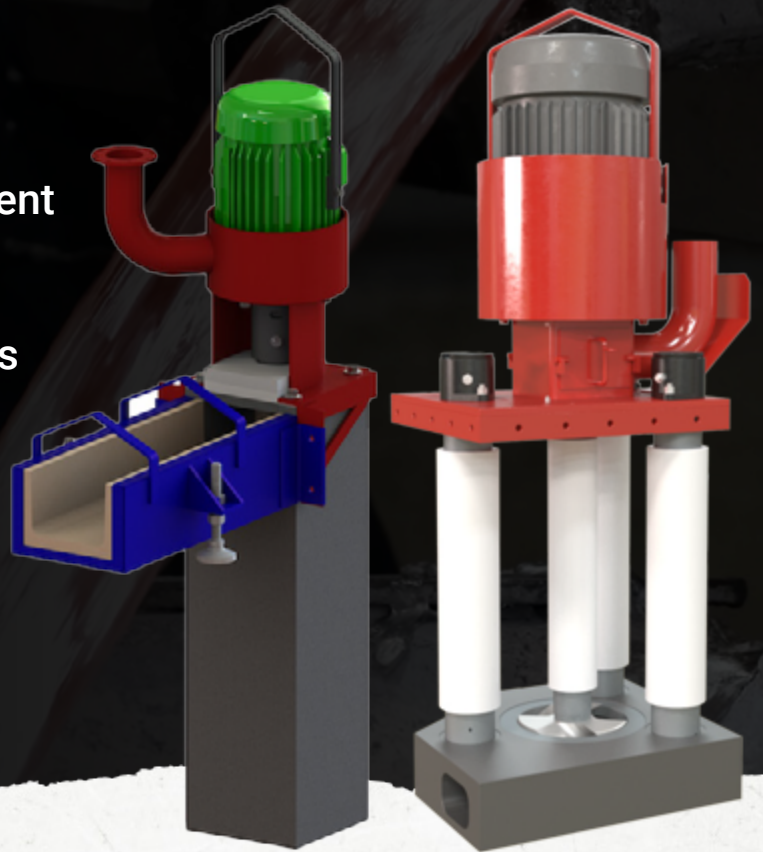


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METAL DOSING PUMPS: SMALLER CAN BE BETTER TOO!



JEFF KELLER
CEO
Molten Metal Equipment Innovations



ARTICLE TAKEAWAYS:

- Dosing pumps deliver liquid metal safely & reliably for smaller castings
- Alternatives to manual methods
- Accurately delivering metal to different mold fill locations

A few issues ago, MMEI wrote on the emergence of Gigacasting and how we had designed a new dosing pump solution for that application. It was and still is a very exciting development for the industry and for us.

It's also true that smaller, more traditionally sized castings have their own dosing needs—and many of the same benefits apply. With that in mind, we wanted to take a closer look. For foundries that still hand-ladle to fill molds, our goal was to provide a safer, more efficient, and higher-quality alternative.

That focus led us back to the testing tank, working closely with potential new customers to develop practical solutions that help advance their operations

LEVERAGING OUR LEARNINGS

So, once again, the goal is to use pump technology to deliver molten metal directly to a mold, this time in smaller amounts, but with the same need for accuracy. Unlike our work with gigacastings, where parts weighed more than 100 kgs in some cases, this time the focus was on more conventional sized castings of 5 kgs or higher. Of course, when moving less metal to fill smaller molds, the accuracy requirement is a much smaller number when measured by weight. This adds to the challenge of delivering consistent amounts of metal to ensure shot size accuracy.

In our previous work with larger castings, we developed a new riser design that eliminated potential system leaks by combining graphite and refractory materials. The next challenge was to scale that solution down to a smaller size—enter the Littlefoot Pump.

This design leverages the new riser system while focusing on moving smaller amounts of metal and accurately dosing those quantities for new applications. We also incorporated our laser technology, building on the experience we've gained in the market over many years.

LESS IS MORE

Unlike the large casting environment where the emphasis was on moving lots of metal as quickly as possible within accuracy parameters ($\pm 1\%$ of shot size), this application shifted the focus to safety, efficiency, flexibility, and accuracy. Anytime operators are handling molten metal, there is a higher risk of potential injury. There is of course also a cost and cycle time variable that can challenge foundry results both as measured by efficiency and financial performance.

In smaller foundries, flexibility is paramount because they typically operate in a higher-mix production environment. Delivering metal to different mold fill locations becomes part of the challenge. Maintaining accuracy and quality while hand-dosing is difficult, and our objective was to find a way to make meaningful improvements to this part of the process.

