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Bottleneck identification and alleviation in a blocked serial production line with discrete event simulation: A case study

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ABSTRACT

Aiming at the gap between theoretical research and practical application in the production bottleneck field, we apply five bottleneck identification methods in a serial production line in aerospace industry based on discrete event simulation and Plant Simulation software, meanwhile discuss the influence of the bottleneck machine quantity on the system performance. This paper evaluated the practicability, accuracy and limitation of various bottleneck identification methods at the practical level. The results of the bottleneck alleviation manifest that increasing the number of bottleneck machines can effectively improve the system performance, but the more machine quantity, the smaller performance improvement. More importantly, the paper studies the influence mechanism and function relationship of the bottleneck machine quantity on the maximum completion time from an interesting actual phenomenon for the first time. The function obtains the condition that the maximum completion time achieves the minimum. The research and conclusion of this paper have essential reference significance for production guidance and theoretical research, and can also contribute to narrow the gap between theory and application of the production bottleneck field.

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Identifikacija in odprava ozkih grl v blokirani serijski proizvodni liniji s simulacijo diskretnih dogodkov: Študija primera

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POVZETEK

Glede na vrzel med teoretičnimi raziskavami in praktično uporabo na področju ozkih grl v proizvodnji, uporabimo pet metod identifikacije ozkih grl na serijski proizvodni liniji za vesoljsko industrijo, ki temeljijo na simulaciji diskretnih dogodkov in programski opremi *Plant simulation*, hkrati pa razpravljamo o vplivu ozkega grla, zaradi števila strojev, na delovanje sistema. V prispevku je bila ocenjena izvedljivost, natančnost in omejitev različnih načinov prepoznavanja ozkih grl na praktični ravni. Rezultati odpravljanja ozkih grl kažejo, da lahko povečanje števila strojev, zaradi katerih se pojavi ozko grlo, učinkovito izboljša delovanje sistema, vendar pa večje število strojev hkrati pomeni manjše izboljšanje zmogljivosti. Še pomembneje je, da članek na podlagi zanimivega dejanskega pojava prvič preučuje mehanizem vpliva in funkcijsko odvisnost ozkega grla zaradi števila strojev na največji čas zaključka. Funkcijski pogoj je, da najdaljši čas zaključka doseže minimum. Raziskave in sklepi tega prispevka so bistvenega referenčnega pomena za vodenje proizvodnje in za teoretične raziskave ter lahko prispevajo tudi k zmanjšanju vrzeli med teorijo in prakso na področju ozkega grla v proizvodnji.

PODATKI O ČLANKU

Ključne besede:
Serijska proizvodna linija;
Identifikacija ozkega grla;
Zmanjšanje ozkih grl;
Simulacija diskretnih dogodkov;
Plant simulation;
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