

Design and Development of Digital Twin of Single Cell Manufacturing Unit using Delmia

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Abstract: *The rising demand for smart manufacturing has accelerated the adoption of Digital Twin (DT) technology, enabling real-time monitoring, simulation, and process optimization in industrial settings. This research focuses on developing a Digital Twin model for a Single Cell Manufacturing Unit (SCMU) using DELMIA, a widely recognized digital manufacturing platform. The proposed virtual model accurately represents the manufacturing cell, analyzing key factors such as cycle time, workstation utilization, material flow, and energy consumption. Through iterative simulations and data-driven optimization, the Digital Twin framework enhances decision-making, reduces inefficiencies, and improves overall productivity. The research methodology involves creating a 2D layout, transforming it into a 3D model, and conducting process simulations within DELMIA to assess different configurations. A comparative analysis of multiple iterations helps determine the most efficient and operational-effective manufacturing setup. This study underscores the importance of Digital Twin technology in enhancing single-cell manufacturing processes, lowering operational constraints, and fostering data-driven, intelligent production systems in alignment with Industry 5.0 principles.*

Keywords: Digital Twin, Single Cell Manufacturing Unit (SCMU), DELMIA, Smart Manufacturing, Process Optimization, Material Flow Analysis, Workstation Utilization, Industry 5.0, Virtual Manufacturing, Cycle Time Reduction, Simulation-Driven Decision Making, Energy Efficiency, operational Optimization

