iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** III **Month of publication:** March 2016

DOI:

www.ijraset.com

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Volume 4 Issue III, March 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Technology Up gradation of GDC Machine Using Messung PLC

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Abstract— Under the present regime of globalization and liberalization, quality enhancement and cost reduction are two major steps to enhance productivity in major industries. We focused on the very practical, safe, economical and rewarding strategies i.e. the application of low cost automation. In industry, which uses automation, a sequence is followed in the manufacturing of number of products of the same kind and thus chance for automation. In our research, we have achieved low cost automation through a PLC (MESSUNG NEXGENIE ND16ADL PLC with CoDeSys). In automated system, PLC is usually the central part of control system. With execution of program in program memory, PLC continuously monitors status of the system through signals from input devices(sensors). Based on the logic implemented in the program, PLC determines which action is to be executed with output instruments such as sensors and actuators. Depending on our requirements, directional control valves and sensors are used to run the sequence. Directional control valves are used to regulate the flow of oil pressure wherever necessary.
Keywords— : Messung PLC, photo-sensors, proximity-sensor, Hydraulic cylinder, Directional control valve.

I. INTRODUCTION

In the recent past, Automation techniques have become one of the effective strategies in the modern manufacturing process to get multifarious benefits. Thus, it is necessary that industries explore methods of enhancing automation and thereby increase the productivity to acquire greater competitiveness in the market. Automation replicates human effort through the introduction of machines and increases the productivity by utilizing available resources in the most efficient manner. In other words, automation is a technology concerned with the application of mechanical, electronic and computer based systems to operate and control production. For rapid industrial growth in developing countries like which is a nucleus of small industries, automation plays an important role. The electronic age and the automatic age both of which were required as revolutions in industrial production is now substituted by Automation age. Fixed automation, Programmable automation and Flexible automation are the three types of automations. Due to high initial investment for custom engineering equipment and major batch manufacturing requirements, need for low cost programmable automation increased. The LCA techniques are considered to be one of the most commendable ones in solving various problems related to automation as it creates some degree of automation around the existing equipment, tools and methods using mostly the standard equipment available in the market. This can be done by introducing very simple devices such as limit switches, Electrical relays, Solenoid valves and pneumatic actuators. Hence, the use of simple devices utilizing relatively cheap human effort in certain operations is called Low Cost Automation.

Because of various reasons, the relay logic systems are widely used in the industrial automation systems till recent past. But with the advent of microcontrollers the Automation systems using them as controllers are increasing day by day. Programmable logic controller is one such microcontroller whose popularity is increasing very rapidly. A PLC may be used to control the fluid power more efficiently. A programmable logic controller uses a program to link together a number of input devices (e.g. Sensors, switches) and output devices (e.g. Actuators, LED's) to produce a desired sequence of operations.

II. EXISTING SYSTEM

Initially the casting process was done manually. The respective person has to operate the machine accordingly. Due to which human efforts were more with less precision.

III. PROPOSED SYSTEM

PLC which is the main unit of the system is driven by 24 V power supply. It is a 1K PLC i.e. It has 40 inputs and 40 outputs. Three i/o modules are connected to it. Each of them has eight relay contacts. Two of them are used as input and the remaining one is used as output. It receives input from sensors and timers regarding the position of die and solidification process respectively. According to the inputs received it drives the hydraulics for tilting or rotating mechanism. There are two proximity sensors used for opening and closing of die respectively. They both are identical as far as specifications and characteristics are concerned. They can sense up

Volume 4 Issue III, March 2016
ISSN: 2321-9653
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to a distance of 2mm. They are placed one below the other. The upper sensor indicates the opening of the die whereas the lower sensor indicates the closing of the die. When the die is opened a metal plate arrives in front of the upper proximity sensor due to which the laser beam emitted by the sensor is cut and the sensor indicates successful opening of die. Similarly when the die is closed the metal plate now arrives in front of the lower proximity sensor it indicates successful closing of the die. Photo sensor is used for checking whether the machine is tilted up to 90 degrees or not. After the molten aluminum is poured in the saucer the machine is rotated up to 90 degrees. The photo sensor senses a metal plate in front of it when the machine is rotated up to desired angle which is 90 degrees. To tilt the machine in a controlled manner we are using hydraulic cylinders whose oil pressure will be controlled by the directional control valves with the help of power pack. Power pack is tank of 200 litres capacity. Oil 68 is used in the hydraulic cylinders. 68 is the measure of viscosity of the oil. The directional control valve is a two way control valve having contacters on both side. According to the requirement the oil is allowed to go in as well as come out. When there is extra oil present in the cylinders the outer contacter coil gets magnetized and it pulls the extra oil out of the cylinder. There are four directional control valves out of which three of them are used. One of them has a parallel connection of cylinders which are used for tilting operation. Other one is controlling the cylinder used for opening and closing of die and the third one is used to control the cylinder used for ejection of the component. The in built PLC timer is programmed for solidification process. For different die different setting of timer can be a made. Machine will remain in the tilted position till the solidification process is complete for which a timer will be set. Once the time duration is completed the timer indicates PLC and it again rotates the machine to bring it to home-position using hydraulic cylinder.

