

A methodology for combined maintenance decision with quality control and production scheduling for multi machine system

Dr. Pravin P. Tambe*

Department of Industrial Engineering,
Shri Ramdeobaba College of Engineering & Management,
Nagpur, India
tambep@rknec.edu, tambepp@gmail.com

Dr. Makarand S. Kulkarni

Department of Mechanical Engineering,
Indian Institute of Technology Bombay,
Powai, Mumbai, India

Abstract

Maintenance, production scheduling, and quality control are the three important functions, which can improve the performance of a manufacturing system. In the operational context, all these shop floor activities have an interacting effect with each other. For example, while production scheduling; it is assumed that the machines are continuously available during production. However, in real manufacturing systems, machines may undergo failure and hence some unavailability periods such as preventive/corrective maintenance activities may exist during production. Similarly, preventive maintenance (PM) activities take time that could have been utilized for production purposes. Also, delaying the preventive maintenance or inadequate maintenance may degrade the machine condition which in turn may degrade the quality of the products being manufactured on the machine resulting in large amount of rework, rejection and scrap. Hence, there exists a strong interrelationship between production scheduling, maintenance and quality control. However, these shop floor activities are done mostly independent of each other. This paper presents a methodology for combining selective maintenance, production scheduling and quality control for multi machine system. The objective is to obtain the minimum cost solution for the simultaneous decision on maintenance, production schedule and quality control. The proposed approach results in the sequence for the batches on each machine, the maintenance actions for components and the quality control parameters. A simulated annealing algorithm is used for optimization. A numerical example is presented to demonstrate the proposed approach.

Keywords

Integrated approach, Maintenance, Production scheduling, Quality control, Multi machine

Biographies

Dr. Pravin P. Tambe is an Associate Professor, at Department of Industrial Engineering, Shri Ramdeobaba College of Engineering and Management (RCOEM), Nagpur, India. He holds a PhD in Industrial Engineering from Indian Institute of Technology (IIT) Delhi. He has more than 15 years of academic experience. He is Fellow of Indian Institution of Industrial Engineering. His research interest mainly focuses on reliability, maintenance planning, quality control and production scheduling. He has published research papers in international journals published by Elsevier, Emerald, Springer, etc. and international conferences organized by POMS, IAENG, IIIE, etc. He is reviewer to many international journals like Computers & Industrial Engineering, Reliability Engineering & System Safety, European Journal of Operational Research, Journal of Manufacturing Technology Management and many international conferences.

Dr. Makarand S. Kulkarni is Professor with the Department of Mechanical Engineering at the Indian Institute of Technology Bombay, India. He graduated in Production Engineering and later did his masters in Materials Technology from the Department of Metallurgical Engineering and Materials Science at the Indian Institute of Technology Bombay. Subsequently, he completed his Ph.D. in the area of Manufacturing Engineering from the Department of Mechanical Engineering at the Indian Institute of Technology Bombay. His post Ph.D. industry experience includes application of quality and reliability engineering techniques in manufacturing and service industry. His areas of interest are Reliability Engineering, Maintenance Planning, Quality Engineering, Smart Manufacturing. His current research focuses on development of reliability models for defense equipments. He is reviewer to many international journals.