Phillips Plastics Corporation™

INTERFACE

Brushing Up

Brushing your teeth is never fun. But today, many companies are making it easier on consumers by creating toothbrushes with streamlined looks and an ease-of-use design. Such is the case with Philips Oral Healthcare, a division of Philips Consumer. The company first came to Phillips Plastics Corporation™ for help with design assistance and manufacture of seven parts for their revolutionary new toothbrush, the Sonicare® Elite. Four of the seven parts are created using the multi-shot molding process, chosen both for its durability in molding and aesthetic appeal.

The goal for this newly designed toothbrush was to create a one-piece handle to replace the traditional clamshell version. This one-piece design would allow Philips Oral Healthcare to reduce the assembly operations needed to put the two halves together and create a more durable handle that would not allow damaging debris to get inside near the sensitive electronic components. According to Philips Oral Healthcare Plastics Engineer Jeff Kelly, “With the one-piece handle, we only had one surface to worry about and the component had better cosmetics and overall strength.”

It's All In The Tools

To begin, Phillips Plastics created a prototype tool to determine if the design was manufacturable and robust enough to pass Philips Oral Healthcare's physical requirements. The prototype also allowed Philips Oral Healthcare to complete preliminary drop testing and visual evaluation.

Once the prototype models were created and the Philips Oral Healthcare team was satisfied with the design, Phillips Plastics began work on a one-cavity production tool. "The one-cavity tool would do a few things for them," explains the Phillips Plastics program manager, "It would get Philips Oral Healthcare production parts quicker so they could get the product in to the market faster. Additionally, the one-cavity tool enabled inventory build-up of parts while the four-cavity tools were being built."

Moving The Design Forward

The seven parts, including a low and high volume version handle, brush head seal, nut, color ring, and lock, are some of the components that make up the Sonicare Elite toothbrush. "With this program," explains Kelly, "There were cosmetic, dimensional, and functional requirements that had to be met." Not only was Phillips Plastics able to meet the requirements, they were able to achieve reductions in cost and labor for Philips Oral Healthcare by providing interchangeability on some of the parts, using the same materials on different parts to reduce resin cost per-pound.

1 3rd shot soft-touch TPE button

2 1st shot opaque white portion of insert

3 2nd shot translucent window

4 Insert is then placed into another mold

5 4th shot substrate resin

6 Sonicare Elite 7300

7 5th shot soft-touch TPE grip

Toothbrush Handle – Elite 7500 and Elite 7300

Materials: TekBond 1728, Xylex 7200, TekBond 1726

Two versions are created to generate the handles for two toothbrush models – a high volume model, the Elite 7500 Series, with an on/off switch and a button allowing the user to adjust the frequency of the brush; and a low volume model, the Elite 7300 Series, with only an on/off switch.

Elite 7500

The handle for the Elite 7500 Series is formed by the multi-shot molding of five materials. According to Phillips' toolroom manager, "Trying to get five shots to come together and have them look good was in interesting challenge."

To do this, the team created a three-shot window insert with two soft-touch control buttons for the toothbrush.

Sonicare Elite 7500 **8**

Window insert **9**

Bridge **10**

Anti-roll lock **11**

Color rings **12**

Brush head seal **13**

Nut **14**

The three-shot part is then loaded into a mold where the two-shot handle is shot over the insert with a substrate resin and soft-touch TPE grip, creating the completed five-shot handle.

Elite 7300

For the Elite 7300 version, an insert was also created to form the button for the handle.

To do this, an opaque white portion of the insert was molded and then placed into another tool where the second and third shots create a translucent window portion and a soft-touch TPE button.

This three-shot insert is then placed into another mold where the fourth and fifth shots, being the substrate resin and soft-touch TPE grip, are molded over the insert to create the complete handle.

Anti-Roll Lock

Material: Eastar BR-203, TekBond 1728
A 16-cavity tool was used to produce the anti-roll lock for both models. This multi-shot part locks the toothbrush components together and causes it to not roll on a flat surface.

Brush Head Seal

Materials: Eastar BR203, TekBond 1726
The brush head seal is a two-shot component located on the top of the toothbrush. Interchangeable between the two models, this part helps create a tight seal around the neck of the brush so fluids can't get inside near the electronics.

Nut

Material: Eastar BR203
The nut, which is part of the brush head assembly, screws the brush head onto the handle of the toothbrush.

Color Ring

Material: Monprene MP2850M
The color ring is a small, o-ring shaped part that comes in four colors allowing the user to differentiate their brush head from another household member.

Bridge

Material: Zytel NC101
An internal part, the bridge is a carrier for the battery and electronics in the handle.

A Stake In It

One of the more interesting features on the toothbrush is a post located on the bottom, which is heat staked inside the handle. A simple feature, the post provided a dual purpose for both teams. For Phillips Plastics, the post offered a way for the three-shot insert to be aligned onto the core and kept in place during molding. For Philips Oral Healthcare, the post provided a place to insert, and hold in place, a magnetic ferrite, which charges the toothbrush. "The post was critical because it had to meet our automation requirements for assembling on and off the core and it also had to meet Philips Oral Healthcare's dimensional and functional requirements," explains Phillips Plastics' project engineer. "Clearances and fit in the post area had to be exact, or the assembly and part would not function correctly."

In The End

"I have a very favorable impression of working with Phillips Plastics. Both Philips Oral Healthcare and Phillips Plastics are focused on putting the best foot forward to make the best quality product. I received 100% support from every team member – engineers, manufacturing support, supervisors, management, and the people on the floor – everyone stepped up to help out," concludes Kelly.

Testing The Waters

Being a consumer product that is used daily, it's a given that over time the part would get dropped and become exposed to elements such as abrasive toothpastes and excess water. As the program progressed, representatives from Phillips Plastics played an important role in choosing materials that could withstand these mishaps. The rugged, durable materials selected for the toothbrush were chosen based on these worst case scenarios, but the product still had to endure rigorous testing to ensure it would hold up in these extreme cases. Scrupulous chemical, drop, and wash testing were done to determine if the parts were strong enough to hold up. In the end, the product endured the tests, proving it was fit to be used in even the toughest everyday settings.

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