

Why Scheduling in Manufacturing with Separate Setup Times Needs Further Investigation

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Abstract

In manufacturing systems, machines often require preparatory activities before processing a job, commonly referred to as setup times. Although these activities do not directly contribute to the value of the final product, they play a critical role in overall system performance. Reducing setup times can lead to higher productivity levels, improved machine utilization, and better adherence to due dates. In certain production settings, setup times are negligible when compared to processing times and may reasonably be incorporated into them. However, this assumption does not hold across all manufacturing environments, particularly those where setup operations are significant and highly variable. Research that explicitly distinguishes setup times from processing times in scheduling problems dates back to the 1960s. Despite this early recognition, the majority of scheduling models developed in the manufacturing literature continue to either disregard setup times altogether or implicitly absorb them into processing times. This modeling simplification contrasts with practical observations, as production schedulers frequently encounter setup-related constraints in real-world operations. Recent reviews of the scheduling literature reveal that fewer than one percent of published scheduling studies over the past decade explicitly address setup times as separate entities. This evident disparity between industrial practice and academic research highlights a critical need for greater attention to scheduling problems that incorporate distinct setup times. Addressing such problems more explicitly can lead to more realistic scheduling models, resulting in enhanced machine efficiency, increased throughput, and overall improvements in manufacturing system performance.

Keywords

Scheduling, manufacturing, setup times