Article
Feb 2003
Hearing Aid Shell Fabrication - UV Process
Part One

The 100th Monkey Phenomenon
You might be wondering what 100 monkeys and UV shell fabrication have in common - and if you didn't wonder, I would need to wonder about you.

Some time ago researchers found a group of monkeys on a remote island. These folks wanted to study this particular group because they had never been in contact with any other monkeys, and they wanted to know how that might effect their development. The researchers were startled to learn however, that this group of monkeys were indeed very developed, and practiced many of the learned traits of other monkey groups on the mainland, even though they had never interacted. Was this therefore learned behavior, or some kind of inborn trait?

They decided to perform an experiment.

They took new-born monkeys and separated them into two groups. One had access to other monkeys to learn from. The others were an isolated group and forced to learn on their own, or from each other. The first group developed as expected, but the second group had a surprise. Researchers found that 1 in about 100 monkeys possessed a unique desire to be inventive and figure out new and better ways of performing tasks. This monkey would then pass this knowledge on to the other monkeys in the group. And even though this process was slower, the 100th monkey would keep the isolated group advancing in development. And when comparing different isolated groups with each other, they all advanced at about the same rate - many times figuring out the same way to do something at the same time.

So What Does This Have To Do With UV Shell Fabrication?
Well, from my standpoint - everything. It takes that 100th monkey to think in a new direction and try things in a new way. I don't want you to think I am comparing people to monkeys, but I can always tell when a new thought process is emerging within our industry because I get phone calls and emails about it. And one subject that has emerged over and over again recently is the idea of folks making there own hearing aid shells for hearing aid fabrication in office - and why not? The benefits are tremendous and the profits are much higher. So, before we take a look at how to make our own shells and custom ITE hearing aids, lets look at why we would want to take on this endeavor.

The Pros:
Here is a list of why you might consider making your own hearing aid shells:

1) More Profit. Obviously you would stand to make more money on a hearing aid sale if you made the unit yourself.

2) More Control: This is a biggie. You get to control the whole process. From turn around time to fixing fit problems, you can give your customers superb customer service as everything you need to fix any problem is right at your facility.
3) Less Turn Around Time: From beginning to end you can easily make a hearing aid in 60 minutes or much less if you have a production process. How does that compare to waiting days for your customer.
4) Better Customer Service: You can react to any customer complaint in minutes instead of days.
5) Less Fit Problems. This one might not seem as obvious, but the sooner you can work with an impression, the more duplicatable it is.
6) Easy Process: Making shells, and hearing aids, is not difficult - especially with the availability of prewired faceplates. Lets face it, if you've never had electronic training it would be nearly impossible for you to figure out how to wire a hearing aid circuit, but now you can buy a digital circuit already wired and tested for you. You just need to learn the process of putting it all together.

The Cons:
1) Money: It is going to take money to get it going. Not tons of money, but enough to make you think it through.
2) Personnel: You might need to hire and train folks to help you, depending on how big your operation.
3) Time: It is going to take more time on all fronts to meet this new process.

Equipment and Materials:
Obviously, you are going to need some special, and some not-so-special equipment and materials to make your own shells. Here are some of the basic pieces required:

Wax Pot for melting wax
Hydrocolloid machine for melting hydrocolloid (larger labs) or a microwave (for smaller labs).
Water clear hydrocolloid material
Disk Sander for trimming the impression and sanding the shell base.
UV Cure chamber for curing shells
Investment cups for pouring casts
UV Spot Cure unit for curing vents
Vent wires
UV Cure unit for attaching the faceplate
Acoustic testing unit for testing the completed hearing aid
UV materials: Shell material in colors, UV lacquer, faceplate adhesive
Soldering station
Various hand tools, bits, burrs ...

So, If You Want To Make Your Own Hearing Aids Why Are We So Focused On The Shell?

The hearing aid shell is the whole stumbling block to making hearing aids. The electronics is easy - just buy prewired faceplates. They are tested and ready to go. But, the shell - well, if you can't produce the shell you're not going to be making hearing aids.

Help In Making Your Decision

I can tell you this, making UV hearing aid shells is not hard work It is a process however, and with every process comes a step by step procedure. And though it may seem like a lot of steps, most are very minor and only take a few moments. If you can follow directions you can do this - I promise.

So, here we go!

Step 1: Working With The Impression

If you've worked in the hearing industry one day you know how important the impression is. A lousy impression is going to make a lousy hearing aid fit - plain and simple. There are a lot of little tricks you can do to help the impression, but if you have large voids you may as well do the impression again - it will be worth it in the long run. When I worked for a hearing aid manufacturer, it was a daily occurrence that we had to call an office and ask for a new impression. And invariably we would be told to make the hearing aid anyway - big mistake. Many times these same hearing aids came back for remakes.

(Another reason to consider making your own shells).

Step 1a Making A Cast, or Investment

Once you have a workable impression you will need to cut it down for making a proper cast, or investment. This is so you have a mold of the ear in which to check the fit once the hearing aid is completed. The oto-block is removed and the lateral process is cut with a razor blade to make a base. The cut impression is then adhered to an investment cup with hot wax and silicone material is poured over it. Once cured, the impression is removed and the investment is complete.

Step 1b Trimming the Impression

Now you will need to cut the impression down to the desired size using a razor blade. What you are doing is trimming closer to the type of hearing aid model to be made. A Full Shell device will want to be cut revealing the helix, where a CIC will need to be cut at the canal opening. This is just an approximate cut as you will take the shell down further after fabrication. After cutting, you will also need to taper the canal and detail the impression so the finished shell can fit comfortably in the ear. Tapering can be easily done using a disk sander.

Step1c Filling Voids

Even the best impression will leave a small void or two. The best stuff I've found for filling voids is DAP 33 glazing compound. This stuff works great, is easy to apply, and is

inexpensive. Just use your thumb or finger to work DAP 33 into any void. Smooth along the impression surface and let it harden for a few minutes.

Step 1d Waxing the Impression
After the impression has been worked it is ready for a coat of wax. This is done by simply dipping the impression in a hot refined wax, and is necessary because we need to build up the impression slightly to help give the hearing aid a snug fit, as well as the small amount of material lost when we buff it later.

Now there are a few things to consider when dipping the impression:
1) Wax adheres in different thicknesses at different parts of the impression. A concave surface will accumulate more wax than a convex surface.
2) The part of the impression that stays in the wax the longest will accumulate the most wax. In other words, the base of the impression is likely to have more buildup than the canal providing the canal was dipped first.
3) Dipping the impression is a skill that must be practiced and mastered as the thickness of the wax will have an effect on fit.

This step may seem scary, but it is really just a matter of practice getting the wax at the right temperature, dipping at the right speed, and removing the impression at the right angle. And this will vary depending on everything from the wax pot to the model of hearing aid to the temperature of the room. But with a little practice, you will be dipping smooth and consistent impressions in no time.

The wax will harden very quickly, and we are now ready for the fun part.

What's Next
For the sake of being long winded, next time we'll take a look at making the negative impression for the shell, and the actual UV Process.

About the Author
Chris Perkins is the owner of Lightning Enterprises, and facilitates the Lightning Enterprises newsletter. He has worked in the hearing aid industry since 1991 in hearing aid manufacturing and product development, as well as equipment and process consulting.