World Academy of Science, Engineering and Technology
International Journal of Economics and Management Engineering
Vol:9, No:07, 2015

Optimal MRO Process Scheduling with Rotable Inventory to Minimize Total Earliness

Authors : Murat Erkoc, Kadir Ertogral

Abstract : Maintenance, repair and overhauling (MRO) of high cost equipment used in many industries such as transportation, military and construction are typically subject to regulations set by local governments or international agencies. Aircrafts are prime examples for this kind of equipment. Such equipment must be overhauled at certain intervals for continuing permission of use. As such, the overhaul must be completed by strict deadlines, which often times cannot be exceeded. Due to the fact that the overhaul is typically a long process, MRO companies carry so called rotable inventory for exchange of expensive modules in the overhaul process of the equipment so that the equipment continue its services with minimal interruption. The extracted module is overhauled and returned back to the inventory for future exchange, hence the name rotable inventory. However, since the rotable inventory and overhaul capacity are limited, it may be necessary to carry out some of the exchanges earlier than their deadlines in order to produce a feasible overhaul schedule. An early exchange results with a decrease in the equipment's cycle time in between overhauls and as such, is not desired by the equipment operators. This study introduces an integer programming model for the optimal overhaul and exchange scheduling. We assume that there is certain number of rotables at hand at the beginning of the planning horizon for a single type module and there are multiple demands with known deadlines for the exchange of the modules. We consider an MRO system with identical parallel processing lines. The model minimizes total earliness by generating optimal overhaul start times for rotables on parallel processing lines and exchange timetables for orders. We develop a fast exact solution algorithm for the model. The algorithm employs full-delay scheduling approach with backward allocation and can easily be used for overhaul scheduling problems in various MRO settings with modular rotable items. The proposed procedure is demonstrated by a case study from the aerospace industry.

Keywords : rotable inventory, full-delay scheduling, maintenance, overhaul, total earliness
Conference Title : ICORS 2015 : International Conference on Operations Research and Statistics
Conference Location : Zurich, Switzerland
Conference Dates : July 29-30, 2015