An economic production quantity model for deteriorating items with multiple production setups and rework

Gede Agus Widyadana*, Hui Ming Wee**

* Department of Industrial Engineering, Petra Christian University, Surabaya, Indonesia
** Department of Industrial & Systems Engineering, Chung Yuan Christian University, Chungli, Taiwan

1. Introduction

One competitive advantage in global competition market is producing high quality products. In order to produce high quality products, defective products eliminated through 100% screening. For an economic reason and environmental concerns, defective products are reworked to become serviceable items. Rework process is also one important issue in reverse logistics where used products are reworked to reduce waste and environmental problems.

The earliest research on rework and remanufacturing process was done by Schady (1967). Since then, research on rework have attracted many researchers. Khouja (2000) considered direct rework for economic lot sizing and delivery scheduling problem (EDSP). Koo et al. (2002) developed production inventory models where supplier can fill the demand in two alternatives: either orders new products externally or reworks defective products through rework. Jamal et al. (2004) evaluated two rework policies. In the first policy, defective items are reworked in the same cycle; and in the second policy, rework is completed after N cycles. Cárdenas-Barrón (2004a) extended the model of Jamal et al. (2004b) by developing an EPQ model for single product, imperfect quality, the same cycle rework and planned backorders. Chiu et al. (2004) developed an imperfect rework process EPQ model with repairable and scrap items. A model for two-stage manufacturing system with production and rework processes was developed by Buscher and Lindner (2007). Chiu et al. (2007a) developed an EPQ model with repairable defective items, scrap and stochastic machine breakdown. An EPQ model with rework process subject to backlogging and a service level constraint was developed by Chiu et al. (2007b) and Chiu (2007). Yao et al. (2009) developed an EPQ model with imperfect production quality, imperfect inspection and rework. Similar research has been conducted by Jaber et al. (2008), They developed inventory models using the concept of entropy cost for perfect and imperfect quality items. Taleizadeh et al. (2010) developed production quantity model by considering random defective items, repair failure and service level constraints. Later, Taleizadeh et al. (2011) studied production inventory models of two joint systems with and without rework. Khan et al. (2011) review some research of EPQ models which incorporate imperfect items. Chu and Gendreau (2011) considered short life-cycle deteriorating product remanufacturing in a green supply chain inventory control system. Yassine et al. (2012) analyzed shipment of imperfect quality items during a single production run and over multiple production runs. Wee and Widyadana (2012) developed a single-vendor single-buyer inventory model with discrete delivery order, random machine unavailability and lost sales.

Some researches on rework also focus on production policy to minimize production and inventory costs. Bodas and Richter (2004) developed a production and recycling inventory model with n number of recycling lots and n number of production lots. Teunter (2004) developed EPQ models with rework in two