

Electromagnetic Pumps Used to Cast High-End Parts for Leading Global Foundry

For over two decades, Grainger & Worrall has used CMI Novacast's PG 450 pump to cast precision parts for its best-in-class automotive, motorsport, aerospace and defense clients

Across industries, demand for lighter and more complex aluminum components is skyrocketing. Among the many foundries striving to meet those demands, few have risen to the occasion quite like Grainger & Worrall. Over its 75-year history, the UK-based sand casting foundry has continuously embraced technological innovations to stay ahead of the curve – and create cutting-edge castings for the motorsport, automotive, aerospace and green energy industries.

It is thanks to this enterprising approach that Grainger & Worrall counts some of the world's best-known brands among its many customers. But serving best-in-class clients leaves little room for error – which is why Grainger & Worrall uses CMI Novacast's [PG 450 electromagnetic \(EM\) pump](#) to cast select components for certain high stakes projects.



A World-Class Pump for First Class Clients

Grainger & Worrall was founded in 1946 as a pattern shop that supplied local foundries with molds and other casting tools. In the 80s, they opened a foundry of their own and, in 1994, an additional foundry was built to meet growing demand. Since its founding, Grainger & Worrall has never shied away from the difficult or complex projects most others turn down. Their willingness to experiment and innovate has pushed boundaries and produced pioneering parts and processes.

One such innovation arose in the late 90s. To meet some of their most exclusive clients' exacting specifications, Grainger & Worrall developed a new line to cast engine heads and blocks. The line – which is still in operation today – uses the Cosworth process and, by design, an [EM pump](#).

When the time came to source the pump for the line, Grainger & Worrall elected to invest in CMI Novacast's [PG 450](#) – a powerhouse pump prized for its accuracy and reliability. The pumps have been a mainstay on the line ever since.

The Casting Process at a Glance

The specialized line is semi-automated and uses only one, high-grade alloy. The alloy – made of aluminum, silicon and copper – is only appropriate for “specific jobs that require high strength and high performance,” according to Jack Strong, Grainger & Worrall’s head of materials engineering.

The alloy is held inside a low-pressure furnace, and, within the furnace, there is an extraction well where the PG 450 sits. To cast the specialty components, the EM pump uses [electromagnetism](#) – and not moving parts – to smoothly transfer the molten metal from furnace to casting.

The Benefits of EM Pumps

According to Strong, the line “only attracts the highest quality products.” Today, it is used to cast very complex powertrain components – including cylinder heads and gear boxes – for motorsports, series vehicles, and aerospace with best-in-class performance requirements.

Because the line is so specialized, high quality is non-negotiable and flexibility is key. The PG 450 allows Grainger & Worrall to achieve both goals.

High Metal Quality

The Cosworth process was developed, in large part, to reduce [turbulence](#) in the flow of metal. Turbulent flow can cause a number of defects – including entrained air, porosity and incomplete castings – that compromise the quality and integrity of parts. Because out-of-furnace casting methods (like hand ladling) always create some amount of turbulence, the Cosworth process relies on an EM pump to cast.

The PG 450 used in Grainger & Worrall’s specialty line dynamically addresses the velocity of molten metal every 10 milliseconds – and can adjust its flow accordingly. “The pump is efficient at transferring the metal at the correct velocity to reduce turbulence,” Strong confirmed.

In addition to reducing turbulent flow, the pump ensures only the cleanest metal makes its way into the casting. The pump is fully enclosed and pulls metal from deep below the furnace’s surface – which means no oxides or dross are included in the casting. According to Strong, the casting process augments the intrinsic properties of the alloy used in the line. Together, the process and metal produce parts made from “qualitatively one of the best alloys we are able to offer,” Strong said.

As a result, the pumps create ultra-high quality parts that meet exacting demands.

“Our experience with the pumps has always been very reliable. Thom and the team aren’t just suppliers, they really understand the engineering. I can always ask them technical questions about the pump.”

- Jack Strong, Head of Materials Engineering

Flexibility

The highly specialized line operates on a project basis and is exclusively used for low batch applications. Because of this, agility and adaptability are key.

Luckily, the pumps and Cosworth process offer a high degree of adjustability. The PG 450’s [control system](#) can save hundreds of fill profiles, which makes it easy to program the system to cast new parts – or repeat specialized projects, if requested. “The pumps allow us to be flexible,” Strong said.

A Lasting Partnership

Grainger & Worrall has relied on the PG 450 to help cast its most specialized parts for over 20 years. “Our experience with the pumps has always been very reliable,” Strong said.

That reliability extends to the CMI Novacast team. “Thom and the team aren’t just suppliers,” Strong said. “They really understand the engineering. I can always ask them technical questions about the pump.”

CMI NOVACAST

About CMI Novacast

Founded in 1981, CMI NOVACAST manufactures electromagnetic (EM) pumps with no moving parts that automate the movement of liquid metal in foundry casting and non-casting applications. Foundry casting applications include pumping aluminum, magnesium, zinc, and other alloys to improve the safety, productivity and retention of workers while also increasing metal quality and consistently reducing scrap rates to below 5% – this helps foundries eliminate hand ladling, maximize yield, and reduce production costs with options for gravity pouring and low-pressure side/bottom-filling. Non-casting applications include pumping liquid sodium that keep secondary cooling systems in nuclear power plants available on a 24/7 basis without needing maintenance – ever.

