



## Investment Casting Technology Reduces Cost in Neck Ring Production

By: Robert Barber, Director of Business Development, Franklin Bronze Precision Components

In the manufacturing process for glass containers, bronze neck rings are commonly used in the forming of the “finish area” of the container.

Historically, these neck rings have been machined in the container mold shops from cast shapes that have been either sand cast or continuously cast. These casting types, with their relatively low process costs, have proven over time to be very reliable casting methods for neck rings. However, with the drastic price increases of copper & nickel, and ever increasing machining costs that container mold manufacturers are currently facing, the investment casting of blanks for neck rings can now be feasibly done with a much more precision casting process: Investment Casting.

Despite higher manufacturing costs, the advantages of the final investment casting, with their near net shape, outweigh the extra costs incurred by using the less precise and less efficient designs of the commonly used sand castings. Franklin Bronze, a U.S. foundry with investment casting operations, has moved its neck ring casting customers from sand castings into investment castings. Each of these customers has reported significant savings and advantages with the new precision designs.



Investment cast inside profile – casting vs. finished ring



Investment cast outside profile – casting vs. finished ring

## **Additional Advantages:**

### **Metal Savings:**

An average set of 3.5" (8.89 cm) sand cast or continuously cast neck rings weighs approximately 7.6 lbs. (3.45 kg) before any machining.

With common melt loss of 15% in the casting process, that means each set of these neck rings requires 8.74 lbs. (3.96 kg) of metal to produce.

Based on the average ingot price of \$4.20 per lbs. (0.45 kg) for XX Bronze during the past year, this translates into a metal cost of \$36.70 for each neck ring set manufactured.

The same neck ring set made from an investment casting has a weight of 4.5 lbs. (2.04 kg). With the same production melt loss of 15% applied - that translates to a metal requirement of 5.17 lbs. (2.35 kg) per set.

Thus the metal cost for the investment cast 3.5" (8.89 cm) neck ring set is \$21.70 per set. This translates into a metal cost savings of \$15.00 per set for the investment castings if only ingot is used as the melt source.

Obviously this figure is reduced to some degree if recycled bronze or scrap is used for this melt source. But, the same benefit of substantially reduced metal cost is achieved with the lighter weight parts because melt loss remains the same on a per pound (0.45 kg) melted basis.

With yielding fewer parts per heat, the heavier sand castings deplete the available pool of recycled metal faster as compared to investment casting. The effectiveness and cost savings of any established recycling program is very negatively compromised by utilizing low yield, high weight sand castings.

### **Machining Savings:**

The machining of neck ring blanks is commonly done in two stages.

First, the half blanks are milled on matching faces with interlocks, reliefs, and any other detail required on these surfaces completed in this operation. An interpolated machined diameter is also completed during this stage. This diameter is used as a chucking surface for the second stage of the operation.



Actual amount of turnings produced by the machining of one set of a 3.5" (8.89 cm) neck ring. Sand cast set on left, investment cast on right.

The second stage, which can result in a completely finished neck ring set, is done on a multi-spindle CNC lathe with live tooling. Both of these operations are enhanced by the reduction of machine stock on most areas of the castings. An average 3.5" (8.89 cm) completed neck ring set weighs 2.6 lbs. (1.18 kg).

With the sand cast neck ring it requires the removal of 5 lbs. (2.27 kg) of material during both operations.

The investment cast sets require the removal of only 1.9 lbs. (0.86 kg) of material. This is over 2.5 times the amount of metal removal required for the sand castings.

Reported reductions in machining time per neck ring set of 30% to 50% have been reported. In addition to there are significant savings in tooling cost, machine wear & tear, and handling time for excessive amount of turnings.

### **In Summary:**

Neck ring blanks, produced with the more precise and consistent investment castings, can and do result in savings in time and costs that are significant enough to off-set the higher process costs associated with investment castings.

Through casting technology, Franklin Bronze is committed to improving glass mould quality and competitiveness.

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