

On setting the delivery due date with production on a machine under outsourced maintenance

Moosa Sharafali

Lee Kong Chian School of Business
Singapore Management University
50 Stamford Road, Singapore 178899, SINGAPORE
sharafalim@smu.edu.sg

Hakan Tarakci and Shailesh Kulkarni

Department of ITDS, College of Business
University of North Texas
1155 Union Circle #311160
Denton, TX 76203-5017
Hakan.Tarakci@unt.edu, Shailesh.Kulkarni@unt.edu

Raja Abdul Razack Shahul Hameed

The Naveen Jindal School of Management
The University of Texas at Dallas
800 West Campbell Road
Richardson, TX 75080-3021
rxs157630@utdallas.edu

Abstract

We consider an unreliable production system with a contractual relationship with a customer for a firm delivery date. We focus on the production-related decisions of the manufacturer. We assume that production rate is constant as long as the system is up and running but the randomness in production is due to downtimes as a result of breakdowns and scheduled preventive maintenance activities. The maintenance of the production facility is outsourced to a contractor. As production output is random, the manufacturer needs to make two important decisions, viz (i) how much time to allow for production taking into account the trade-off between the penalty fee if actual production time turns out to be longer than the deadline and the inventory holding cost if the production time is shorter than the allowed time and (ii) how to design the maintenance outsourcing contract to maximize its own profit while satisfying the contractor's reservation (minimum) profit requirements. This is a finite horizon optimization problem. A regenerative stochastic process is identified and analysed to develop the cost function over the finite horizon. The optimization problem will be illustrated through numerical examples. Some managerial insights with regard to coordination and some extensions will also be provided.

Keywords

Maintenance; reliability; availability; outsourcing; channel coordination;

Biography

Moosa Sharafali, is an Associate Professor of Operations Management (Edn.) with the Lee Kong Chian School of Business, Singapore Management University, Singapore. He holds a Ph.D. in the area of Operations Management from the National University of Singapore and a Ph.D. in Operations Research from I.I.T., Madras, India. He has held academic positions with the National University of Singapore, University of Melbourne, Australia and the University of Madras, India. His research interests include stochastic modeling of issues in queues, inventories and reliability. He has also consulted for companies in Singapore mainly in the area of logistics and supply chain management. He is a life member of the OR Society of Singapore, a member of INFORMS and DSI. His research articles have appeared in *Management Science*, *Operations Research*, *Production & Operations Management*, *IIE Transactions*, *International Journal of Production Research*, *Journal of Applied Probability*, *Queueing Systems*, *OR Letters* etc.

Hakan Tarakci is an Assistant Professor of Decision Sciences at The University of North Texas. He received his BS in Industrial Engineering from Bogazici University, his MS in Industrial Engineering from Iowa State University and his PhD in Quantitative Methods from Purdue University. He previously worked at Melbourne Business School. His research has been published at *IIE Transactions*, *EJOR*, *Decision Support Systems* and *International Journal of Production Research*, among other journals. His research interests include maintenance outsourcing, supply chain management, inventory management and technology in healthcare. His teaching interests include management science, business statistics and operations management.

Shailesh S. Kulkarni is Professor of Decision Sciences in the ITDS Department at the University of North Texas (UNT). He received his Ph.D. from the Lindner College of Business at the University of Cincinnati. Professor Kulkarni's research interests are in the areas of supply chain networks and stochastic modeling and analysis. His research has been published, among others, in *Production and Operations Management*, *IIE Transactions*, *Decision Sciences Journal*, *European Journal of Operational Research* and the *International Journal of Production Research*. He has received formal awards for his teaching and research and has secured external research grants to support his work. He currently serves as the Associate Vice President for Sponsorship for the Production and Operations Management Society (POMS).

Raja Abdul Razack Shahul Hameed is a MS student in the field of Information Technology and Management at the University of Texas at Dallas. He received his BS degree from Anna University. He also has experience in the field of Energy and Utilities through working for Cognizant Technology Solutions Corp for three years. His areas of interest include Operations Management, Machine learning and Supply Chain Management.