Intermodal terminal simulation for operations management

Alessandro Baldassarra ¹*, Stefano Impastato ¹*, Stefano Ricci ¹*

¹ “SAPIENZA” University of Rome – DITS Transport Area

Abstract

A freight terminal is a key node in a transportation network and the transit time of containers through this terminal represents one of the most relevant bottlenecks in logistic chains.

The system performance reduction and the corresponding increase of transit time is often due to the increase of the freight flow without a corresponding increase of stacking and handling capacity.

For this purpose it was decided to approach the problem by a discrete event simulation model, in order to reproduce the activities carried out inside an intermodal terminal, to calculate the total transit time and to identify the bottlenecks.

The transit time of a cargo unit in a terminal is the summation of times required for the development of each phase of the process (waiting time + operational time).

Therefore, the first step was the identification of the main activities and the analysis of waiting and operational phases, in order to quantify the times of each phase.

For modelling the software Planimate® was used. Planimate® allows the simulation of a process as a set of discrete events, in series or in parallel, through the use of hierarchical networks.

In order to optimise handling operations on containers, different scenarios were simulated with various fleets of trailers and front cranes to investigate the corresponding variations of performance indicators.

For the application of the model an Italian case study was chosen: the container terminal inside the harbour of Livorno (Darsena Toscana Terminal).

Keywords: Intermodal terminal; Simulation; Freight; Logistic; Management.

1. Introduction

Railway freight terminals play a key role within multimodal transport and the transit time through these terminals represents one of the most relevant bottlenecks in logistic chains.

A freight terminal is a basic node in a transportation network, where thousands of daily decisions are taken to manage relevant flows of containers.