

BACK-TO-BASICS

Investing for a Precision Fit

Back-to-Basics is a series focused on basic skills necessary for a successful career in dental technology. For skilled professionals it is a useful tool as a refresher for skills learned on the job—or long ago. For those new to dental technology, it will be an invaluable resource to keep on hand.

This is the third article in the Back-to-Basics series, designed to reinforce core skill training with an emphasis on the science behind the materials being used in the techniques shown. We continue our series with *Investing for a Precision Fit*. It is our hope everyone in the lab will benefit from this review.

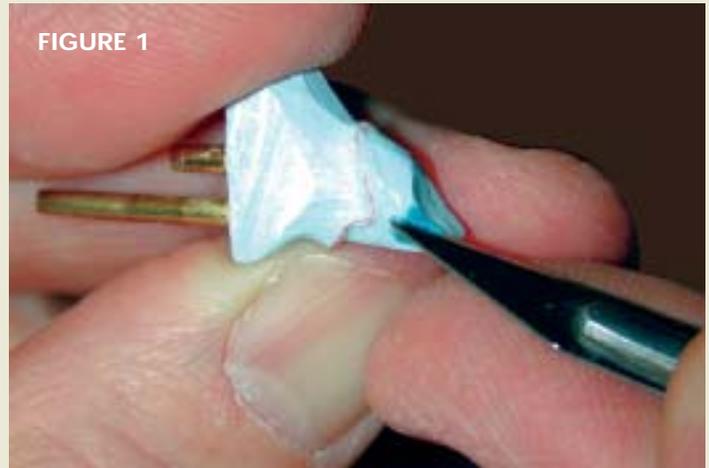


FIGURE 1



FIGURE 2a



FIGURE 2b



FIGURE 2c

Step 1. Create the ideal investing environment

Store liquid and powder at room temperature 72-75°F (22-23°C). The hotter the room, the faster investment sets. If you are pouring multiple rings, especially in the hot summer months, store at least the expansion liquid in the refrigerator. You will weaken the mold if the investment starts to get thick and warm as you are pouring; this could lead to a blown mold. Plan ahead for cold winter months, as most investment liquids are usually not stable below 32°F (0°C).

Step 2. Select a high-quality investment, and follow the manufacturer's directions

Today's leading investments allow technicians to go from wax to metal in under an hour, saving time and money. An investment that can be placed directly into a hot oven and burned out quickly is also a plus.

Investment can be controlled for expansion and shrinkage with the use

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of expansion liquid and distilled water. Adjusting the expansion is in direct proportion to the amount of expansion liquid you use, keeping the total volume constant. For example, the more expansion liquid and the less distilled water used, the more expansion you will get. The more distilled water and the less expansion liquid used, the more shrinkage you will get. Do not attempt to adjust the total volume of liquid to powder ratio. It will only lead to confusion and possibly a weaker mold.

Step 3. Blockout all undercuts

Look for and blockout slight undercuts before blaming your investment for tight fits (**Figure 1**, also illustrated in the March 2003 issue of JDT, “Model and Die: A Proper Beginning”). In some cases, technicians will adjust the ratio by adding an extra cc of expansion liquid to compensate for undercuts. A good recommendation is to set aside a standard die with no undercuts. Before running a full day’s production of wax patterns through with a newly opened case of investment, use the standard die and wax, cast and check the fit. Alter if needed. This will save you time and aggravation in the long run.

Step 4. Spray wax pattern with debubbler

Use a debubbler to break-up the die lubricant and the wax surface tension. Spray the wax pattern with debubbler, then take a soft synthetic brush and lightly scrub the wax pattern inside and out to clean off the die lubricant and other foreign matter left on the wax from handling the pattern. Use a sports bottle filled with fresh water at room temperature to gently rinse the debubbler off the wax pattern (**Figure 2**). Hold the base former with a firm grip and shake the excess water off or lightly blow off with an air hose. Note: If the debubbler is left on the wax patterns, it can retard the chemical set of the investments, causing roughness. Do not use an alcohol-based debubbler, as it will not rinse off.

Step 5. Measure the investment liquid

Always keep your investment bowl filled up half way with water when not in use. When you are ready to invest, pour the water out and swab the inside with a dry towel. A dry bowl will soak up approximately 1cc of liquid creating inconsistent fits. For accurate and consistent liquid measurements, use a 20 cc Monoject syringe (**Figure 3**). Graduated cylinders tend to give you inaccurate readings. Due to adhesion, 1/2 cc or more of liquid can remain on the walls.

