An Extended EPQ Model with Imperfect Quality and Backorder

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ABSTRACT

This research investigated an extended economic production quantity (EPQ) model with imperfect quality and backorder. The classic EPQ model assumes that manufacturing facility functions perfectly during a production run. However, due to process deterioration or other factors, the production process may shift and produce imperfect quality items. In this study, we study two cases: one is quality sceening conducted during production, the other is the sceening process starts once normal production stops, Not all of the defective items are reworkable, a portion of them are scrap and discarded. Furthermore, not all of the defective items are perfect quality items sfter rework. The reworked items are classifed into the restored perfectly items and the secondary product items. This research evaluated the effects of defective rate and and reworkable portion ratio on the the expected annual cost, optimal production lot size and the maximal level of backorder.

Keywords : imperfect quality, EPQ, scrap item, reworking.

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REFERENCES

[1] 吳碧玉，「不完美品質生產系統之最佳經濟生產批量之探 討」，朝陽科技大學工業工程管理系所碩士論文，2002 [2] 許志源，「探討多樣產品於同一生產設備上之經濟生產批 量」，朝陽科技大學工業工程與管理系所碩士論文，2002 [3] 陳至安，「在不完美的生產條件與維修之整合模型下最佳經 濟製造批量之研究」，台灣科技大學工業管理系所碩士論 文，2004 [4] 蔡雪麗 陳皇銓，考量不完美品質與價格折扣之經濟生產批 量模式，數位元科技與創新管理國際研討會，屏東科技大學 工業管理系，2006 [5] 戴翰林，「在不完美製程下最佳生產週期與檢測策略之研 究」，東海大學工業工程與經營資訊學系碩士論文，2004 [6] Chang, H. K. and Yushin, H., An optimal production run length in deteriorating production processes, International Journal of Production Economics, Vol.58, pp. 183-189 (1999).

[7] Chiu Y. P., Determining the optimal lot size for the finite production model with random defective rate, the rework process, and backlogging, Engineering Optimization, Vol. 35, No. 4, pp. 427-437(2003).

[8] Chung, K.J., Bounds for Production Lot Sizing with Machine Breakdown, Computers and Industrial Engineering, Vol. 32, pp. 139-144. (1997)

[9] Cardenas-Barron, L.E. The economic production quantity (EPQ) with shortage derived algebra onal Journal of Production Economics, Vol. 70, pp. 289-292. (2001) [10] Chiu, Y.P., Solving an economic production quantity model with random scrap items algebraically, First Conference, INFORMS-Taiwan Chapter & Conference 2004 -Technology & Management, National Taipei University of Technology, (2004) [11] Chung, K. J., Hou, K. L., An optimal production run time with imperfect roduction processes and allowable shortages, Computers & Operations esearch, vol.

30, pp. 483-490, (2003) [12] Chiu, S.W., Wang, S.L., Chiu, Y.P., Determining the optimal run time for EPQ model with scrap, rework, and stochastic breakdowns, European Journal of Operational Research, vol. 180, pp. 664-676, (2006) [13] Eroglu,A. and Ozdemir,G. An economic order quantity model with defective items and shortages, Int. J. Production Economics, vol. 106, pp. 544 – 549,(2007) [14] Grubbstrom, R.W. and Erdem, A. The EOQ with backlogging derived without derivatives, International Journal of Production Economics, Vol. 59, pp. 529-530, (1999).
[15] Mohamed Ben-Daya, The economic production lot-sizing problem with imperfect production processes and imperfect maintenance, Int. J. Production Economics Vol. 76, pp. 257-264, (2002).
[16] Pascale, H. A. and Moueen, S. K., Production lot sizing with the reworking of imperfect quality items produced, Production planning and control, Vol. 12, pp. 584-590, (2001).
[17] Papachrittos, S. and Konstantaras, I., Economic Ordering Quantity Models for Items with Imperfect Quality, International Journal of Production Research, Vol. 100, pp. 148-154, (2006) [18] Rosenblatt, M. J. and Lee, H. L., Economic production cycles with imperfect production processes, IIE Transactions, Vol. 18, pp. 48-55,(1987).
[19] Salameh, M. K. and Jaber, M. Y., Economic production quantity model for items with imperfect quality, International Journal of Production Economics, Vol. 64, pp. 59 – 64 (2000). Wee, H.M. Yu, Jo [20] Wee, H.M. Yu, Jonas. and Chen, M.C. Optimal inventory model for items with imperfect quality and shortage backordering, International Journal of Management Science, Vol. 35 , pp. 7 – 11, (2005)