

**DEVELOPMENT OF A HIGH SPEED STAPLER PIN
MANUFACTURING MACHINE**

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Department of Electrical Engineering

University of Moratuwa

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Thesis submitted in partial fulfillment of the requirements for the degree of Master of
Science in Industrial Automation

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Declaration

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Prof. N. Wickramarachchi

Abstract

Converting any kind of production system from discrete process to continuous process saves substantial time in production process enabling reduction of power consumption, reduction of space, utilized to increasing production capacity. That can be applied for development of existing manufacturing processes; here used for steel wire production processes.

Stapler pin was invented in late 1877's for binding of materials, popular due to simple form of use in the industry and now it has become an essential commodity in the market. In past decades, stapler pin manufacturing process have not been developed and used conventional manufacturing process all over the world which have limitations due to high energy consumption and high space requirement; therefore setting up such factories leads to high capital investments.

The objective of this study is to Development of High Speed Stapler Pin Manufacturing Machine to introduce to the local market and cope up the target. Total requirement of the stapler pins of different sizes for office uses and industrial uses are imported and distribute by various suppliers in Sri Lanka. No one can think of manufacturing stapler pins in Sri Lanka due to high capital investment and high operation cost and lack of own technology. Now many suppliers import base product and packet locally and distribute through super markets and retail markets. Stapler pin manufacturing process involves very simple mechanical functions of wire forming, feeding, cutting, bending, moving and gluing. Conventional stapler pin manufacturing is done by using round galvanized steel wire of different wire gauge from 18 to 26 based on the application.

Single or multiple wire which feed through set of rollers to straitening and forming it's flat shape then gluing it by using gum. Then heated to dry and make wire flat strip. After it cut and bent to correct size to produce stapler pin by using mechanical actuator by aid of square shaped die and mold which moves up and down.

In this design mechanisms have completely changed to make its square shape by using rotary bending mechanism. Steel wire feed through freely rotating rollers by using rotational square bar then it cut by using rotating cutting tool while moving stapler pin forward. Cutting tool moving up and down enabling to produce two stapler pins at a time. In this Design of high speed stapler pin manufacturing machine addresses to save energy, time and space leads to convert factory manufacturing environment to domestic manufacturing environment. Use of time, space and energy saving strategy is most economical and applicable in modern industry accordingly manufacture of stapler pins can promote / emerge into the domestic industry and this product enabling to country economic development.

Two types of conceptual machines have been developed and relevant prototype models have been tested. Only one type of the conceptual design has been successful. Further improvements and developments have been incorporated to the successful model in order to produce stapler pins with correct shape and dimensions. Power requirements have been calculated by using theoretical approach by using formula and also experimental power requirement has also been calculated by experimental approach and observed that both power requirements are almost the same. Therefore the formulated equations can be used for further developments in the proposed process. Machine will be used in domestic manufacturing environment; hence certain safety precautions were concerned when selecting the power source, drive motor, heater and control system.

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