

NEW ADVANCES IN MOLTEN METAL DELIVERY IN LARGE CAST PARTS



JEFF KELLER
CEO

Molten Metal Equipment Innovations



ARTICLE TAKEAWAYS:

- Manufacturing is an iterative process, with a commitment to continuous improvement
- Big leaps generally come from a sequence of small steps in rapid succession to support a vision
- Disruptive technologies drive industry innovation and lead to lasting changes

Manufacturing is an iterative process whereby improvements generally occur over time and through a commitment to continuous improvements. In the broader foundry and metal casting industries, advancements in technology are driven by the desire to improve quality, reduce costs and expand margins, both for the customer and supplier.

At the end of the day, the market is efficient and those companies able to deliver advanced manufacturing solutions to their customer base will prosper and those who can't, will not. It is also generally true that behind every front-page story of a new "breakthrough" there is a much longer story of everything that went into the new development, and how the entire supply chain rallied around a new idea to generate what looks like a big leap forward. My dad loves to say, "an overnight success is 15 years in the making." It is exciting to see that in our industry, some of these breakthroughs are the result of new thinking and

processes that will continue to advance technology and improve outcomes.

ADVANCEMENTS IN AUTOMOBILE MANUFACTURING

Some recent advancements in the manufacturing of automobiles are worth noting. As a first step, we should generally ask why this change is occurring, and what is driving that change. As it relates to the manufacture of automobiles, we have seen some pretty significant developments in recent years in metal processing and the overall assembly process. Some examples would be the

rapid change in the industry from steel to aluminum for the production of body panels. And the creation of closed loop systems where the alloy can be recycled and repurposed for that same use almost infinitely. The drivers here are not new: weight savings result in higher fuel efficiency; cost effective alloys can lower cost and recyclable materials can reduce carbon footprint.

The move to larger structural cast parts is another area where the change drivers are not new, and results in many benefits to the vehicle. In this case, one of the primary drivers is the reduction of overall parts needed in the assembly and the simplification and cost reduction that this can generate.

In the case we will look at below, **over 70 parts were eliminated** from the overall assembly. Another is the ability to blend the structural requirements of the vehicle into the power plant of the vehicle where, in this case, the battery adds structural rigidity to the frame improving overall safety and ride characteristics and lowering the center of mass. These types of advancements require the entire supply chain to reimagine the way cars are made and to develop new products and processes to enable these benefits to be achieved.

