The Critical Buffer-Level in Scheduling Re-entrant Lines A Proposal for a Dispatching Policy to Minimize Average Holding Costs

Iris Ann G. Martinez
Department of Industrial Engineering and Operations Research
University of the Philippines,
Diliman, Quezon City, Philippines
Email: irisann.martinez@gmail.com

Dedrick Balanggao, Dianne Guan Hing, Jennifer Maula
B.S. Industrial Engineering, 2006
University of the Philippines
Diliman, Quezon City, Philippines

ABSTRACT

A re-entrant line is an emerging production configuration that is characteristic of semiconductor processing. In re-entrant lines, parts visit a machine more than once for processing. With a set of different machines composing production, each machine is to be used to process parts that are at different stages of completion. These parts accumulate and a decision is to be made on which of these parts is to be dispatched for processing once a given machine becomes available.

Scheduling policies, so far available, such as the Least Slack Policies and the Clear-a-Fraction policy have significantly contributed to the alleviation of production planning difficulties encountered with re-entrant lines. Specifically, the Least Slack Policies have contributed to the reduction of the mean and variance of manufacturing lead time. However, they have failed to consider set-up times and differences in the holding costs of parts at different stages of processing. The Clear-a-Fraction policy, on the other hand, does consider setup times and holding costs but is applicable to production systems with one machine only.

This paper proposes a dispatching policy to address the inadequacies of the existing policies mentioned above. This new policy is designed to be applicable to re-entrant lines involving more than one machine and processing one type of part only. Furthermore, there is only one entry point and one exit point in the line. The main objective of the proposed policy is to minimize the average holding cost per part per unit time while considering the set-up time and the differences of the holding costs at various points or stages of processing. This paper attains the objective by finding the critical buffer level. The proposed policy suggests that parts in the buffer with the maximum difference between the current and critical levels should be processed first as soon as the machine becomes available.