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DISTRIBUTED MODEL OF "YASKAWA" DC DRIVES

A dissertation submitted to the
Department of Electrical Engineering, University of Moratuwa
in partial fulfillment of the requirements for the
degree of Master of Science

by

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DECLARATION

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Abstract

Developing a faithful and interactive model for the DC Hoist Drive System of the Container Cranes at Port of Colombo is the base of this research work.

Hoisting a maximum load of 45.5 ton, including the container weight under the spreader of the container crane at 45 meters per minute is the base requirement of the system. But lighter loads can be hoisted at higher speeds than the base speed utilizing the rated capacity of the system.

A closed loop DC drive system, being arranged in Ward-Leonard Speed Control method is providing acceleration torque to all loads to speed up on a fixed ramp increasing the motor armature voltage. While the load is on acceleration the system calculates the load torque and sets the load dependent final speed limit beyond the base speed if possible. Motor field has to be weakened to raise the rotor speed beyond the base speed.

A model is developed to simulate complete closed loop system as in actual operations using MATLAB-SIMULINK software with all available data. The model output matches almost perfectly with steady state portions of the actual operational cycle but deviates from the actual measurements at transient states.

The Model is then enhanced to behave as actual operational cycle and to reflect output as much as closer to the field measurements modifying the dynamic function blocks. For some blocks it only needed adding delay components but load torque and motor excitation control function blocks have to be modified with more complex systems.

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ABBREVIATIONS

Chapter 1

Term	Explanation
ACR	Automatic Current Regulator
ASC	Automatic Speed Regulator
DC	Direct Current
EMF	Electro Motive Force
RPM	Revolution per minute
μR	Friction (Sliding Plane)

Introduction

Part of Colombo Container Terminal



The terminal is a large industrial structure with multiple levels and cranes. It is located in a port area. The terminal is used for handling containers. The terminal is a large industrial structure with multiple levels and cranes. It is located in a port area. The terminal is used for handling containers.



Figure 1-1: Container Terminal at Port of Colombo

The terminal is a large industrial structure with multiple levels and cranes. It is located in a port area. The terminal is used for handling containers. The terminal is a large industrial structure with multiple levels and cranes. It is located in a port area. The terminal is used for handling containers.