

Stepper Motor Coil Unloading Automation

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ABSTRACT: In this project we use electric linear actuator with gripper to unload the coil automatically from the metal tray to the thermocol tray. Resistance of the coil is checked by resistance checker. The range of the coil should be in between 2.7k -3k, if the coil is not in this particular range the coil is considered as bad and it is rejected. Locator cylinder is used to hold the metal tray and unlock cylinder is used to unlock the coil from the metal tray. Gripper in the linear actuator picks the unlocked coil and places in the thermocol tray. Here 3 different sensors are used: **i.**Photo electric sensor, **ii.**Inductive proximative sensor, **iii.**Read switch. Due to the relay logic complexity and more space accommodation in the existing method PLC is used to overcome this issue. Finally the thermocol tray is filled with 100 good numbers of coil and then this tray is unloaded using stepper motor.

I.INTRODUCTION

Coil is very important in watch manufacturing. Titan has the capability to manufacture coils with wide range of materials including titanium, tantalum, nickel, monel, zirconium, hast alloy, Inco alloys and special grade stainless steel. Titan's corrosion resistant coils are also available to help match a corrosion and chemical erosion solution to your budget. Whether your factory environment is acidic or alkaline, salt-laden, or de-ionized, we have the capability to select the proper combination of materials to match your duty requirements. Titan efficiently manufactures a wide range of oil sizes and dimensions. The benefits of this unloading automation are experienced and qualified welding teams and strong history large range of references in acetic acid. It experience in designingsolid or cladded pressure vessels and design according to international standards. The coil drives the stepper motor by inducing an alternating magnetic field in the stepper motor. As such supply the quality of the coil might effect the smartness with which the drive train moves but, assuming it produces enough torque to move the train, it isn't going to effect the accuracy. As in the SD the timekeeping is done by the crystal and divided down from the operating frequency to a usable pulse to run the drive train. By the time gets to the coil and the stepper motor the time base is established. The little aluminium cylinder does indeed contain a small quartz tuning fork in most, but not all watches. This resonant body may come in other shapes such as lenticular. However, the tuning fork with a 32k frequency is overwhelmingly the most common. Only the earliest quartz do not also come with a mosfet driver circuit which divides the frequency of the quartz down by repeated division by two.

II.OBJECTIVE OF THE PROJECT

The main objective of this project is to unload the coil used in watch manufacturing from the metal tray to thermocol tray automatically by using linear accutuator. PLC (Siemens TIA version 13) is used which uses ladder logic and reduces complexity and time consumption.

III.PROPOSED METHOD

In this method we use electric linear actuator with gripper to unload the coil automatically from the metal tray to the thermocol tray. when the automatic push button is pressed the process of coil unloading starts, the stepper motor starts running Stepper motor is an electromechanical device achieving mechanical movements through conversion of electrical pulses. Resistance of the coil is checked by resistance checker. The range of the coil

should be in between 2.7k -3k, if the coil is not in this particular range the coil is considered as bad and it is rejected. Locator cylinder is used to hold the metal tray and unlock cylinder is used to unlock the coil from the metal tray. Gripper in the linear actuator picks the unlocked coil and places in the thermocol tray. To overcome the drawbacks of the existing method, the proposed method is implemented with linear actuator with gripper, resistance checker, sensors and PLC (siemens TIA version) in which both HMI and PLC can be used. Once the start button is loaded and moves through the conveyor belt and reaches the locator cylinder which holds the metal tray. Resistance checker checks the resistance of each coil, then the metal tray moves to the coil unlock cylinder where the coil is picked using the gripper in the linear actuator and placed in the thermocol tray. Finally the tray is unloaded.

