PLC Based Induction Metal Hardening

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Abstract- *There is an increase in demand for automobile.. As in Automobiles, parts of vehicle have to go through mechanical shocks while traveling which reduces the strength of the part thus results in damage of part. To overcome this problem we provide metal hardening process which increase its strength and make it capable to undergo any shocks or vibrations.*

Keywords- Induction, PLC(programmable logic controller), Metal Hardening, Mechanical job.

I. INTRODUCTION

The main aspect of the project is to automate the processing of metals which is a crucial step in the production of automobile materials like shafts, levels and gears. The automated process will efficiently reduce the human resource required and also increases the efficiency of hardening and tempering process of raw metal bits. Our system deals with designing of a PLC based control system for Hardening Metal. There are three types of control drive in this PLC based automated system, namely, Heating Coil, Solenoid valves and Rotating Motor. Hardening and tempering of steels is a procedure for modifying the metal's characteristics to better suit the job it has to perform.

II. LITERATURE REVIEW

PLC based Control System for Hardening and Tempering Furnace in Heat Treatment Plant

This research paper attempts to describe a PLC based Control System for Hardening and Tempering Furnace in Heat Treatment Plant as implemented at the Siddheshwar unit for Mahindra Automobiles Limited, which is one of India's largest vehicle manufacturing corporation. The proposed system deals with designing of a PLC based control system for Hardening and Tempering Furnace. This paper provides the description of the components implemented for the control system along with the flow of working of various required components. The system is controlled with the help of Messing PLC.

III. BLOCK DIAGRAM

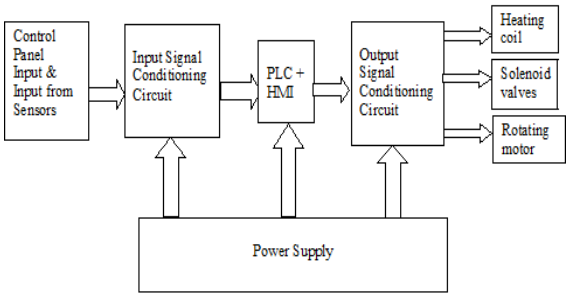


Fig.1 block diagram of induction metal hardening process.

IV. SYSTEM ARCHITECTURE

The main objective of Induction Metal Hardening machine is to provide a service of hardening of metal to increase strength of mechanical job. The system architecture consist of rotating motor, solenoid valves, Heater. The purpose of the system is to apply accurate hardening to the job as per the requirements of customers.

V. METHODOLOGY

This is the system for heat treatment of the mechanical job of vehicle. This system includes following equipments:

- Power supply.
- Solenoid valves.
- Heating coil.
- Rotating motor.
- PLC.
- HMI.
- Control Panel.

1. Power Supply

Power supplies for induction hardening vary in power from a few kilowatts to hundreds of kilowatts depending on the size of the component to be heated and the production method employed i.e. single shot hardening, traverse hardening or submerged hardening.

2. Solenoid Valves

The drive to which the output signal from PLC are feed is given to solenoid valve.. Basically solenoid are used in complex automations in which water is used as feed input. Therefore, in our case, we use solenoid controls for driving the valves of pumps in the quenching process.

3. Heating coil

The signal output is fed into other output drive, i.e., Heating coil. This kind of drive is normally used in case of working with heavy objects or jobs. Therefore, in our case, we use Heating coil to heat the job at desired temperature. Through our PLC program we start and stop the heating coil.

4. Rotating Motor

The third drive connected to output is the Rotating Motor. Rotating Motor is used to rotate the job is desired speed so that the job is heated overall. We can vary the speed of motor through the potentiometer. Through PLC program we can on/off the motor.

5. PLC

PLC (Delta) based controller is provided to control the functions of equipment. Control panel is provided with necessary push buttons for auto/ manual mode.

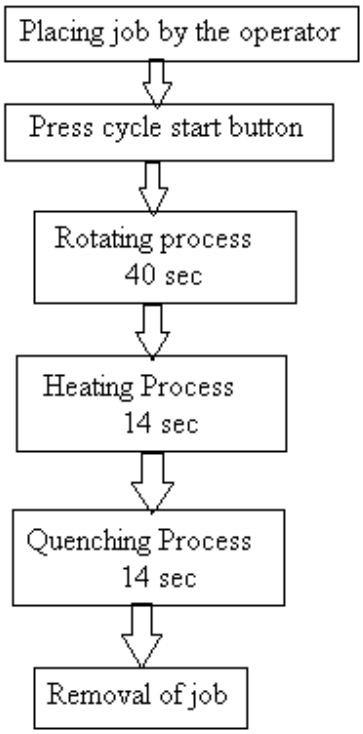
6. HMI

To achieve an active communication between the system and the operator Human Machine Interface is used. The operator can set the values of various parameters like the total time for heating process, etc. The HMI provides information about parameters like the count of the finished jobs and the mode of operation of the system.

7. Control Panel

The Control Panel block and the input signal conditioning circuit includes the various components like PLC, SMPS, Transformer, Relays, and Connectors.

VI. FLOW CHART



VII. RESULT

Hence we have provide accurate hardening to the job in minimum time with required safety parameters.

VIII. ADVANTAGES

- Minimum cycle time.
- High wear and fatigue resistances.
- Improves components Durability.
- SCADA controlling available**.**
- More production rate**.**

IX. CONCLUSION

This is how we performed our project completing the PLC program and controlling three drives: Heating Coil, Solenoid Valves and Rotating Motor. And so our job is treated successfully.

X. ACKNOWLEDGEMENT

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