

## Abstract

This paper explores the transformative potential of digital twin technology in vertical centrifugal casting (VCC), a cornerstone manufacturing process for high-integrity cylindrical components. By integrating real-time data, physical models, and machine learning algorithms, digital twins unlock a new paradigm of process optimization, predictive maintenance, and quality control. Integration of digital twinning enhances the performance in different domains of work like enhancing the quality of research, production etc. However, digital twinning is nascent in the domain of manufacturing specially in the casting sub domain. A physical set up of VCC is integrated with Internet of Things (IoT) and data acquisition system to stream the collected data to the cloud-based server. Transformation of Internet of Things (IoT) enabled VCC integrated with different sensors into the digital twin helps in quality prognosis for future applications. The data is further fetched from the cloud and interconnection is established between the digital twin. Real time monitoring, controlling and operating can be done easily with the help of a digital twin to predict the quality and tentative defect locations. Further amplifying these benefits, emerging technologies like Virtual Reality (VR), Augmented Reality (AR), and the Metaverse hold immense promise for revolutionising VCC training, collaboration, and visualisation.



Get full access to this article

View all access and purchase options for this article.