IV.HARDWARE DESIGN

The system mainly consists of HMI, Linear Actuator and sensors like inductive proximity sensor and photoelectric sensor

BLOCK DIAGRAM:

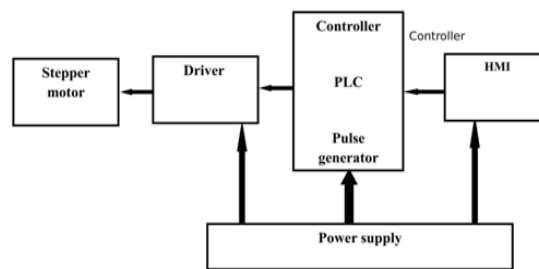


Figure 1. Basic block diagram

V.HUMAN MACHINE INTERFACE (HMI)

The human machine interface consists of number of push buttons namely cycle start, cycle stop/reset, locator, linear for, up/down, coil unlock, gripper, tray load, tray unload. The emergency push button is used as a safety measure to stop hazardous parts. Both auto and manual mode is present. When the machine is in auto mode, start button is pushed and the stepper motor starts running. The stepper motor runs only when the electric pulse is given. The photo sensor senses the metal and the metal tray is unclamped which is loaded in the conveyor belt. The movement of the metal tray is done by the cam shaft. Each metal tray holds 20 coils.

VI.ELECTRICAL LINEAR ACTUATOR

A **linear actuator** is an actuator that creates motion in a straight line, in contrast to the circular motion of a conventional electric motor. The threads of a lead screw act as a continuous ramp that allows a small rotational force to be used over a long distance to accomplish movement of a large load over a short distance.

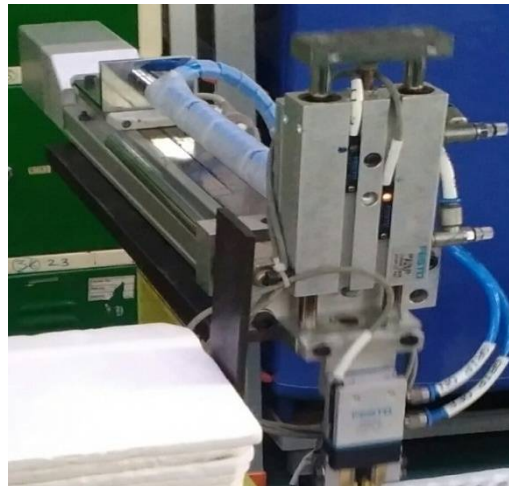


Figure 2 Linear Actuator

VII.SENSORS

A.INDUCTIVE PROXIMITY SENSOR:

An inductive proximity sensor is a type of non-contact electronic proximity sensor that is used to detect the position of metal objects. The sensing range of an inductive switch is dependent on the type of metal being detected. Ferrous metals, such as iron and steel, allow for a longer sensing range, while nonferrous metals, such as aluminum and copper, can reduce the sensing range by up to 60 percent.

B.PHOTOELECTRIC SENSOR

A photoelectric sensor, or photo eye, is an equipment used to discover the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver.

VIII.SYSTEM SOFTWARE DESIGN

A.PROGRAMMING LOGIC CONTROLLERS (PLC)

A Programmable Logic Controller (PLC) is a specialized computing system used for control of industrial machines and processes. It uses a programmable memory to store the instructions and specific functions that include On/Off control, timing counting, sequencing, arithmetic and data handling. PLCs are equipped with special input/output interfaces.

B.Need for plc:

Hardwired panels were very time consuming to time, debug and change. The following requirements for computer controllers to replace hardwired panels

1. Solid-state not mechanical.
2. Easy to modify input and output devices.
3. Easily programmed and maintained by plant electricians.
4. Be able to function in an industrial environment.

IX.CONCLUSION

In this paper we have implemented an automation of coil unloading which is very important in watch manufacturing. Coils produced are picked and placed automatically rather than manually and saves lots of human time. This reduced time consumption, increases speed and thus increases productivity. Based on this result, we proposed an asymptotically globally optimal and a suboptimal iterative resource allocation algorithm

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to solve the problem by alternating optimization transmission provides energy efficiency and throughput gains compared to manual systems which utilize the human power and time consumption. Finally 100 good number of coils are picked and placed by this machine automatically.

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