Production Platinum Casting

Jurgen J. Maerz • Platinum Guild International

This is a method of platinum casting that was introduced to me by Michael Epstein of EPS LLC in Feasterville, PA. This method allows the casting of large flasks weighing as much as 575 grams in a centrifugal induction-casting machine. For this type of casting, we tried several investments with similar results. We used Platinum Plus from R&R, Opticast from Kerr, Romanoff J Formula and Westcast Platinum QC from Rio Grande. The casting machine was a Galloni Modular 6, with a large coil and a large size crucible. The casting alloy was Platinum /Iridium 950 as well as Platinum/Ruthenium 950. Both alloys gave great results with minimal porosity.

INVESTING

When one prepares a flask for platinum casting using phosphorous bound investment, some investments are prepared by mixing the acid with water, to create the solution, which is then mixed with a prescribed ration to make the investment slurry. As the set-up dries, the water needs to be removed so that the acid can interact with the investment powder, making an exact replication possible. This is commonly done by using a liner paper inside the flask and then setting the flask on a cardboard base, which helps with water removal.

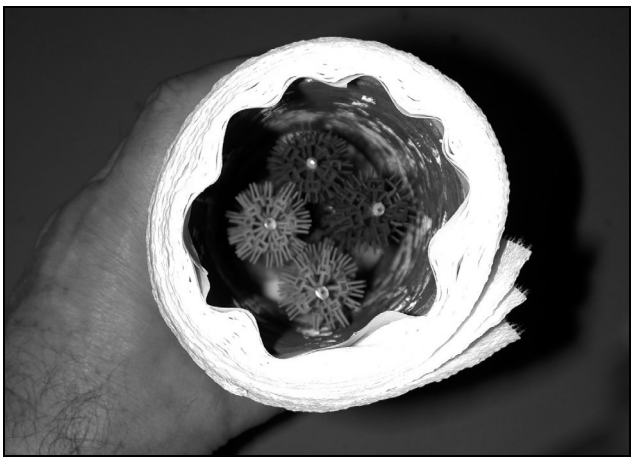
During this process, the investment turns into a gel-type substance, which settles down during the drying process. Michael has found through trial and error, that many times when the investment settles, cracks would appear. This happens in the early stages of the drying process.

By diluting the acid ratio to 45% of the recommended volume and adding water to maintain the ratio of the solution, and then using that to mix the investment, he created a more porous and less dense investment set-up. This has many advantages. During the casting, as the liquid platinum enters the cavity, the gases can escape through the less dense pores of the investment, making it possible for the metal to travel rapidly and fill the mold. The investment is not as hard and de-vesting is less complicated.

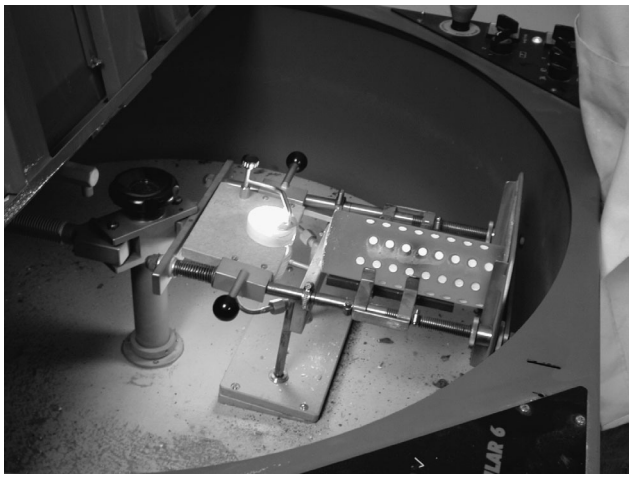
Michael uses a perforated stainless steel flask that is 3”x 8”x 1/8” The use of a perforated flask in casting is not new. It is, however, rarely used for centrifugal casting. On a tall flask, it is difficult to remove the water through the bottom. By using a perforated flask and wrapping the outside with several layers of paper towels, the water can be removed slowly and evenly. There is no slump to speak of. The tree is waxed to an absorbent paper and the flask, wrapped with the paper towels is then waxed to that paper also.