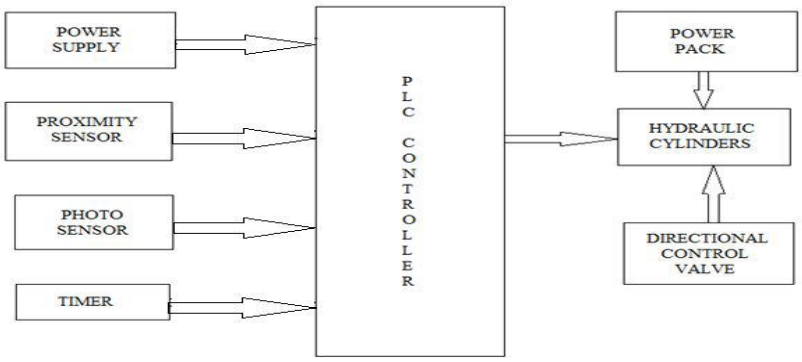

Fig.1.Block Diagram.

IV. FLOWCHART

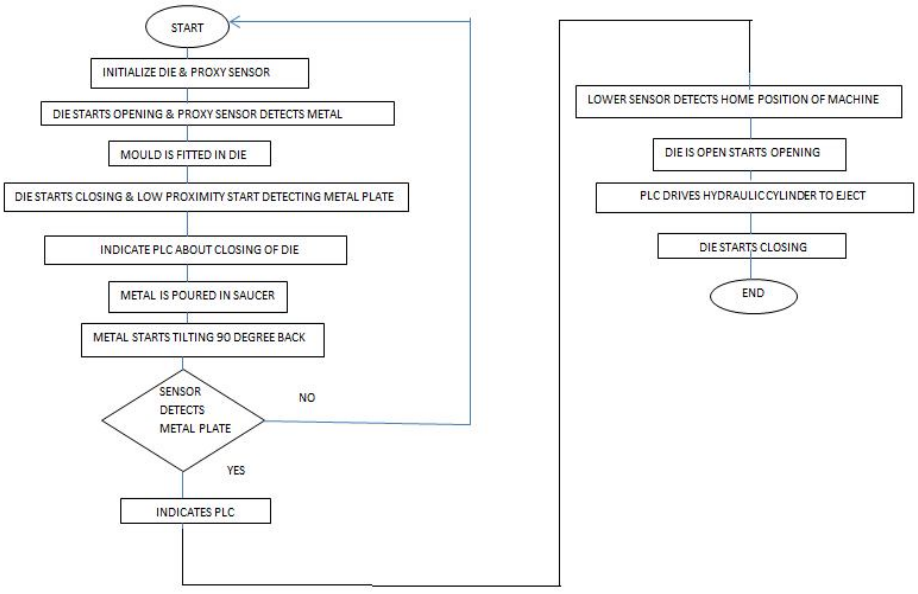

Fig.2. Flowchart

V. RESULT

Earlier the problems such as un-fill, porosity, air-bubble, shrinkage, improper finishing were observed in the final product. Due to the up-gradation carried out on the GDC machine the problems which were faced earlier are removed. Also the up-gradations resulted into increased productivity, reduced error rate, reduced human efforts, increased precision in the overall process. We achieved the objectives which we had to achieve. The casting process improved due to incorporating the messung PLC and sensors (photo-sensor & proximity sensors).

VI. CONCLUSION

The Messung PLC from the leading automation companies offer high performance, flexibility and advanced features. Scanning time and maintenance time of the system is thus reduced by using PLC. Thus leading to increase in production of casting. The compactness required in the GDC machine is achieved by upgrading the present system with the Mitsubishi PLC. Thus the cycle time is reduced from millisecond to nanosecond. This is going to help us reducing the downtime error. And with the help of Messung PLC error rate is also reduced as compared to the current MTC machine.

