

YOUR GLOBAL MANUFACTURING RESOURCE

PHIB

**ALUMINUM HEADLIGHT CASTING
CASE STUDY**



ISO 9001:2008 TS-16949 CERTIFIED

THE PROBLEM

A global automotive lighting company came to PHB with the challenge of creating two aluminum castings – one for low beams and one for high beams. Because of the complexity in aligning the fixtures (heat sink pads) for the LEDs, prior aluminum die casting companies were able to only provide three heat-sink pads per casting. Since both the low beams and high beams required six heat sinks, each headlight required four castings. The problem compounded when the mirror design was required for left or right headlights.

The challenge in producing the six heatsink pads is to maintain the profile tolerance to the 6 pads to within .4mm to the datum structure. There are 17 individual features at each pad location and 102 total features per casting that are critical to function. Any missing feature results in a part that our customer cannot fully assemble. On the 17 features at each location are 8 oblong bosses positioned to form the rectangular shape to place the LED during assembly. Two of 8 bosses are .020 in. wide x .040" high the other 6 oblong bosses are .040" wide X .040" high. The distance across the width and the length has a tolerance of $+.002\text{in}/-0$.



The other features include Datum holes and slots at each location, two locating bosses for additional components, and cored holes. The finish requirement is a 15 micro-m (60micro-inch) finish.

With high level of part complexity, the added expense of creating separate tooling for all of the castings, and the additional time and expense involved in aiming these eight castings, our customer realized it was time for a new solution.

HOW WE SOLVED IT

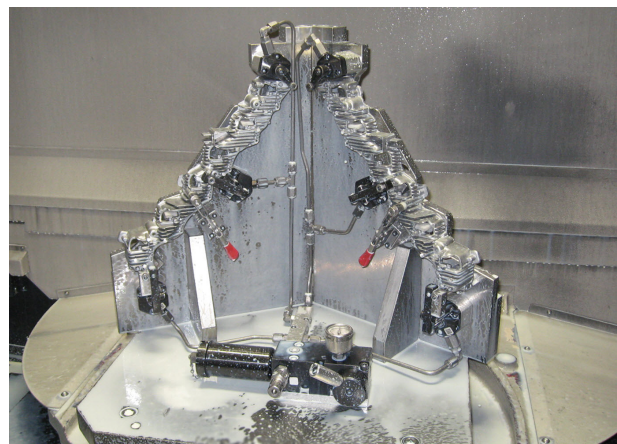
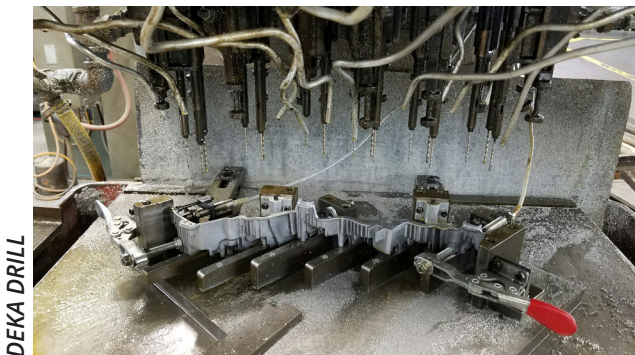
Early in the development of this program PHB utilized the MAGMA process simulation software to both optimize the gating and to analyze the distortion. We also wanted to analyze the potential effects on the flatness and profile requirements of the individual parts in the assembly.

The results of the distortion of the parts were shared with the customer in the form of reports explaining our findings. The customer incorporated changes in the each

of the castings by increasing draft, radii, and added ribs and gussets to the part designs. In addition, the High Beam heat-sink was made adjustable in the light assembly. This report also helped to develop the “as cast” tolerances and the datum structure of the part, which resulted in a reduction in the amount of CNC machining early on in the project. The changes were incorporated by the customer into the part models for the heat-sinks and the aiming bracket.

Services Provided:

- The parts are supplied cast, trimmed, and drilled at PHB Die Cast.
- Each casting is individually checked on our Cognex vision system to ensure all critical features are present.
- The Heat-sinks are Black Anodized at PHB.
- Additional CNC Machining is provided by PHB Machining Division.



QUALITY IN ACTION

The 17 features at each of the 6 locations are scanned using a vision system after the trim operation at the die cast machine to ensure the presence of the 102 features, functional gaging is used to check the $+.002''/-0$ tolerance, and periodic CMM measurement of the profile tolerance maintains the required quality level of the heat-sinks.



We are problem solvers, constantly innovating in prototyping, design, and manufacturing. Let's talk about your die casting project.

The die cast die for the heat-sinks has replaceable sub-inserts at 6 locations (that cast the 17 features) and heat-sink pad. The two reasons these were made as individual sub-inserts; the first was for an X, Y, or Z adjustment of the heat-sink pads and the second being the need for replacement of any of the individual six heat-sink pads as it wears.

The dies for the Lower Heat-sink and High Beam Heat-sink are single cavity dies with interchangeable inserts that can cast either a Right or Left Hand part in a 600 Ton Machine. The Aiming Bracket die is a two cavity die that produce a Right and Left Hand part in a 1400 Ton Machine.



PHB die casting machine

To get a die casting, machining, or injection molding quote or for more information,

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