In trial castings it was determined that the best results were achieved with a 4.5mm center tree for a single tree and a 3mm sprue for a triple tree. To create a wax stem for the single tree, that will be this thin yet support 65 eternity rings, some stability has to be created. This was accomplished by dipping a 1.5mm copper wire into the wax pot and coating it with wax. With a little bit of practice it was possible to make a 4.5mm sprue with a

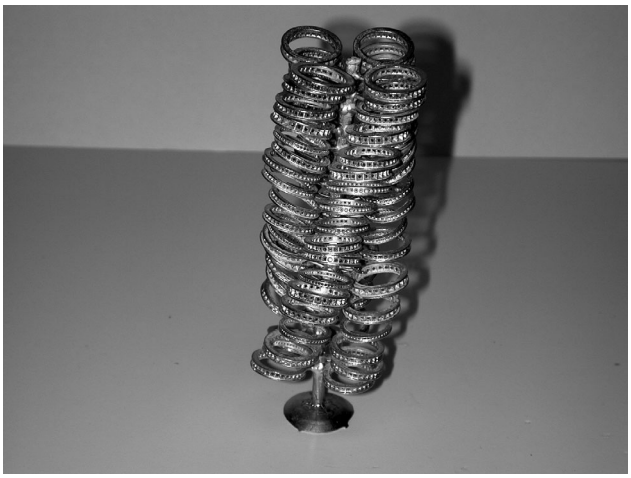
Wax trees ready for investment



Tree inside towel wrapped flask



Casting using a perforated flask



550 gram platinum tree

copper center. Now the rings could be waxed on the tree and the tree could be waxed to a domed base. During burn-out, the copper wire is then removed. It comes out easy once the wax has been melted away.

The following schedule was employed for burn-out.

After pouring the investment into the wrapped flask and additional vacuuming to remove the air bubbles, the flask remained on the bench over night

In the morning, the paper towels and the paper on the bottom were removed.

The flask was then set into the kiln and the kiln was brought to 1400° F in one continuous ramp over 2-3 hrs time.

To achieve the amazing casting results Michael reduced the RPM of the casting machine to the 200-300 range. One assumes that when casting platinum a higher speed would bring better results. This is not true. At high speed the metal enters the flask with lots of turbulence. Any sudden change in direction, any gas obstruction will shorten the distance the liquid platinum can flow. By reducing the speed of the machine, the metal enters in a smooth even flow, has the ability to push any gas from inside the flask away and fill the cavity with amazing, clean and porous free castings.

For large pieces the recommended speed of the arm was 200 RPM, for most rings the best results were at 250 RPM and for a triple tree casting with many small parts, 300RPM worked best.

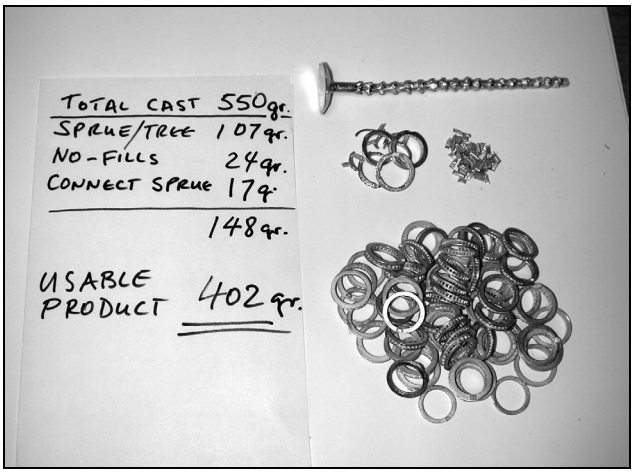
The actual castings were done efficiently with the flask being at 1400°F. The flask is sitting in the cradle of the machine and a small amount of Platinum grain was filled into the crucible. The induction coil was the activated and as the platinum started to melt, more grains were added to the melt until all 550 grams were in the crucible and liquefied. This was the maximum capacity of the crucible. The metal temperature was 1950°C, which represents a super heating of about 200°C above the liquidus of the platinum. For this casting the alloy was Pt950/50 Iridium. I personally do not care for this alloy too much for casting, as it is rather soft (only about 80 HV, but these are eternity rings and will be set with stones all the way around. Michael claims that with his process the metal seems harder than other Pt950/50 Ir alloys he has worked with. I would want to test this to confirm.) we did several castings with Pt/Ru 950 also.

