Chicago White Metal Casting, Inc.

die cast solutions No. 53

An Advanced Approach to Designing a Fuel Cell:

Find out how Collaborative Design & Innovation Transformed a Part

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Reliability and performance are paramount for a heavy-duty fuel cell system. Let's delve into the collaborative efforts between CWM and our customer to develop and manufacture a crucial component for such systems — the Fuel Cell Spring Plate. The team developed a product that surpassed initial expectations through design enhancements and meticulous attention to the manufacturing processes.

From Hogout to Die Casting

Initially, this part was a hogout (machined from billet). The customer wanted to convert the part to a die casting because they sought enhanced efficiency and cost-effectiveness. When they began working with CWM, they recognized that they now had greater design flexibility compared to hogouts. That allowed for intricate shapes and thin walls, which allowed them to maintain high dimensional accuracy and ultimately achieve their goals.

CWM engineers helped to redesign the part to convert it to a die casting. They did so by adding ribs, gussets, etc., to provide strength. They also used Magmasoft® to predict mold flow to help minimize porosity.

Part Details:

- **Material:** A380 aluminum alloy
- **Weight:** 4.81 lbs.
- **Dimensions:** 17 in x 5.6 in. x 1 in.

Engineering Innovation:

The Fuel Cell Spring Plate started as a simple design concept based on a machined plate (see Figure 1). However, thanks to the CWM team's collaborative efforts and extensive engineering, the customer benefitted from a significant change in the product design, resulting in cost reductions without sacrificing the necessary strength and stiffness (see Figure 2).

Figure 1: Original design from 2019

Figure 2: Completed part in 2022

Overview of the Fuel Cell Spring Plate:

The Fuel Cell Spring Plate is a critical component at the top of the assembly. The CWM team designed the part to endure the challenges of rigorous applications, such as automotive, marine, and high-torque power units. This component is essential for maintaining operational efficiency and longevity.

Decision Making:

After careful consideration, the customer opted to work with CWM rather than take the project offshore. They had trust and confidence in CWM's capabilities and commitment to quality, which was a big emphasis in their decision-making process.

Manufacturing Process:

The journey from concept to completion involved a series of meticulously executed manufacturing steps:

- **Die Cast/Die Trim:** The initial shaping of the part begins with die casting, ensuring precision and consistency.
- **Inspection:** Each part undergoes thorough inspection during manufacturing to maintain quality standards.
- **Polishing:** The exterior is polished to remove the parting line vestige so it has a uniform and visually attractive finish.
- **CNC Machining:** CWM's machining team provides critical processes such as milling, drilling, and tapping.

Conclusion:

The successful collaboration between CWM and its customer exemplifies the power of partnership and innovation in achieving superior outcomes for die cast conversions. The Fuel Cell Spring Plate shows how teamwork, careful design tweaks, precise manufacturing, and a dedication to quality can make a big difference in completing successful projects.

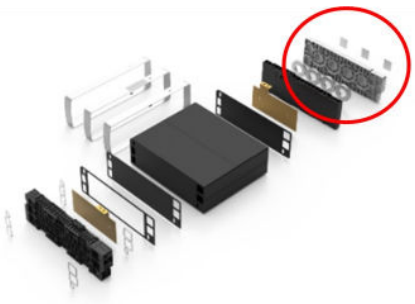

Figure 3: End product: Fuel Cell assembly