

# **An Optimal Integrated Maintenance Policy for a Pro-rata Warranty Model**

**Hajej Zied, Rezg Nidhal**

Laboratory of Industrial Engineering of production and maintenance  
Lorraine University  
Metz, 57045, FRANCE  
zied.hajej@univ-lorraine.fr, nidhal.rezg@univ-lorraine.fr

## **Abstract**

In the current consumer market, an equipment's warranty is one of the important factors in the consumer's decision-making process. Pro-rata Warranty is considered among the commonly-used warranty policies. Under this warranty, if an equipment fails before the end of the warranty period, it is replaced at a cost that depends on the age of the equipment at the time of failure. The replacement equipment is then covered by an identical new warranty. In this paper, based on the forecasting optimization problem, we develop a mathematical model to study the opportunity provided by the pro-rata warranty for the buyer as well as for the manufacturer, taking into account the influence of the production rates in the equipment degradation consequently on the total cost.

## **Keywords**

Maintenance Preventive, Optimization, Warranty, Production

## **Biographies**

**Hajej Zied** is an Associate professor at the University of Lorraine, Metz platform since September 2012. It operates research in the laboratory LGIPM Metz. After obtaining his doctorate at the University of Paul Verlaine - Metz in 2010, he was employed at the University of Metz as contract research engineer until August 2012. His main areas of research on the optimization of maintenance policies coupled to production and the development of methods and support the design and control tools in the production systems of goods and services. He is the author of numerous articles in international community of industrial engineering. Her teaching areas include modeling and organization of manufacturing and logistics systems, the practice of simulation, automation, and quality system production.

**Nidhal Rezg** is a professor at the University of Lorraine; he is a Doctor of Industrial Automatic from the National Institute of Applied Sciences (INSA) in Lyon in 1996. Accreditation to supervise research at the University of Metz in 2003. he was Professor at the Faculty of Engineering of the University of Moncton, New Brunswick Canada from 1997 to 1999 and Associate professor at the University of Metz until 2004, and currently holds the position of Professor of University. He is director of LGIPM laboratory since October 2006 and scientific responsible of the INRIA CusTom team from 2007 to 2011. His research interest is the optimization of maintenance policies coupled to production, the optimal control SED. He is the author of sixty papers in international journals, directors of 12

theses and 4 Accreditation to supervise research. Keywords researches are modeling, simulation and optimization of stochastic processes, reliability and maintenance and Petri nets.