VII. ACKNOWLEDGEMENT

We would like to acknowledge our project guide Prof. S.M Dhavale for her enormous co-operation and guidance. We have no words to express our gratitude for teachers who whole-heartedly supported the project and gave their valuable time while making this project. The technical guidance provided by them was more than useful and made the project successful. We would also like to thank our Department of E&TC Engineering, Pimpri Chinchwad College of Engineering.

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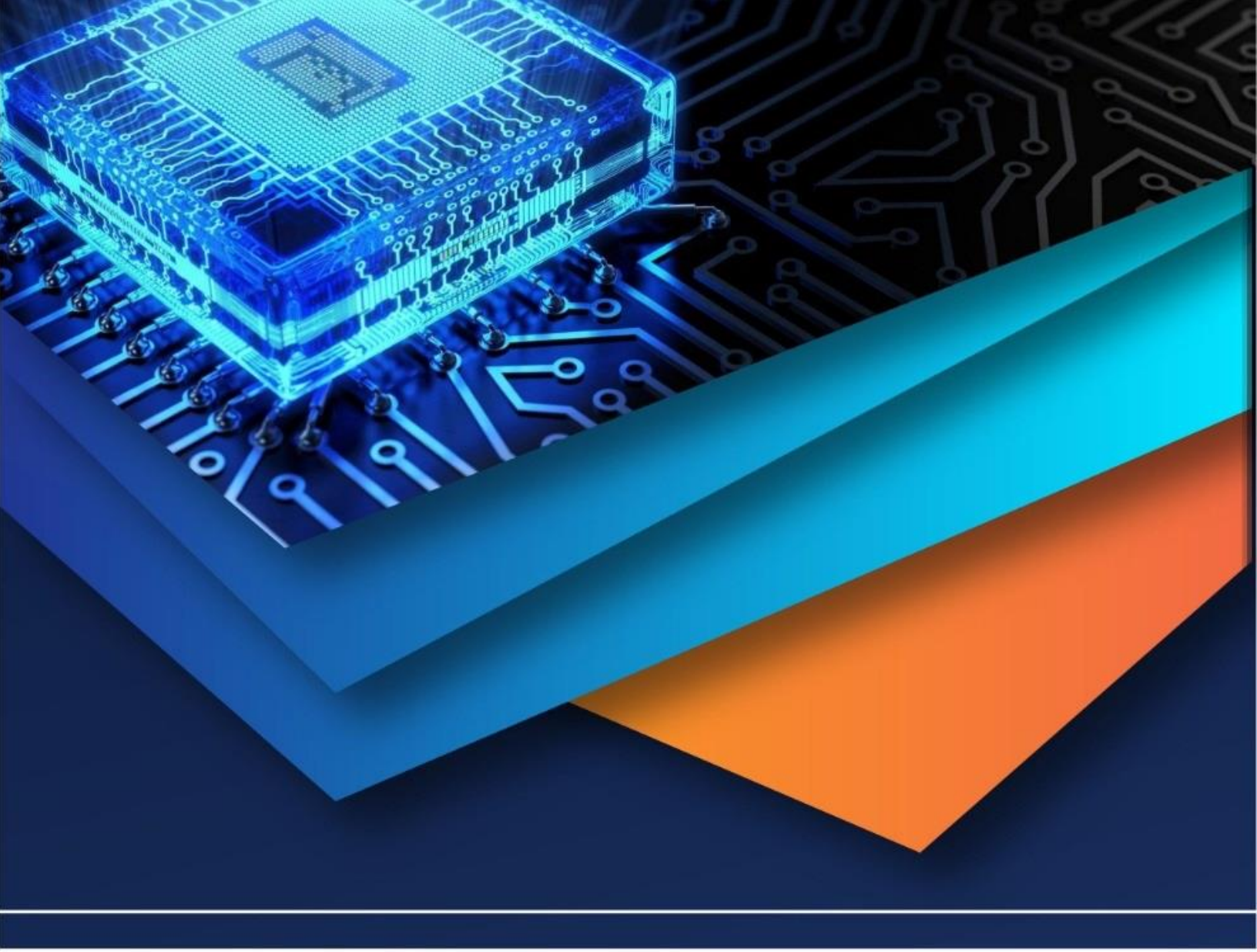

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