

Efficiency Improvement in Urban Distribution Centers (UDCs) using maintenance and subcontracting policies

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Abstract

In this paper, we present an improved distribution plan for many urban distribution centers (UDC) as a solution to solve the last mile problem of urban freight. These UDCs have to meet daily demands for delivery on time of their allocated urban areas. However, these demands may not be met when they exceed the available capacities of these infrastructures. In addition, some UDCs are unavailable when their capacity to deliver is affected by random unavailability or preventive maintenance actions. In this case, the entire site or a part of it will be "Out Of Service".

Our goal is to improve the efficiency of these UDCs in terms of availability and satisfaction of demands and this via preventive maintenance actions as well as the inter-UDC collaboration strategy. For instance, unavailable UDCs can be delegated to others UDCs as a subcontractor to ensure deliveries for their allocated urban area on time. The choice of subcontractor will depend on distance, environment and availability criteria. In doing so, we define a mathematical model for searching the best distribution correlated to a maintenance plans using a subcontracting strategy for all UDCs. Moreover, we consider delay for the next periods with an expensive penalty. Finally, we present a numerical example illustrating the advantages of our approach.

Keywords

urban logistics; urban distribution center (UDC); integrated maintenance; subcontracting strategy

Biographies

Nadia Ndhaief has obtained her PhD in logistics this year in march 2018. Currently, she is working as a teaching assistant (ATER) at Lorraine University, and is also a member of the research laboratory LGIPM in Metz, France. Her main research interest is the optimization of distribution policies of urban distribution center. She is also considering the last mile problem of urban freight according to sustainable development requirements.

Olivier Bistorin is associate professor at ICN Business School since 2012. He exercises research in the laboratory LGIPM Metz. After obtaining his doctorate at University Paul Verlaine-Metz in 2007, he was employed as contractual professor in the ENIM until September 2010. His main areas of research concern the development of methods and tools for the design and the piloting within the framework of the goods and services production systems. He is the author of numerous articles in international community of industrial engineering.

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.