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Using queuing theory and simulated annealing to design the facility layout in an AGV-based modular manufacturing system

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Abstract

An automated guided vehicle-based flow production system is used for manufacturing prefabricated bathroom units. One unit can occupy a space of more than 10 m^2. Due to large time deviations in sequential processes, queues are formed and greater plant space is needed. Reducing work-in-progress helps to save plant space but renders manufacture less efficient. The research explores better workstation arrangements. An open queuing network (OQN) model was used to approximate the flow production system. Since the problem of workstation arrangement is a combinatorial optimisation problem, simulated annealing (SA) was applied to search for a good solution. The combination of an OQN model and SA provides a powerful tool to solve the facility layout problem for a stochastic flow production system. The experimental results show

that the proposed approach has the potential to guide industrial layout design and practice.

Keywords:

facility layout | flow lines | queuing theory | modular manufacturing | simulated annealing

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