CHAPTER 8
CONCLUSION AND SUGGESTION

After doing all the modeling through the ELSP in perfect production system and imperfect production system with one key module by using solver function in Microsoft® Excel, the conclusions of this research are drawn. Suggestion for further research in ELSP context in imperfect production system with two key modules is also explained later in this chapter.

8.1. Conclusion

a. ELSP spreadsheet model in imperfect production system with one key module can be used as the platform to build the spreadsheet model of ELSP in imperfect production system with two key modules.
b. ELSP in imperfect production system with two key modules can be solved by using Independent Solution and Common Cycle approach.
c. The formula of *T* to calculate the optimum cycle time by using Algorithm 1 or Algorithm 2 is defined as $T = \sqrt{\frac{A_i+\lambda_j.s_i}{H_i+u_i[(\alpha_i+\beta_i)d_i-\alpha_i.d_i.e^{-\mu_i\rho_i T}-\beta_i.d_i.e^{-\gamma_i\rho_i T}]}}$.
d. The algorithm to solve ELSP in imperfect production system with two key modules under Independent Solution approach is explained in Algorithm 1.
e. The optimum set of cycle times *T* for modified Bomberger (1966) stamping problem with two key modules is T={33.2, 23.6, 22.6, 11.2, 52.5, 85.9, 160, 20.7, 18.6, 38.6} for item 1, 2, …, 10, respectively, with total cost in one year is calculated as $101,307.9.
f. The algorithm to solve ELSP in imperfect production system with two key modules under Common Cycle approach is explained in Algorithm 2.
g. The optimum cycle time T^* for modified Bomberger (1966) stamping problem is T={31.892} for item 1, 2, …, 10, respectively, with total cost in one year is calculated as $247,592.43.

8.2. Suggestion

Considering the complexity of the ELSP with two imperfect key modules, this research only covers Independent Solution and Common Cycle approach. For further research under this theme, modeling towards Basic Period and Time-Varying approach is highly recommended since other development by relaxing ELSP basic assumptions is considered hard.

REFERENCE LIST

Bae, H., Moon, I., & Yun, W. (2014). Economic lot and supply scheduling problem: a time-varying lot sizes approach. *International Journal of Production Research*, *Vol. 52* (8), 2422–2435.

Ben-Daya, M. & Hariga, M. (2000). Economic lot scheduling problem with imperfect production processes. *Journal of the Operation Research Society*, *Vol. 51* (7), 875-881.

Bomberger, E. E., (1966). Dynamic programming approach to a lot size scheduling problem. *Management Science*, *Vol. 12* (11), 778-784.

Chan, H. K., Chung, S. H., & Chan, T. M. (2012). Combining genetic approach and integer programming to solve multi-facility economic lot-scheduling problem. *J Intell Manuf*, 2397-2405. doi 10.1007/s10845-010-0474-4.

Chatfield, D. C. (2007). The economic lot scheduling problem: A pure genetic search approach. *Computers & Operations Research*, *34*, 2865–2881. doi:10.1016/j.cor.2005.11.001.

Dobson, G. (1987). The economic lot-scheduling problem: achieving feasibility using time-varying lot sizes. *Operation Research Society of America*, *Vol. 35* (5), 764-771.

Elhafsi, M. & Bai, S. X. (1997). The common cycle economic lot scheduling problem with backorders: benefits of controllable production rates. *Journal of Global Optimization*, *10*, 283–303.

Elmaghraby, S. E. (1978). The economic lot scheduling problem (ELSP): review and extensions. *Management Science*, *24* (6), 587-598.

Federgruen, A. & Katalan, Z. (1996). The stochastic economic lot scheduling problem: cyclical base-stock policies with idle times. *Management Science*, *Vol. 42* (6), 783-796.

Gong, D.C., Lin, G.C., Zhuang, K.X., & Lee, P.H. (2012). A finite economic production quantity model with two imperfect modules. (technical report).

Graves, S. C. (1979). Note-on the deterministic demand multi-product single machine lot scheduling problem. *Management Science*, *Vol. 25* (3), 276-280.

Hanssmann, F. (1962). Operations research in production and inventory. NewYork: Wiley.

Hsu, W. (1983). On the general feasibility test of scheduling lot sizes for several products on one machine. *Management Science*, *29* (1), 93-105.

Karalli, S. M. & Flowers, A. D. (2006). The multiple-family ELSP with safety stocks. *Operations Research*, *Vol. 54* (3), 523-531, doi 10.1287/opre.1060.0297.

Ma, W. N., Gong, D. C., & Lin, G. C. (2010). An optimal common production cycle time for imperfect production processes with scrap. *Mathematical and Computer Modelling*, *52*(5), 724-737.

McKay, M. (1999). Economic lot scheduling with stochastic demands and lost sales. (dissertation). University of Washington, Washington.

Miller, D. M., Chen, H., Matson, J., & Liu, Q. (1999). A hybrid genetic algorithm for the single machine scheduling problem. *Journal of Heuristics*, *5*, 437-454.

Moon, I., Giri, B. C., & Choi, K. (2002). Economic lot scheduling problem with imperfect production processes and setup times. *Journal of the Operational Research Society*, *Vol. 53* (6), 620-629.

Moon, I. Silver, E. A., & Choi, S. (2002). Hybrid genetic algorithm for the economic lot-scheduling problem. *International Journal of Production Research*, *Vol. 40* (4), 809-824. doi: 10.1080/00207540110095222

Raza, S. A., Akgunduz, A., & Chen, M. Y. (2006). A tabu search algorithm for solving economic lot scheduling problem. *J Heuristics*. *Vol. 12*, 413-426. doi 10.1007/s10732-006-6017-7.

Tang, O., & Teunter, R. (2006). Economic lot scheduling problem with returns. *Production and Operations Management*, *Vol. 15* (4), 488-497.