

DYNAMIC SIMULATION, MODELING & ANALYSIS OF AN AUTOMATED SEALING & PRE - CUT PLASTIC BAG MACHINE

5 BTL - 00 - 2

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24 FEBRUARY 2003



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quality for awarding the Bachelor Technology in Mechatronics Engineering

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**A FINAL YEAR PROJECT REPORT SUBMITTED IN PARTIAL
FULFILMENT FOR THE BACHELOR TECHNOLOGY IN
MECHATRONICS ENGINEERING**

**MECHATRONICS ENGINEERING
INDUSTRIAL ELECTRONICS DEPARTMENT
GERMAN-MALAYSIAN INSTITUTE AND KUITTHO**

24 FEBRUARY 2003

OATH

I hereby declare that this thesis, submitted to GMI as a partial fulfillment of the requirement for the degree of Bachelor Technology in Mechatronics Engineering. I also certify that the work explain here is entirely my own except for literature review, the fundamental mathematical modeling and summarise when sources are appropriately cited the references. This thesis also is free from any plagiarism and available within the GMI library or available within the Kuittho library for the purpose of research and development.

Signature

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Date

:

5th March 2003

DEDICATION

I would like to dedicate this thesis to my beloved family especially my mom and dad with their confidence in me to overcome the entire obstacle in my journey to success. This dedication also goes to my lovely fiancée whom persistently gives me precious support and motivation through out the year.

ACKNOWLEDGEMENT

I would like to acknowledge my project supervisor, Mr. Zulkifli bin Naim whom I have a great deal of helpful advice, solved every project work problem that I encountered. He also gave me valuable support and advice in order to achieve my objective of project paper. He has persistently put his attempt in developing my self-confidence and provide ideas in the project implementation.

In particular, I wish to acknowledge to a lecturer from International Islamic University of Malaysia, Mr Shahrul Naim bin Sidek for his cooperation, advice and precious knowledge of Matlab and Simulink programming for my project paper. He also gave some suggestion on my project in order to improve it.

I would especially like to thank Mr James Lai as a Field Support/Application Engineer of National Instrument for his advice and guidelines for using Labview and gave new ideas to support my project simulator.

Finally I wish to thank to Mr. Faiz, Mr Zainuddin, Mr Chin, and Mr Badli Shah for their commitment as GMI staff give me valuable support to complete my thesis. I would like to extend my appreciation to my colleagues for the supporting and help. They provided inspiring conversation and attractive in the project.

ABSTRACT

A mathematical model is an algorithm or set of equations that is combined with a set of data values to represent the significant behavior of a system, process, or phenomenon. The development of a mathematical model for a given real-world system can be a difficult task. In cases where the system's dynamics are not well understood, a series of experiments must be performed to collect data that can then be processed using various techniques to yield a model of system behavior. This thesis introduced some of the methods used in the development of mathematical models of real world systems and phenomena.

Based on the study, the system response of tension plastic for an automated sealing and pre-cut plastic bag machine will give us the overview of the system performance. The mathematical model of DC motor are developed and tested with PI controller model too see the feedback with various values of K_p (proportional gain) and K_i (Integral gain). The study of characteristics of control system like settling time, rising time, steady state error and overshoot has been done. Previous study of this kind of web tension or unwinder/winder application is mostly used of PI controller. The reason will be discuss on this thesis implementation. Using Matlab and Simulink as a simulation software does the experiment.

The system simulator is made for guideline or reference to engineer or machine design so that they can test their material used in unwinding and winding system applications. Using Labview as virtual instrument software does the testing experiment.

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LIST OF SYMBOLS AND ABBREVIATIONS

| | | |
|---------------|---|--|
| V_a | - | Armature voltage or source voltage |
| V_c | - | induced voltage |
| V_{Ra} | - | Voltage across armature resistance |
| V_{La} | - | Voltage across inductance |
| R_a | - | Armature resistance |
| i_a | - | Armature current |
| L_a | - | Inductance of armature coil |
| K_v | - | Velocity constant |
| ω_a | - | The rotational velocity of the armature |
| T_ω | - | The torque produced by velocity of rotor |
| $T_{\omega'}$ | - | The torque due to rotational acceleration of the rotor |
| T_e | - | Electromagnetic torque |
| T_L | - | The torque of the mechanical load |

| | | |
|------------|---|--------------------------------|
| J | - | The inertia of the rotor |
| B, b | - | Damping coefficient |
| Ω_m | - | Speed of motor |
| θ | - | Position of shaft |
| f | - | Tension. |
| τ_a | - | armature circuit time constant |
| τ_l | - | tension/speed time constant |
| τ_c | - | current PI time constant |
| τ_s | - | speed PI time constant |
| τ_t | - | tension PI time constant |