

THÜRER, Matthias; FERNANDES, Nuno O.; CARMO-SILVA, Sílvia; STEVENSON, Mark. (2017). Improving performance in POLCA controlled high variety shops: An assessment by simulation, *Journal of Manufacturing Systems*, Vol. 44, Part 1, July 2017, p. 143-153

<https://doi.org/10.1016/j.jmsy.2017.05.006>.

(<http://www.sciencedirect.com/science/article/pii/S027861251730095X>)

Improving Performance in POLCA controlled High Variety Shops: An Assessment by Simulation

Abstract

POLCA (i.e. Paired-cell Overlapping Loops of Cards with Authorization) is a card-based production control approach developed to support the adoption of Quick Response Manufacturing. The approach has received significant research attention but has remained largely unchanged since its introduction in the late 1990s. The main improvements have occurred in the context of an electronic POLCA system, but such developments undermine the simplicity of the original card-based concept. We ask: is there any refinement possible to enhance the performance of POLCA without jeopardizing its simplicity? By analyzing POLCA, two possible refinements are identified: (i) the choice of rule to support both the card allocation and dispatching decisions; and (ii) the use of a starvation avoidance mechanism to overcome premature station idleness, as reported in the context of load limiting order release. Using simulation, we demonstrate that performance gains can be obtained by using different rules for card allocation and dispatching other than the earliest release date rule typically applied in POLCA for both decisions. Further, results demonstrate performance improvements for all combinations of card allocation and dispatching rules considered via the addition of a simple starvation avoidance mechanism. Both refinements significantly enhance POLCA performance, potentially furthering its application in practice.

Keywords: Job Shop; Order Release; Dispatching; Operations Management; Discrete Event Simulation.