control the way sound is processed in any environment. **DMR**

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