

# Optimizing Ketchup Manufacturing Process: A Tecnomatix Simulation for Reduced Waiting Time and Improve Operational Efficiency

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**Abstract:** *This research investigates the optimization of a ketchup production factory layout using Tecnomatix Plant Simulation software to enhance resource utilization and production efficiency. Both push and pull system were used to analyzed the entire ketchup production process, from receiving raw tomatoes to the final product storage, incorporating various processing stations with different processing times. In a push environment, driven by predetermined schedules, the simulation results showed an increasing trend in throughput over 4, 7, 11, and 14 days, with significant efficiency gains over time. In a pull environment, driven by actual customer demand, throughput simulations of 50, 100, 200, and 500 units demonstrated increasing productivity with higher workloads. The findings highlight the importance of optimized workstation layouts to reduce idle time and improve workflow, emphasizing that while push environments maintain consistent productivity, pull environments offer greater efficiency through flexibility and responsiveness to demand.*

**Keywords:** Ketchup production; Factory layout optimization; Tecnomatix Plant Simulation; Throughput analysis; Bottleneck reduction; Workflow management; Resources Utilization