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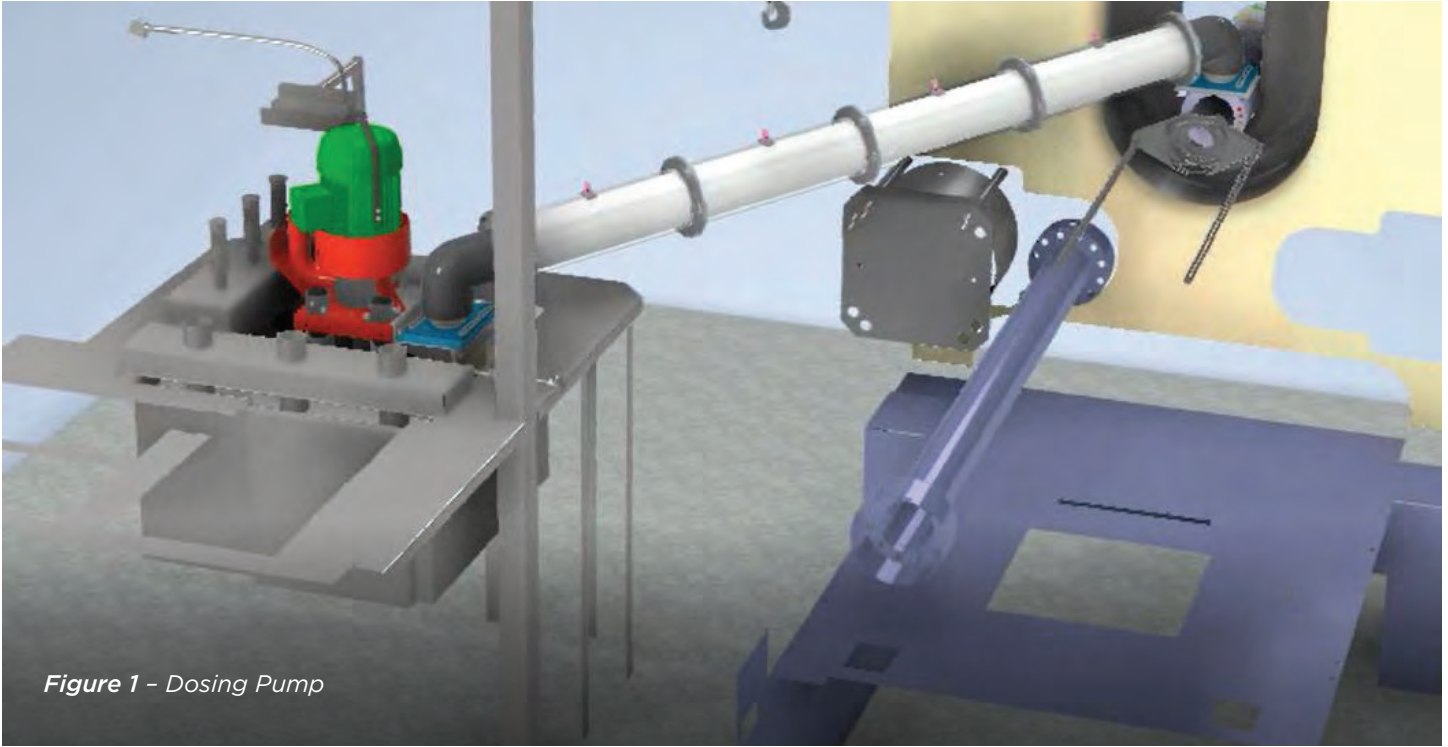


Figure 1 - Dosing Pump

MOLTEN METAL DELIVERY IN LARGE PART CASTING

I'd now like to focus on advancements in metal delivery for large part castings that our business Molten Metal Equipment Innovations has been involved with in support of a large California based OEM in the electric vehicle space. The size of the castings they now need to produce has required a new paradigm in which to address the new requirements. The size of the dose is the first new reality requiring that 105 kg of molten aluminum be delivered in each shot. This is more than a robotic dipper or pressure pour technology can deliver and instead the solution requires a dosing pump that can deliver this amount of metal to the die casting machine.

The availability of metal is crucial and so the technology must include a continuous information loop to ensure that the metal level remains constant. A second MMEI pump equipped with our SMART technology is used to measure the

biscuit after each dose so that the precise amount of metal is available to the machine to ensure that each dose is consistent with what is needed.

The speed of the machine cycle is another new process requirement in that these large, accurate doses must be delivered in less than 9 seconds, requiring rapid metal movement without creating turbulence and other porosity creating opportunities. In testing we were able to get down to 4 seconds delivery time, and now in production 7-8 seconds is the rate. Metal temperature is also a critical requirement in the system and so MMEI working with our partner ASI (Advanced Systems & Integration) utilizes proprietary heated launder piping that maintains constant metal temperature throughout the process. We have also incorporated a rotary degasser into the system to ensure the highest degree of metal quality and to prevent any porosity from getting into the part.

SUMMARY

New advancements in manufacturing are always exciting as to how they shape the future of our industry. The drivers and the trends that they create take us in new directions that essentially are the response to market forces. It keeps us all on our toes and leads to some long days and late nights. It also takes time for these new methodologies to take hold and when the news finally breaks, it's often years after the development work began. This is healthy and supports new investment in the development of new materials, processes and ultimately products. In our case, it has been exhilarating to work on a challenge that caused us to leave our comfort zone and branch out into some new areas. On the bigger scale, it is exciting to think about where this may take the industry and how when we all do our small part it leads to big and lasting changes for the better.



Contact:
JEFF KELLER
jeff.keller@mmei-inc.com

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MMEI-INC.com

15510 Old State Road, Middlefield, Ohio 44062
Phone: +1 (440) 632-9119 Email: info@mmei-inc.com