As the flask is removed from the cradle, one can see that it is a good cast. The button has a nice dip in the center and all the metal is inside the flask. There were no spills and no cracks in the investment. Michael set the flask on a fire brick to let it cool down some. He then used a hammer as well as several buckets of water to dowse the flask and remove the casting. The tree was amazing. Over 550 grams of platinum, yielding over 75% of usable product.

This was then repeated for several more flasks. One special tree comes to mind. There were three center sprues coming up from the cone and the parts for three complete link bracelets, 55 links each as well as the lock and some parts for a ring were waxed on these three main sprues. The sprues had a diameter of 3.5 mm and were over 6” long. As you can see by the photo, the success was mind - boggling. The center sprues were also made with a copper wire for stability. The RPM was set to 300 on the machine for a complete fill.

ADDITIONAL EXPERIMENTING

Treetop after divestiture

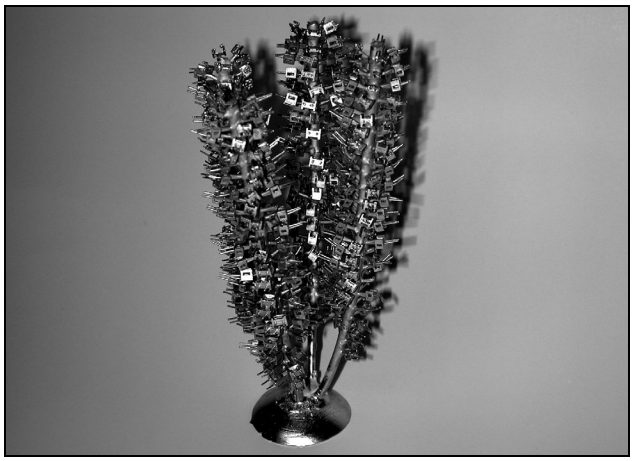


75% usable product was the result

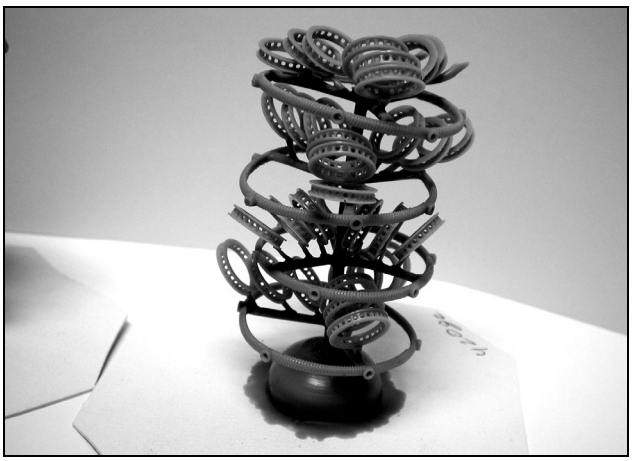
One experiment was the casting of complete one piece bangle bracelets in Platinum. As there is no reason to waste metal, he used the feeder sprues to the bracelet to serve as sprues for additional small parts In this particular experiment, three complete bangle bracelets were placed on a tree and again , the castings came out perfectly with the tree being at machine capacity of over 525 grams, yielding 410 grams of usable product.

SUMMARY

- To tree, a tall thin sprue of 4.5mm with a center core of 1.5mm cooper wire is needed.
- The flask is 3"x8"x1/8" perforated stainless steel wrapped with 12 sheets of "Bounty" paper towels.
- Follow the exact burn-out cycle:
- bench set over night
- remove paper
- 3.5 hr ramp to 1400°F
- cast with 200°C super heat above liquidus
- Slow the casting speed of the machine to 250 RPM for small to medium size rings on the single tree, 200RPM for large and 300RPM for the triple tree.
- De-vest with 45% Caustic Potash or other available investment removers. I do not recommend the use of HF.



Link bracelet tree



Ring-Bangle tree