The system we designed builds on our long experience using lasers for process-parameter control. In this application, we deployed three lasers. The first measures the holding furnace level to establish a baseline from which we can track metal delivered to the mold. The second laser monitors the launder,

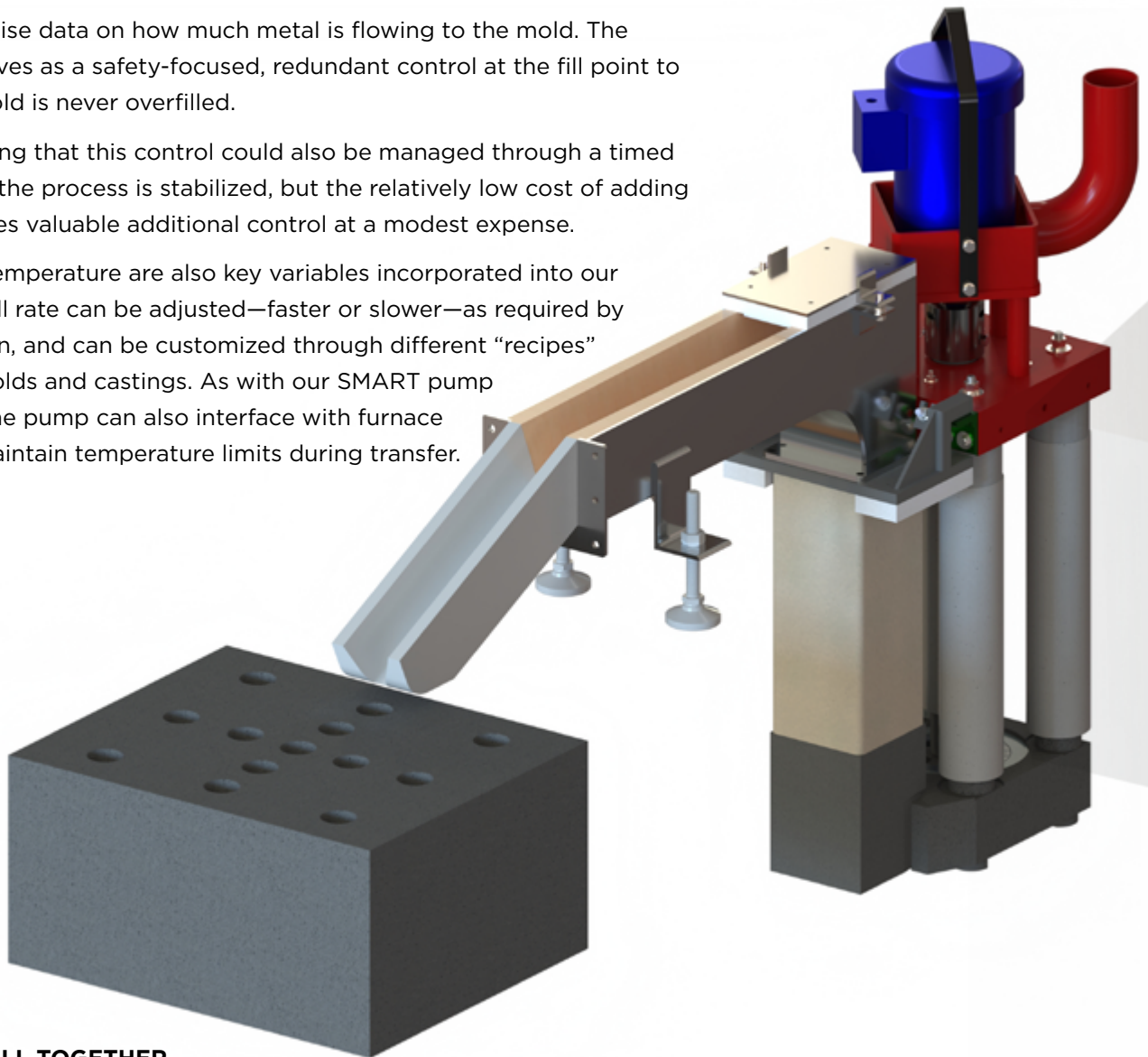
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SIMPLE SOLUTIONS THAT WORK!

giving us precise data on how much metal is flowing to the mold. The third laser serves as a safety-focused, redundant control at the fill point to ensure the mold is never overfilled.

