PLC Based Auto Weighing Control System

Ganesh B.Shinde, Vishal P.Ghadage, Akshay A. Gadhave, Dr.D.k.Shedge

***Abstract* – The scope of this paper is to describe the initial steps in the implementation of PLC based auto weighing control system for automation industry. In modern globalization, many technologists are trying to update a new development based on automation which works very rigidly, high effectively and within short time period. The progressive invention in auto weighing system is becoming an important task especially because of rising demand of products and declining labor availability in industry.**

In recent years, in industry the weight of the jobs are checking and then faulty jobs are rejected manually . But now a days we can check the weight of the object using the automation(using Load cells) technique and faulty jobs rejected using PLC and accurate jobs pass to further process on the conveyor belt. In industry the production speed should be high because demand of the product is more. But when we check the weight of the object manually then it will take more time for checking the weight and overall speed of the production will decrease. Hence the purpose of this project is to develop a automation technique using PLC.

***Index Terms*—Conveyor Belt, Load Cells, Programmable Logic Controller.**

I. INTRODUCTION

The main purpose of this project is to increase the accuracy and speed of the checking weight of job in industry and accept or reject job as per our requirement using PLC. There are various types of weighing machines are available in market. but these weighing machines are not suitable for industrial applications. because every industry require auto weighing control machine means the weighing machine should have automatic control of weight in order to accept or reject the job as per the standard weight. Introduction With the increasing level of automation, automatic control technology applications in the production of quantitative packing more and more in food, fertilizer, feed and light industry are widely used in industry. Weighing the development of packaging technology has gone through the manual weighing, relay control, weighing instrument control, PLC control stages. Compared with the traditional weighing instrument control, application PLC and touch screen control system composed of easy to switch settings, reset and set and improve the machine speed and accuracy.

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That's why we designed "PLC Based Auto Weighing Control System" for accepting right jobs which having accurate weight.

II. EXPERIMENTAL PROCEDURE

A. Literature Survey

We started searching for new ideas on world wide web. from starting we were interested in automation field. Automation is mostly used in various industry for increasing speed, accuracy and effectiveness of the production and also reduced risky hazards.

We discussed the lots of ideas with our internal guide on PLC based project. Then finally our friend Shrikant borate. who had suggest this idea to us. He completed his BE in electronics and worked in lavkim company which is near to pune-satara road, shirval. in his company there are lots of problems regarding weight of the jobs of stators and rotors of different types of motors. Then it does problems for future applications of the product. So they used this technique to control the weight of the job.

Mohit dev shrivastav[1].They used PLC for Traffic control. In this work they use load cell for weightng vehicles. Akshay deshmukh[2].They have used and implement fire detecting for security purpose in ships using PLC.

Darshil[5]developed PLC based elevator system for colour sensing capabilities for material handling in industrial plant. in this system they used PLC for the controlling elevator and used some sensors to give input to the PLC. Nandesh K. N[6]. They used PLC for improving the the efficiency of Weigher. In industrial sectors, the raw material that is entering to the system must be in the same ratio for the production and it should be weighed accurately for further use. By designing the some parameters the whole system is controlled by using Programmable Logic Controllers (PLC). In this paper PLC is used to control overall system because it is capable of controlling weight of the material.

III. PROPOSED WORK

We developed automation technique using PLC and increase the speed and accuracy of the process of production. we used one load cell for measuring the weight and PIC 18F Microcontroller for displayed the weight of Job using LCD. And according to the weight of the job PLC will accept or reject the job as per the weight of the job. we make PCB for PIC 18F microcontroller and interfacing for load cell and LCD. This is the initial step of the hardware and then pneumatic cylinder and indicator is connected to the PLC.

System architecture

1.SPECIFICATION OF THE SYSTEM

We used one load cell which is inductive type and its limit is 10 kg. and we use PIC18F microcontroller which is having inbuilt ADC of 10 bit. ADC has Easy interface to

all microprocessors Operates ratiometrically or with 5 VDC or analog span adjusted voltage reference. No zero and full-scale can be adjusted for system. having 8-channel multiplexer with address logic. 0V to 5V input range with single 5V power supply. Outputs are meet TTL voltage level specifications. Standard hermetic or molded 28-pin DIP package.28-pin molded chip carrier package. We used PLC of Siemens. The specifications of this PLC is - Power supply :24Vdc. Memory : 10 KB. No of digital input : 8. No of digital output : 8. No of analog input : 4. Separate modules provide additional communication ports. Forcible I/O ranges from 512 through 3072 I/O.

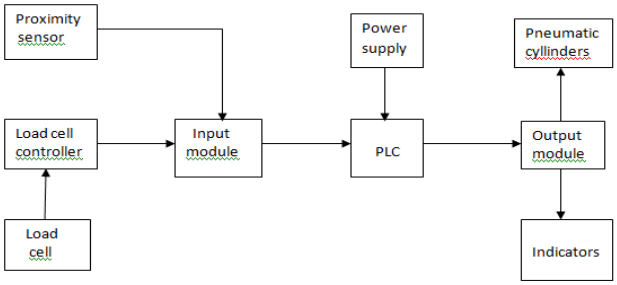


Figure 1: Block Diagram Of The System

2. DESCRIPTION OF BLOCK DIAGRAM

PROXIMITY SENSOR:-

It is used for detecting the object which is moving on the conveyor belt. And proxy sensor send signal to the PLC to ready for object is coming. Inductive proxY sensors detect the metallic objects which is moving on the coveyor belt. The operating principle of the proximity sensor is based on a coil and high frequency oscillator that produced a field in the sensing surface. Due to presence of metal in the operating area it causes a change in the oscillation amplitude. This change in amplitude is detected by a threshold circuit, which changes the output of the proxy sensor. The operating distance of the sensor depends on the size of coil as well as the shape of target, size and material.

