RUBBER FLIPPER UNLOADING SYSTEM

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

by

ABESINGHE ARACHCHIGE DUMINDA KUMARASINGHE

Supervised by: Dr. A.M. Harsha S. Abeykoon

Department of Electrical Engineering
University of Moratuwa, Sri Lanka

March 2011

DECLARATION

The work submitted in this dissertation is the result of my own investigation, except where otherwise stated.

It has not already been accepted for any degree, and is also not being concurrently submitted for any other degree.

UOM Verified Signature

A. A. D. Kumarasinghe

08/03/2011

I endorse the declaration by the candidate.

UOM Verified Signature

Dr. A. M. Harsha S. Abeykoon

CONTENTS

Abstract

Brandix hangers (Pvt) Ltd is one of factory in Brandix group which is a large scale hanger manufacturing factory in Sri Lanka. The main production of the factory is hangers. The current production is 4 million hangers per month. However the monthly demand is around 5.5 Million hangers per month. The key concern for this research is to increase the production of the hanger manufacturing at Brandix Hangers (Pvt) Ltd to cater the current market demand.

However the purchasing of new advanced machine was very expensive and at the same time increasing the number of labour was also not a good option. Therefore by using the existing machines and labour the production had to be increased.

The rubber lever machine was selected as the best option to increase the production rate by replacing the human interaction with any other effective method. The main concern was given to minimize wasting time and decrease the cycle time. To improve the production, human interaction should be replaced or should need to be speed up. However speed up of the human has a maximum limit and it is impossible to increase more than that. So by replacing the human activity with any other method, the cycle time can be minimized. Therefore automate some function of human process was identified as one of the best solution to decrease the cycle time and hence cater the market demand.

Rubber lever machine loading and unloading processes were done by human. If the automation is introduced for the loading process, the image processing technology has to be used because the placement of the flipper levers is very important factor to follow the next steps. However the image processing equipment was very expensive and could not bear it within the available budget. The other option was to automate the unloading process. Since the placement was not a very important factor for the unloading process (this was the end of the process and only the removal of the complete product was done) not needed image processing technology. On the other hand the longest time was taken for loading. Since the loading process cannot be automated to minimize the loading time the manual input should have to be increased. For that the unloading operator was transferred to the loading process. Hence the loading time becomes half.

Acknowledgement

This research project would not be possible without the generous support, help and advice of my academic supervisor, Dr. Harsha Abeykoon, Department of Electrical Engineering, University of Moratuwa. He has deep understanding for the details and superb analytical skill, these have been key in the success of the project. I am also grateful to Dr. Palitha Dasanayaka, Department of Mechanical Engineering, University of Moratuwa, for his precious advices, support and guidance to complete my research successfully.

My gratitude extends to Prof. Lanka Udawatta, Prof. Sisil Kumarawadu, Dr. Nalin Wickramarachchi, Department of Electrical Engineering, University of Moratuwa, for serving as my committee members. Their valuable advices and the suggestions were very worth to make my research in the correct path.

I would like to take this opportunity to extend my deepest gratitude to Mr. K.P. Thayakaran (Chief Operating Officer), Brandix Hangers (Pvt) Ltd for giving me the opportunity and providing the funds and resources to carry out this project. My warmest gratitude goes to Mr. Rajitha Wellagiriya (Factory Manager), Brandix Hangers (Pvt) Ltd for his great help in many ways to complete this project. All the shift engineers who lend a hand to me in this regards are highly appreciated.

All the technicians such as welder, lathe man, machine fitters and work shop supervisor are extremely appreciated for their assistance to fabricate the robot arm and sharing their ability to successfully complete this project within short period.

Finally I dedicate this research to my parents, sisters and my wife who have always encouraged me to go after my dreams and for their constant moral support.

List of Figures

List of Tables