A Study of Lot-Streaming in Job-Shop Production System

陳文銓、駱景堯

E-mail: 8809532@mail.dyu.edu.tw

ABSTRACT

In recent years, optimized production technology (OPT) has become an important tool for production planning and scheduling. Lot-streaming is the most important idea of OPT. The purpose of lot-streaming is to split a process batch into several transfer batches, and production then can be run simultaneously on different manufacturing processes so that the makespan of producing the entire batch can be shortened. Although the concept of lot-streaming philosophy, has been widely used in practice and has shown favorable results. Up to present, most related literature, however, merely describe the concepts of OPT and very few focuses particularly on the quantitative analysis of lot-streaming. In this research, first , the study develops two kind of lot-streaming model for job-shop production system , which are minimization of the makespan model and minimization of the cost model. Following, a multiple objective model is constructed in which both the makespan model and cost model are considered simultaneously to obtain a comprised schedule. Finally, some experimental analysis are designed to provide some suggestion for the following researchers.

Keywords : process batch ; transfer batch ; lot-streaming ; job-shop production system

Table of Contents

REFERENCES

[1]王正文，民84，"裝配作業零工式工廠排程問題之研究:考慮多種加工多途程、順序相關之整備時間及加工順序可交換之作業"，中原大學工業工程研究所碩士論文。
[2]王文祁，民84，"零工型製造單元限制管理式的排程方法"，國立交通大學工業工程研究所碩士論文。
[3]方世榮翻譯，William J. Stevenson原著，民81，生產管理，曉園出版社出版。
[4]向士中，民83，"流程式工廠最佳化生產技術與批量流之研究"，國立台灣工業技術學院管理技術研究所工業工程學程。
[5]邱科璟，民84，"機器當機影響零工式生產前排程模擬績效之研究"，中華大學工業研究所碩士論文。
[6]方煥能、向士中，民85，"流程型工廠單產品批量流最佳解與探索解模式之研究"，中國工業工程學會工業工程期刊，13(1)，頁73-83。
[7]張耿通，民83，"零工型生產之交期設定模式發展"，國立交通大學工業工程研究所碩士論文。
[8]張仁輝，民85，"多階序列式製造系統最佳化生產技術批量流模式之研究"，國立科技大學管理技術研究所工業管理學程。
[9]黃明智，民87，"零工式生產系統最佳化生產技術批量流之研究"，大葉大學工業工程研究所碩士論文。
[10]蔡志弘，民85，"零工型工廠交期設定模式之構建"，國立交通大學工業工程與管理研究所博士論文。
[11]賴士葆，民84，"生產作業管理－理論與實務"，華泰書局出版。
[12]蘇文政，民84，"零工工廠在異常環境下誤期縮減模式之構建"，元智大學工業工程研究所碩士論文。
[13]Adams , Joseph , Egon Balas and Daniel Zawack , 1988 ,"The shifting bottleneck procedure for job shop scheduling", Management science , 34(3) , 391-401.
[14]Anderson , E. J. , C. A. Glass , C. N. Potts , 1995 ,"Local search in combinatorial optimization:Applications in machine scheduling", Research Report , No. OR56 , University of Southampton.
[15]Aarts , E. H. L. , P. J. M. van Laarhoven , J.K. Lenstra , and N.L.J. Ulder , 1994 ,"A computational study of local search shop scheduling", ORSA Journal on Computing , 6 , 118-125.
[16]Applegate , D. , and W. Cook , 1991 ,"A computational study of the job shop scheduling problem", ORSA Journal on Computing , 3 , 149-156.
[17]Baker , K. R. and Jia , D. , 1993 ,"A comparative study of lot streaming procedures", OMEGA , 21(5) , 561-566 .
[18]Baker , K. R. and Pyke , D. F. , 1990 ,"Solution Procedures for the Lot streaming problem", Decision Sciences , 21(3) , 475-491.
[19]Baker , K. R. , 1988 ,"Lot streaming to reduce cycle time in a flow shop", The Amos Tuck of Business Administration , Dartmouth College.
[20]Barnes , J. W. , M. Laguna , and F. Glover , 1992 ,"An overview of tabu search approaches to production scheduling problems", Proceedings Symposium Intelligent Scheduling System , San Francisco , 30-50.
[21]Barker , Jeffrey R. and Graham B. Mcmahon , 1985."Scheduling the general job-shop", Management Science , 31(5) , 594-598 [22]Brucker , Peter , Bernd Jurisch , Bernd Sievers , 1994 ," A branch and bound algorithm for the job-shop scheduling problem", Discrete Applied Mathematics , 49 , 107-127.
[23]Brucker , Peter , Bernd Jurisch and Andreas Kramer , 1994 ,"The job-shop problem and immediate selection", Annals of Operation Research , 50 , 73-114.
[24]Balas , E. , J. K. Lenstra , and A. Vazacopoulos , 1995 ,"One machine scheduling with delayed precedence constraints", Management Science , 41 , 94-109.
[25]Byeon , Eui-Seok , S. David Wu , Robert H. Storer , 1998 ,"Decomposition Heuristics for Robust Job-Shop Scheduling", IEEE Transations on Robotics and Automation , 14(2) , 303-313.
[26]Cetinkaya , F. C. and Kayaligil , M. S. , 1992 ,"Unit sized transfer batch scheduling with setup time", Computers and Industrial Engineering , 22(2) , 177-183.
[27]Carlire , J. and E. Pinson , 1989 ,"A practical use of Jackson''s preemptive scheduling for solving the job-shop problem", Annals of Operation Research , 26 , 269-287.
[28]Carlire , J. and E. Pinson , 1990 ,"An algorithm for solving the job-shop problem", Management of Science , 35(2) , 164-176.
[29]Chu , C. , J. M. Proth and C. Wang , 1998 ,"Improving job-shop scheduling through critical pairwise exchanges", International Journal of Production Research , 36(3) , 683-694.
[30]Glass , C. A. , Gupta , J. N. D. and Potts , C. N. , 1994 ,"Lot streaming in three stage production processes", European Journal of Operational Research , 75(2) , 378-394.
[31]Graves , S. C. and Kostreva , M. M. , 1986 ,"Overlapping operations in material requirements planning", Journal of Operations Management

