

Model to determine the capacity of wafer fabrications for batch-serial processes with time constraints

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Abstract

Time constraints related issues are unavoidable in wafer fabrications. However, when the lots released from a batch workstation overload the downstream serial workstation the consequences are more serious. Under a time constraints environment, peak workload is a critical problem that seriously hurts the overall performance of the downstream workstation. This work applies a GI/G/m queuing network to develop a capacity planning model for batch-serial processes. By applying this queuing network model, the expected waiting time between batch-serial processes can be estimated. Managers can also determine the capacity through the setting of expected rate of exceeding time constraints. The arrival smoothing of the upstream batch workstation and its effect on the downstream workstation is also analysed. The results show that arrival smoothing can effectively decrease the waiting time on the downstream serial workstation through increasing the upstream number of batch machines and decreasing the batch size. The results also conclude that increasing the number of downstream serial machines is not the only option under the batch-serial process in a time constraint environment. Therefore, an investment function of batch-serial process

equipment with time constraints is established in this work that can support managers when making investment decisions.

Keyword : capacity planning; time constraints; batch–serial processes; queuingtheory; arrival smoothing