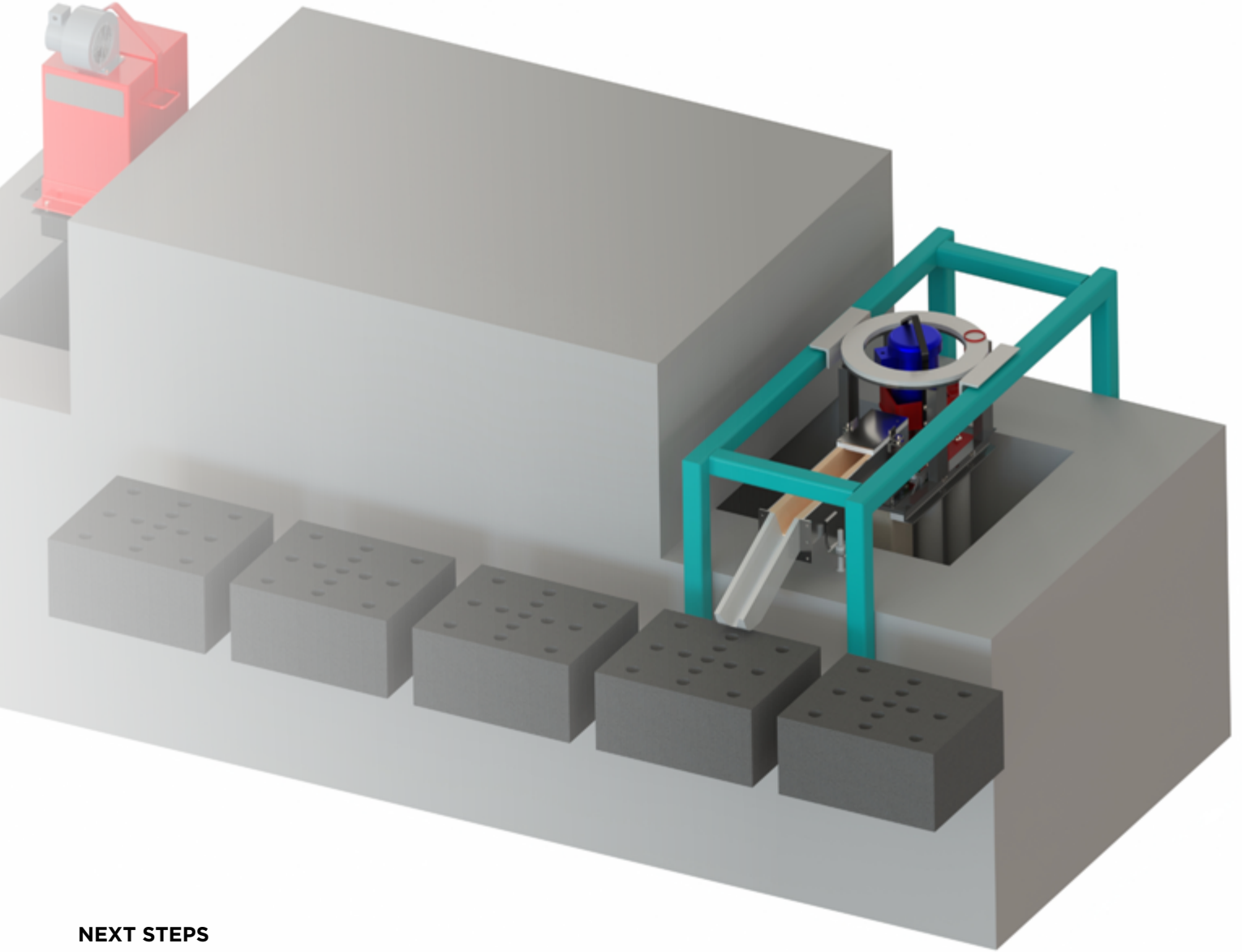
It's worth noting that this control could also be managed through a timed transfer once the process is stabilized, but the relatively low cost of adding a laser provides valuable additional control at a modest expense.

Fill rate and temperature are also key variables incorporated into our system. The fill rate can be adjusted—faster or slower—as required by the application, and can be customized through different “recipes” for various molds and castings. As with our SMART pump technology, the pump can also interface with furnace controls to maintain temperature limits during transfer.



PUTTING IT ALL TOGETHER

This combination of system elements presents a significant opportunity for smaller foundries with conventional sized castings to move away from less efficient, manual processes for a very modest investment. The system can be used in its entirety or system elements can be added to existing infrastructure to achieve much of the same benefits. As a whole, the system includes a final degassing step in a holding furnace to ensure the highest quality metal. The dosing pump is then mounted in a way that allows it to pour into multiple mold-fill locations so as to be very versatile and flexible as molds are changed to accommodate the product mix. The lasers ensure that the metal delivery is consistent and that accuracy achieve a higher level than is possible when pouring manually. The automated pour eliminates any molten metal handling and thus operator safety is now at the highest level possible. The cycle times of the new system/cell will exceed the manual process adding to the financial benefits that this system can bring. There is likely also a way to reduce the overall amount of space required to produce castings as the ability to fill different molds from one location can help foundries consolidate their production to this system/cell.



NEXT STEPS

When we began developing dosing solutions for gigacastings, we knew it would open the door to offering similar advancements across a much broader segment of the diecasting market—and help more of our customers achieve improved results. Today, we're confident that these systems are ready for deployment, allowing us to do our part in moving the industry forward.

Whether implemented as a turnkey new system or as a modification to an existing furnace or cell, the benefits to foundries are significant. It's an effective way to unlock new operational efficiencies while keeping safety at the forefront.



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