

Name of the Scholar: Mudar Dayoub

Name of supervisor: Prof. Rasheed Ahmad Khan

Name of Co-Supervisor: Dr. Mohammed Sharif

Name of Co-Supervisor: Dr. Mohammed Sohaib

Department of Mechanical Engineering

Title of Thesis: SOME STUDIES ON THE PRINCIPLES AND MECHANISMS FOR LOADING AND UNLOADING

Abstract

In this research, development and implementation of several studies has been carried out for optimal scheduling of loading and unloading operations in container terminals. A generic model based on mixed integer programming (MIP) has been developed and its effectiveness in scheduling container loading and unloading operations has been studied. In addition to MIP model, four generic models based on different scheduling algorithms have been developed in this research. The performance of these models has been evaluated in terms of the quality of solution achieved by them. Comparison of the performance of MIP model with that of other models has revealed that although MIP model is able to produce optimal solutions but its execution time is quite high. Due to the high execution time requirements, it was concluded that MIP model has limited practical applicability to real world problems.

Major achievements of the research carried out in this thesis may be summarized as follows:

- A comprehensive review of literature related to application of optimization techniques for improving container terminal operations has been carried out with a view to provide ready reference for any future work.

- A comprehensive review of processes being followed, and equipment being used in container terminals has been carried out in order to put the work carried out in this research in context.
- Real-world data pertaining to processing time and travel time for each container has been procured from CONCOR, and has been used to test the developed models
- A generic MIP model that is transportable to any other container terminal with minimal changes has been developed for the truck scheduling problem
- Analysis of several computational experiments carried out using the MIP model has revealed that the execution time requirements are quite high for solving even moderate size problems, thereby ruling out the application of MIP model to large real-world problems
- Four generic models based on STF, LTF, FAT, and LBT scheduling mechanisms have been developed and their practicality in solving complex problems has been demonstrated through application to four real-world problems.
- It has been demonstrated that the application of recommended models for unloading different number of train could lead to substantial savings in the cost of operations
- A distinct practical advantage of the model developed in this work are that they are transportable to any other container terminal without any difficulty
- Models developed in this work can be used by terminal operations managers for optimizing container terminal processes
- Models recommended in this work provide a wider choice to the terminal managers as well as to customers
- Finally, implementation of models developed in this work is straightforward due to the ease of interfacing