, 6(3) , 283-294.
[32]Hancock , T. M. , 1991 ,"Effects of lot-splitting under various routing strategies", International Journal of Operations and Production Management , 11(1) , 68-75.
[33]Hwang , C. L. and Yoon , 1981 , " Multiple objective decision making : methods and applications" , Springer-Verlag Berlin Heidelberg.
[34]Jacobs , F. R. and Bragg , D. J. , 1988 ,"Repetitive lots : Flow time reductions through sequencing and dynamic batch sizing", Decision Sciences , 19(2) , 281-294.
[35]Jacobs , F. R. , 1984 ,"The OPT uncovered: Many production planning and scheduling concepts can be applied with or without the Software", Industrial Engineering , 16(10) , 32-41.
[36]Jacobs , F. R. , 1983 ,"The OPT scheduling system: A review of a new production scheduling system", Production and Inventory Management Journal , 24(3) , 47-51.
[37]Karimi , I. A. , 1992 ,"Optimal cycle time in multistage serial system with set-up and inventory costs", Management Science , 38(10) , 1467-1481.
[38]Kropp , D. H. and Smunt , T. L. , 1988 ,"Optimal and heuristic models for lot-splitting in a flow shop", Decision Sciences , 21(4) , 691-709.
[39]Lundrigan , R. , 1986 ,"What is this called OPT ? ", Production and Inventory Management Journal , 27(2) , 2-12.
[40]Moily , J. P. , 1986 ,"Optimal and heuristic procedures for component lot-splitting in multi-stage manufacturing system", Management Science , 32(1) , 113-125.
[41]Muth , J. F. , and G. L. Thompson , 1963 ,"Industrial scheduling", Prentic-Hall , Englewood Cliffs , N. J. , 236.
[42]Dell'' Amico , M. , and M. Trubian , 1993 ,"Applying tabu search to job-shop scheduling problem", Annals of Operation Research , 41 , 231-250 [43]Ronen , B. and Starr , M. K. , 1990 ,"Synchronous manufacturing as in OPT: from practice to theory", Computers and Industrial Engineering , 18(4) , 585-600.
[44]Preston White K. and Ralph V. Rogers , 1990 ,"Job-shop scheduling : Limits of the binary disjunctive formulation", International Journal of Production Research , 28(12) , 2187-2000 [45]Raman , N. , 1995 ,"Input control in job shops", IIE Transactions , 27 , 201-209.
[46]Stephane , D. P. and Lasserre , J. B. , 1993 ,"An iterative procedure for lot-streaming in job-shop scheduling", Computers and Industrial Engineering , 25(1) , 231-234.
[47]Sotskov , Y. , NY. Sotskova , F.Werner , 1997 ,"Stability of an Optimal Schedule in a Job Shop", Omega , International Journal of Management Science , 25(4) , 397-414.
[48]Sun , D. , R. Batta , and L.Lin , 1995 ,"Effective job shop scheduling through active chain manipulation", Computer and Operations Research , 22 , 159-172.
[49]Sun , D. and R. Batta , 1996 ,"Scheduling larger job shops:a decomposition approach", International Journal of Production Research , 34(7) , 2019-2033.
[50]Trietsch , D. and Baker , K. R. , 1993 ,"Basic techniques for lot streaming", Operations Research , 41(6) , 1065-1076 [51]Vickson , R. G. and Alfredsson , B. E. , 1992 ,"Two-and three-machine flow shop scheduling problem with equal sized transfer batches", International Journal of Production Research , 30(10) , 1551-1574.
[52]Van Laarhoven , P. J. M. , E. H. L. Aarts , and J. K. Lenstra , 1992 ,"Job shop scheduling by simulated annealing", Operations Research , 40 , 113-125.
[53]Vepsalainen , Ari P. J. and Thomas E. Morton , 1987 ,"Priority rules for job shops with weighted tardiness costs", Management Science , 33(8) , 1035-1047.