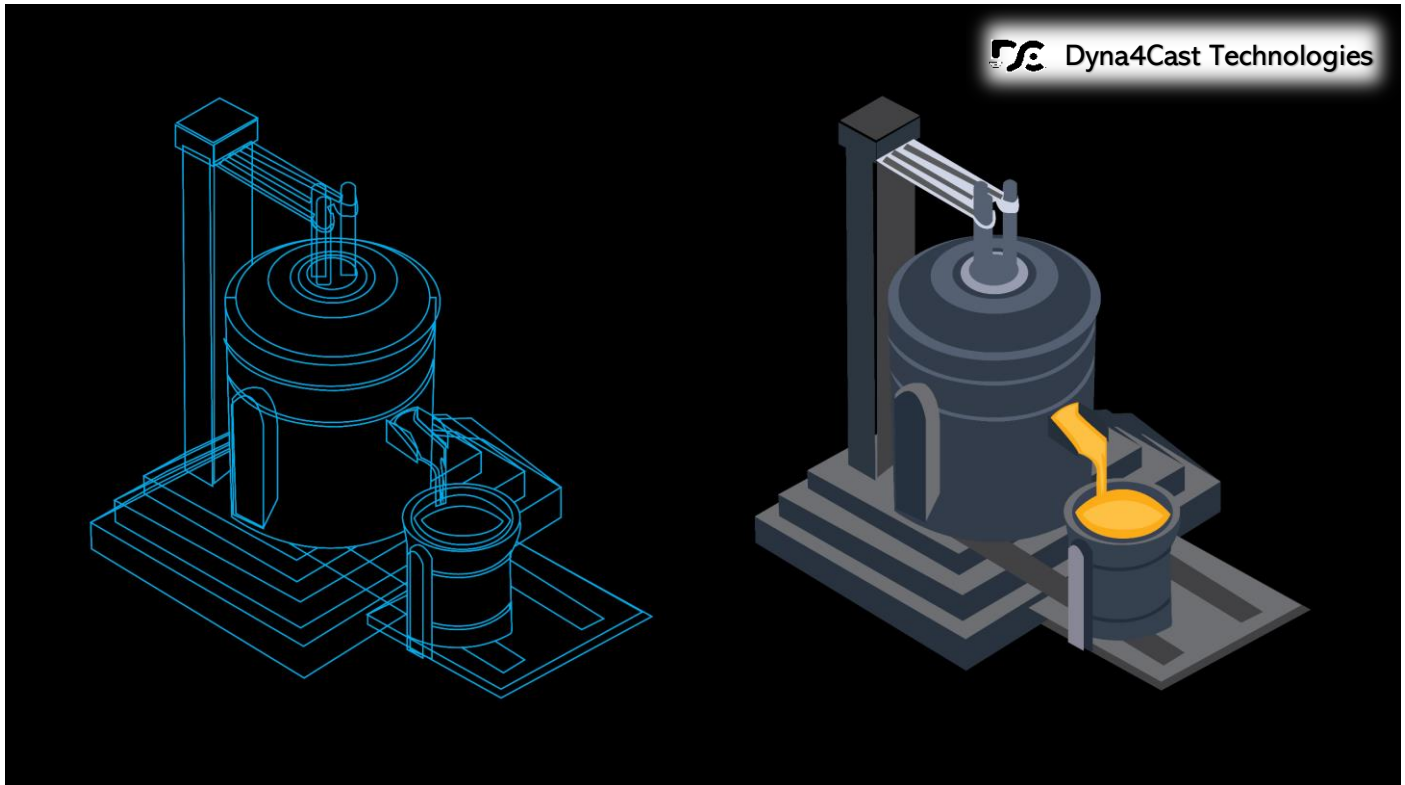


Digital Twin for Foundries



In today's digital era, a new concept is making waves in the industry - the Digital Twin. Digital twins are virtual representations of physical assets or systems that can be used to monitor, analyze, and optimize their performance. It is an advanced technology that brings together the physical and digital world and enables seamless interaction between them.

In the context of industrial applications, Digital twin solutions were deployed by Dyna4cast Technologies for foundries, particularly in the melting sector. The melting zone will have the highest energy usage. D4C investigated and watched the procedure and discovered unnecessary electricity use that can be stopped.

In depth, the first iteration begins with the raw ingredients being added to the furnace, and the melt is then tested for quality using a spectrometer. Until the final grade is achieved, this iteration process will be repeated by adding alloys. The furnace must be left inactive throughout this iteration, using some electricity. We identified this as something to overcome and developed a digital twin spectrometer software with our Dyna system as a remedy. By doing this, our dyna software will examine the spectrometer result after the first iteration is completed and recommend how much extra material should be put based on the iteration result and the desired grade.

The number of iterations is decreased as a result, and the required grade is reached with fewer iterations overall. The energy used by the furnace in the interim is abruptly stopped by lowering the iteration duration and number. This directly affects on how much amount is spent on the energy.

Let's visualize this with numeric,

Consider, you have a 1-ton furnace, planned for 4 heat/day. Average time for 1 heat is 60 mins. By, Digital twin the spectrometer is twinned with Dyna system and the heat time is reduced by 5 mins (i.e 55 mins/heat). That 5 mins energy consumption per heat is saved. And for 4 heats/day, 20 mins of furnace run time and its energy consumed is saved.

Now, coming up with the energy and cost saved,

Let keep ₹8/unit for HT line (varies based of regions). For melting 1 Ton of metal, on average it takes 800 kWh. For a minute it is 13.3 kW. Like mentioned above for 5 mins saved/heat $5 \times 13.3 =$ **66.6 kWh/heat energy is saved** and **₹ 533/heat is saved**.

Calculating it for a day,

4 heat/day. Therefore, $4 \times ₹533$ amount **₹ 2132/day can be saved** & $4 \times 66.6\text{kWh}$ power of **266.4 kW/day can be saved**. The above calculation is for 1 furnace, imagine if you have around 3-4 furnaces. You can save a lot in both cost and electricity

Conclusion

Digital twin technology is transforming various industries by providing a virtual replica of physical systems and enabling real-time monitoring, optimization, and interaction. It is a valuable tool for improving performance, reducing costs, and enhancing efficiency. D4C has been implementing digital twin solutions mainly for foundries and other core industries based on the client's requirements and necessity. As the technology continues to evolve, we can expect digital twins to play an even more significant role in shaping the future of various industries