APEM journal

Advances in Production Engineering & Management
Volume 17 | Number 4 | December 2022 | pp 413–424
https://doi.org/10.14743/apem2022.4.445

ISSN 1854-6250
Journal home: apem-journal.org
Original scientific paper

Demand prediction and optimization of workshop manufacturing resources allocation: A new method and a case study

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ABSTRACT

At present, great changes are taken place in the internal production management and resource allocation model of manufacturers. Under the premise of rational resource allocation, the completion period of products largely depends on the timeliness of resource allocation. The related studies mostly tackle the allocation of a single type of production resources in a single workshop, without considering much about the mutual influence between workshops. Through in-depth research on workshop manufacturing practices, this paper chooses to explore the planning, allocation, and demand prediction of manufacturing resources, which has long been a difficulty in workshop production. The research has great scientific research significance and practical value. The authors designed an algorithm based on the difference of the mean stagnation time of different production processes in the execution process, and used the algorithm to predict the number of production resources required in each period, before formulating the optimal configuration plan. This method is highly reasonable and applicable. After presenting a prediction method for the allocation demand of workshop manufacturing resources, the authors discussed whether the manufacturing resource allocation between different workshops is balanced in a fixed period. Then, a new idea was proposed for collaborative production between machines of different workshops in a specific environment, and an optimization algorithm was put forward to optimize the manufacturing resource allocation to machines facing the operation execution process. Through experiments, the authors compared the utilization rate of material, technological or human production resources in each period, and thereby verified the effectiveness of the proposed algorithm.

ARTICLE INFO

Keywords:
Workshop;
Manufacturing resources;
Resource demand;
Allocation;
Optimization;
Simulation;
Modelling;
Prediction

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Article history:
Received 6 July 2022
Revised 8 October 2022
Accepted 15 October 2022

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APEM journal

Advances in Production Engineering & Management
Letnik 17 | Številka 4 | December 2022 | Strani 413–424
https://doi.org/10.14743/apem2022.4.445

ISSN 1854-6250
Spletna stran: apem-journal.org
Izvirni znanstveni članek

Napovedovanje povpraševanja in optimizacija dodeljevanja proizvodnih virov v delavnici: Nova metoda in študija primera

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POVZETEK

Trenutno se dogajajo velike spremembe v notranjem upravljanju proizvodnje in v modelu dodeljevanja virov v proizvodnih podjetjih. Pod predpostavko racionalnega dodeljevanja virov je čas dokončanja izdelkov v veliki meri odvisen od pravočasnosti dodeljevanja virov. Povezane študije se večinoma ukvarjajo z razporeditvijo ene same vrste proizvodnih virov v posamezno delavnico, ne da bi upoštevale medsebojni vpliv med delavnicami. S poglobljeno raziskavo proizvodnih praks v delavnici smo raziskali načrtovanje, dodeljevanje in predvidevanje povpraševanja po proizvodnih virih, kar je dolgo predstavljalo težavo v delavniški proizvodnji. Raziskava ima velik znanstvenoraziskovalni pomen in uporabno vrednost. Oblikovali smo algoritem, ki temelji na razliki povprečnega časa stagnacije različnih proizvodnih procesov v procesu proizvodnje, in uporabili algoritem za napoved števila proizvodnih virov, potrebnih v posameznem obdobju, preden smo oblikovali optimalen konfiguracijski načrt. Metoda je zelo razumna in uporabna. Po predstavitvi metode napovedovanja povpraševanja po dodeljevanju proizvodnih virov v delavnicah smo razpravljali o tem, ali je dodeljevanje proizvodnih virov med različnimi delavnicami v določenem obdobju uravnoteženo. Nato je bila predlagana nova ideja za sodelovalno proizvodnjo med stroji različnih delavnic v določenem okolju in predstavljen je bil optimizacijski algoritem za optimizacijo dodeljevanja proizvodnih virov strojem, ki izvajajo operacije. Z eksperimenti smo primerjali stopnjo izkoriščenosti materialnih, tehnoloških ali človeških proizvodnih virov v posameznem obdobju in s tem preverili učinkovitost predlaganega algoritma.

PODATKI O ČLANKU

Ključne besede:
Delavnica;
Proizvodni viri;
Povpraševanje po virih;
Dodelitev;
Optimizacija;
Simulacija;
Modeliranje;
Napoved

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Zgodovina članka:
Prejet 6. julija 2022
Popravljen 8. oktobra 2022
Sprejet 15. decembra 2022

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