

Problem of maintenance strategy and production planning for a multiple-product manufacturing system

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Abstract

Currently, the competition between companies is reflected in the revision of the current industry strategies to improve the planning of production and maintenance. In fact, the nonsatisfaction of the customer on time is often due to a random demand or a sudden failure of production system. Therefore, it is necessary to develop new maintenance and production strategies.

Looking in the literature we note that, the integrated maintenance and production policies for manufacturing system, which is focus to indecisions such as randomly machine failures, demand variations, etc., has fascinated the attention of some researchers. The development of industrial strategies (maintenance/production) has become very significant for several companies in order to decrease their total costs. In this way, Dehayem et al. (2011) developed a new process to find simultaneously the optimal production, and preventive maintenance or replacement plan for a degraded manufacturing system. In the same context, Gharbi and kenné (2007) proved that failure frequencies can be reduced through preventive maintenance, and developed joint production and preventive maintenance policies depending on the inventory levels produced. An analytical model and a numerical example which permit the establishment of a joint optimal inventory control and an age based on preventive maintenance policy for a randomly failing production system was studied by Rezg et al. (2008). But we note that all this studies treated the sample case of one type of product, that's way in the proposed study, we investigate

the area of multiple-product manufacturing system, but usually keeping the same objective of determining the optimal integrated maintenance production plan.

More precisely, in this study, we treat some maintenance policies integrated with production for a manufacturing system. In fact, this paper deals with the problem of maintenance strategy and production planning for a multiple-product manufacturing system. The manufacturing system under consideration consists of one machine which produces several products in order to satisfy random demands corresponding to every product. The significance of the present study is that the study deals with the case of a system which produces several products.

In this study we have developed and optimized analytically production policies for a multiple-product manufacturing system, in order to meet several random requests characterizing respectively different customers. These policies consist of determining periodic production plans for each product, minimizing the costs of production and storage while meeting predefined service level for each product. Subsequently, we have established optimal strategies of maintenance, taking into account the impact of economic production plans obtained, on the evolution of the manufacturing system degradation. Several scenarios have been studied according to the durations of the sub-periods of production and the cost of set-up of each product. In the end, case studies with numerical examples and sensitivity studies were treated in order to proof analytical results obtained.

Keywords

Maintenance, production, optimization, multiple-product

Biography

Mifdal Lahcen is a Professor, and Responsible of Industrial Engineering Department at Polytechnic School of Agadir. Mr Mifdal holds a Bachelor of Science degree in Industrial Systems Control from National School of Applied Science of Agadir. He earned Masters in Conception, Industrialization and Innovation from University of Lorraine, France and PhD in Industrial Engineering from the same university. Dr Mifdal has taught courses in Operations Management, Maintenance, Logistics and Operational Research. His research interests include manufacturing, optimization, reliability, scheduling, manufacturing, logistics and production.

Hajej Zied is an Associate professor at the University of Lorraine, Metz platform since September 2012. It operates research and responsible for the RIAD team 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.

Dellagi Sofiene obtained his Ph.D. from University of Lorraine (France) in industrial engineering. His main expertise and research interests include Systems Reliability and Maintenance, and Production management. He is associate Professor in Industrial Engineering at the University of Lorraine (France). Besides his research contributions through the publication of several articles and a book, Dr Dellagi works on various international research projects in collaboration with industry. He also acts as invited professor in European and North American universities. He has also been the Co-Editor of a special issue of the International Journal of Production Research in 2008.

Majdouline Ilias is a PhD graduated in Management Science from the University of Nancy 2 and certified by different organizations (APICS, Microsoft...). Actually dean of engineering school of Universiapolis, Vice-president Research and development of the International University of Agadir, and a visiting professor at various universities in Europe. Mr. Majdouline is the author of "Les ingénieurs entrepreneurs au Maroc : Réalités et

proposition de dispositif de formation"; a book published in Europe in 2011 as well as many scientific publications in management science. Highly active in professional associations, Mr. Majdouline holds the position of General Secretary of the International Network of Engineering (the Cartagena Network), Vice President Education and NICT in SMD CGEM (General Confederation of Moroccan Enterprises - Souss Massa Daraa), and Chairman of the Accreditation Committee of the Entrepreneurship Network in Morocco.