DESIGN AND DEVELOPMENT OF AUTOMATED DIFFERENT VISCOSITY CHEMICAL MIXING MACHINE FOR GLOVE INDUSTRY

AmilaPrasangaPahalavithana

139527V

Degree of Master of Science

Department of Electrical Engineering

University of Moratuwa

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Dissertation submitted in partial fulfillment of the requirements for the Degree Master of Science in Industrial Automation

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DECLARATION

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ABSTRACT

Compound preparation is one of the most important processes in glove manufacturing industry. It is highly concerned to achieve required physical and mechanical properties of a specific glove. This is almost depending on quality compounding. Therefore compound preparation should be done according to correct formulation. Since this is a manual process, long term practice is very important and hence high skilled labor is required.

In this manual process weighing of each chemical precisely and mixing them in a specific time is essential. Also in this process human interference is very high and this is a monotonous work too. Furthermore there are specific compound formulation among competitive companies which are to be kept securely without revealing to others. Therefore there's a necessity of minimizing human intervention in compounding. Automating the compounding process is a good solution for this and also it is a challenging task, since there are so many factors to be considered in designing.

This research oriented towards design and development of an automated compounding machine by eliminating all drawbacks in manual process. Here measuring of chemicals precisely, feeding chemicals in to the mixing chamber with a required flow rate, maintaining the mixing sequence of chemicals, easy operation of the machine and maintaining the secrecy of compound formulation are highly concerned. Basically in this machine an authorized personal can enter the mass, time and impeller speed data according to the process and formulation. These data are stored in the PLC memory until they are edited by the authorized personals as they required. The operator simply can select the compound type and the batch size and then start the machine by means of the HMI unit. The filling and measuring of the required amount of chemicals in to the intermediate compartment are done by means of a system comprises of a servo pump, load cell with a load cell amplifier and a PLC unit. According to the load cell feedback signal the PLC controls the servo pump by varying the output pulse rate and hence measure the correct amount of

chemicals. Also feeding of the measured chemical into the mixing chamber is done by a servo pump attached to the intermediate compartment and the flow rate is maintained by varying the output pulse to the above servo pump according to the load cell signal. Chemical feeding sequence, Chemical filling, maintaining required flow rate, controlling impeller speeds and all other operations are controlled by the PLC unit. The PLC algorithm is developed for fulfill the above operations and can be further developed. The operator machine interface is done via the HMI unit. The outcome of this machine is successful. That is when checking the properties of the compounds prepared from this machine, it can be confirmed that they were up to the standard.

DEDICATION

Dedicated to

my beloved

Parents, Wife and Two Children

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AmilaPrasangaPahalavithana

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