

FORMING AND SCHEDULING JOBS WITH ORDER WEIGHTS IN SEMICONDUCTOR MANUFACTURING

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Abstract: We study a new scheduling problem motivated by the challenges observed in the newest semiconductor manufacturing wafer fabrication facilities. As wafers are larger and heavier in these wafer fabs, it is becoming more common to use specialized material handling containers that carry multiple orders coming from different customers and to schedule the containers as jobs in the fab. Noting that orders may have varying levels of importance, we consider the system performance as a function of the weighted completion times of orders. The performance ultimately depends on both (1) how the orders are assigned to such containers (“job formation”), and (2) how the containers are scheduled in the fab (“job scheduling”). The overall problem is to find the best way to form and schedule the jobs subject to complicating constraints, including the restrictions on the number of containers that can be used at one time and on the number of wafers the containers can carry. In this study, we extend our earlier results provided for the unweighted completion time case, and show that some of the important properties do not extend to the weighted problem. In particular, solving the weighted problem is significantly harder than solving the unweighted problem. To solve the weighted problem, we introduce a heuristic method, based on the ideas presented in an earlier study. We report our preliminary computational results, which show that the heuristic provides near-optimal solutions.

Key words: Multiple Orders per Job, Semiconductor Manufacturing, Job Formation and Scheduling, Batching, Weighted Completion Time.