Step 6. Vacuum mix the investment

Introduce powder into liquid and hand spatulate for approximately 15 seconds. Make sure that the lip of the investing bowl exhibits a clean, flat non-chipped surface. This will maximize vacuum pull. Also, wet the rim of the bowl before placing the lid on. Vacuum spatulate for 60 seconds, then place the bowl on vibrator and break vacuum slowly. If your machine does not have a



FIGURE 3a

vacuum release dial, turn off the machine so you let the air gently into the bowl. Do not snap the hose off while the vacuum is still on. By snapping the hose off, the air is slammed back into the bowl pushing all those tiny bubbles right back into your mix. Eliminating tiny bubbles will produce smooth castings, saving time and labor in the finishing process. Note: 26 Hg on the vacuum dial is a 100 times weaker vacuum pull than 29 Hg on your vacuum. If you see this inefficient vacuum pull, call the manufacturer for assistance or take care of the problem right away. We guarantee you will notice a big difference.

Step 7. Fill the rings

We prefer the clear polyvinyl ringless system; it is flexible and allows the natural setting expansion to take place without distorting the mold. The mold releases easily after the investment sets. We suggest that you take the mold out according to the manufacturer’s recommendations. Using only low to medium vibration, fill rings no more than a 1/4” over the wax patterns to allow the steam to escape out of the mold. If you bury your wax patterns over that 1/4”, you’re creating a “pressure pot” scenario (**Figure 4**). The volatile steam will create too much pressure in the mold (especially in larger rings) and can either blow the top off or the sides out.



FIGURE 3b

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Step 8. The burnout cycle

Now, thanks to innovative technology, there are two methods to burnout investment rings: the conventional 2-stage and the new rapid technique. However, we highly recommend that if your rings contain any plastic runner bars, precision attachments, etc., use the conventional 2-stage technique.

The conventional 2-stage technique

This technique has been the standard in the industry for years. This requires approximately a 13° F per minute increase up to 800° F, and hold for 1-hour. Then rapidly raise to desired casting temperature.

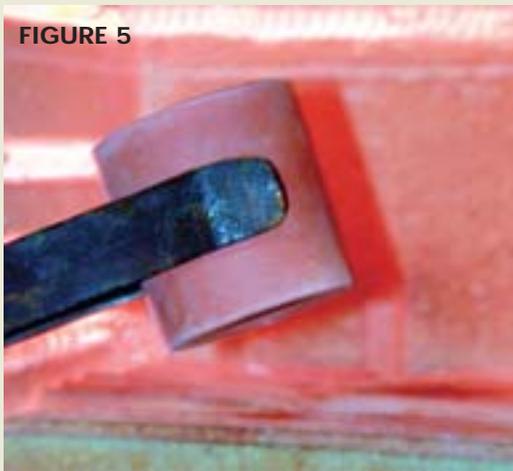


FIGURE 5

The rapid technique

After the required bench set time, place ring in a hot burnout oven (Figure 5). *Note: some investments require placing the ring in at a specific temperature and then raise to desired casting temperature. Other manufacturers say that their investment can withstand placing the ring in at casting temperature.* When placing the ring in at casting temperature, we recommend this equation: for every gram of investment used, multiply this by a quarter of a minute (e.g. 90 grams x .25 = 22.5 minutes) at casting temperature. Add 10 minutes per additional ring.

Close adherence to the process described above will consistently produce bubble free, smooth castings (Figure 6). **jdt**

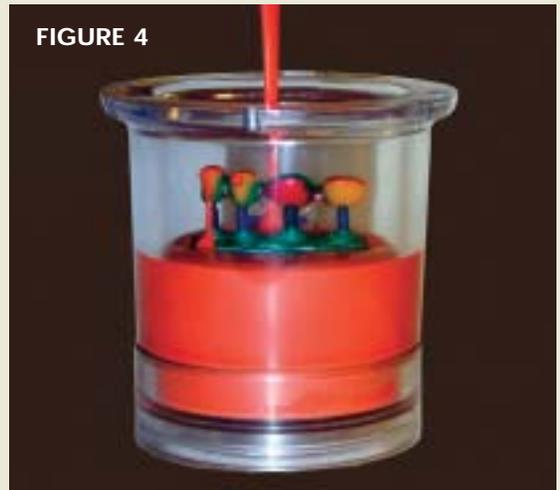


FIGURE 4



FIGURE 6

The next edition of Back to Basics will feature “Casting Techniques to Assure the Integrity of All Alloys.”

THE AUTHORS

Mr. Edward J. Harms, CDT, is CEO of Talladium, Inc., manufacturer and supplier to the dental laboratory industry. He is a graduate of Southern Illinois University with a Bachelor of Science Degree in Physics and a minor in Metallurgy and Dental Technology. Mr. Harms has written articles and lectured globally on innovations in laboratory techniques and products.

Mr. Edward R. Harms, CDT, is Sr. Vice President of Operations at Talladium, Inc. and also a graduate of Southern Illinois University. “Eddie” conducts much of the research and development at Talladium and has lectured globally on innovations in laboratory techniques and products. For additional information, contact Talladium at (800) 221-6449.

