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Multiple response optimization using mixture-designed experiments and desirability functions in semiconductor scheduling.

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Summary: Today's highly competitive semiconductor markets place a great emphasis on responsiveness to customers. In the past, competition has primarily focused on the product design arena. More recently, short lead times and good on-time delivery performance have become equally important to winning customer satisfaction. To meet these criteria, a recent thrust of manufacturing management has focused on the use of effective scheduling techniques to manage wafer movement. Dabbas and Fowler (1999) proposed an approach that combines multiple dispatching criteria into a single rule with the objective of maximizing multiple response measures simultaneously. This is accomplished using a linear combination with relative weights. The weights identify the contribution of the different criteria. This paper details the use of experimental design methodology as well as a desirability function approach in the optimization of the weights' assignment to the different criteria. The basic idea of the desirability function approach is to transform a multi-response problem into a single-response problem by means of a mathematical transformation. The responses of interest are on time delivery, variance of lateness, mean cycle time and variance of cycle time. Results demonstrate that the proposed approach is superior to the use of single-dispatching criteria with an average of 20% improvement for all responses. All data presented in this paper have been normalized to disguise actual performance results as the raw data are considered to be Motorola confidential data.

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