

# Patriot Foundry & Castings Reduces their Scrap Rate by 98% with ESI ProCAST

**PATRIOT**  
FOUNDRY & CASTINGS  
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## Challenge

A late stage customer requirement for a near perfect cast finish on a military service Nickel-Aluminum-Bronze gearbox required an upside down pour resulting in an initial 50% scrap rate due to shrinkage porosity defects that only showed during final machining.

## Benefits

Numerous changes to every feature of the mold, from runners to risers, were attempted causing the shrinkage porosity defects to relocate frustratingly to other areas of the cast gearbox.

Next, Patriot brought ESI ProCAST software into the process to model the pour leading to a 98% reduction in scrap rate and a very satisfied end customer with quality parts delivered on time.

*"ESI understands our industry and its unique issues. Consequently they quickly came to terms with the limitations in the changes we could make to the matchplate configuration. Together, we were able to work within those constraints to solve the problem successfully."*

**W. Christian Leuteritz**  
Professional Engineer, Owner  
Patriot Foundry & Castings



Fig. 1: The defects as seen in the initial castings before the change was made



Fig. 2: View of the added flow channel to feed the lower triangular section during cooling

## Story

Patriot Foundry & Castings is an industry-leading company specializing in top-quality sand castings of bronze, aluminum and zinc-based alloys. What sets them apart from other foundries is they partner with their customers to provide solutions to their production challenges. Additionally, they co-cast alloys around heating elements, copper tubing, cast iron parts and steel inserts or components.

One specific part they produce for a Department of Defense customer is a sand casted nickel-aluminum-bronze gearbox. After nomination, the customer required that no grind marks should be seen on the exterior of the casting. To achieve the desired result, Patriot essentially had to cast the part upside down. This created unforeseen issues. At first sight, the parts looked acceptable, but once machining began, it was obvious over 50% of the castings initially produced contained shrinkage porosity defects.

In a bid to correct the error, Patriot ran several iterations, changing every feature of the mold from the gating to runners to the risers. Their efforts improved the situation, but many castings were still being rejected as problems just shifted around the part (Fig.1). This trial and error approach inevitably led to severe time and budget setbacks. At this point, Patriot needed a guaranteed fix and sought out ESI and its casting simulation software, ESI ProCAST.

Together, Patriot and ESI ran simulations and successfully isolated three areas where shrinkage was likely to occur. Based on this new data, Patriot was able to rework the casting design completely to their customer's satisfaction (Fig. 2).

The breakthroughs were the addition of chills to the thick-ringed portion around the opening to the gearbox, plus additional material on the bosses' risers that enabled superior feeding of the part. Finally, two risers were repositioned closer to the part.

"The return on investment was almost instantaneous", says W. Christian Leuteritz.

Thanks to the insight Patriot received from simulating the casting, it managed to reduce its scrap waste by an astounding 98%. However, this wasn't the sole benefit, as the initial hit and miss casting methodology was also wasting time; both Patriot's and its customer's. Since the new, enhanced casting methods were deployed, after the ESI simulation data was analyzed, Patriot's customer was satisfied with nearly flawless parts that met their aesthetic requirement.



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