LOAD CELL CONTROLLER:-

PIC 18F is used for converting the load cell output into the real weight of the object using 10 bit inbuilt ADC. load cell output is send to Load cell controller and then ADC which is inbuilt in controller is convert this output into the digital form and then controller convert it into the kg and displayed on the LCD.

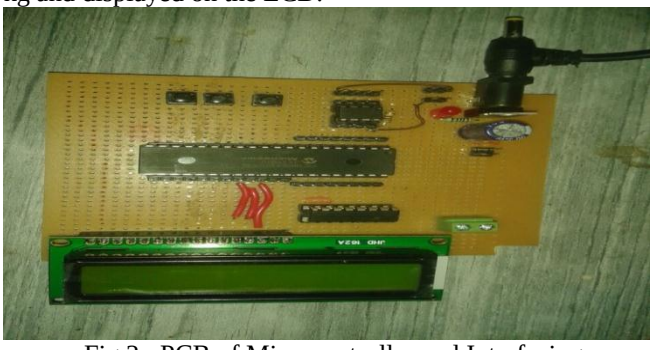


Fig 2: PCB of Microcontroller and Interfacing

LOAD CELL:-

Load cell is used to measure the weight .of the job which is moving on the conveyor belt. A load cell is nothing but a transducer which is used to create an electrical signal. The magnitude of this signal is directly proportional to the force being measured. The various types of load cells including hydraulic load cells, bothe the pneumatic load cells and strain gauge load cells are available in market.

PLC:-

PLC is the heart of our project. load cell controller is connected to the input module and output module of PLC is connected to pneumatic cylinder and indicators. The fixed range of weight is put into the PLC and then it will check the coming job is in range or not if the job is not in the range of weight then it is rejected by pneumatic cylinders and accurate jobs are passing on the conveyor for the further process. A PLC or programmable logic controller is a digital computer used for the automation of typically industrial processes, such as control of machinery on the factory assembly lines, light fixtures or amusement rides. PLC's are used in most of the industries and machines. Early PLCs, up to the middle of 1990s, were programmed using proprietary programming panels or special-purpose programming terminals which often had dedicated function keys representing the various logical elements of PLC programs. Some proprietary programming terminals displayed the elements of PLC programs as graphic symbols, but plain ASCII character representations of contacts, coils, and wires were common. Programs were stored on cassette tape cartridges. Facilities for printing and documentation were minimal due to lack of memory capacity. The very oldest PLCs used non-volatile magnetic core memory more recently, PLCs are programmed using application software on (PC) computers, which now represent the logic in graphic (diagrams) form instead of character symbols. The computer is reuired for PLC which is connected to the PLC through Ethernet, RS-232, or cabling. The programming application allows entry and editing of the ladder-style logic. Generally this software provides functions for troubleshooting and debugging the PLC software, for example,the portion which is highlighted the logic to show the current status during operation or by simulation. The software will upload and download the PLC program for the purpose of backup and restoration. In some of the models of programmable controller the program is transferred from a personal computer to the PLC through a programming board which writes the program into a removable chip such as an EEPROM . PLC programs that is ladder diagram programs are typically written in a special application or software on a personal computer, then downloaded this file by a direct-connection cable or over a network to the PLC. The program is stored in the PLC in battery-backed-up RAM or sometimes in some other non-volatile flash memory often a single PLC can be programmed to replace thousands Of relays. In case of the standard, PLCs that can be programmed using standards-based programming languages. A graphical programming notation called sequential function chart is available on certain programmable controllers. From starting most PLCs utilized Ladder Logic Diagram Programming, a model which emulated by electromechanical control panel devices (such as the contact and coils of relays) which PLCs replaced. This model is very common now a days.

LCD DISPLAY:-

The LCD display is used for indication purpose. The weight of each job is indicated by the LCD display.+5 v DC

power supply is required for 16*2 alphanumeric LCD is interfaced to the PIC18F Microcontroller.

CONVEYOR BELT:-

Conveyors are very durable and also reliable components used in automation and distribution and warehousing. It is used with combination with computer controlled pallet handling equipment this allows for more efficient retail, wholesale, manufacturing distribution.conve yor belts are largely used in industry because it saves largly manpower and transfer volume from one lacation to another location, allowing companies to receive or ship higher volumes with small storage space and with low labor expenses. The conveyor belts having made by rubber is used to convey the items whose having irregular bottom surface ,having small items may be fall in between rollers (e.g. a sushi conveyor bar), or bags of product that can be sag between rollers. Belt conveyors are generally similar in construction consisting of a metal frame with rollers at the end of a flat metal bed. The belt is looped around both of the rollers and when one of the rollers is powered (by an electrical motor) the belting slides across the solid metal frame bed, moving the product. In case of heavy applications the beds are pulling to the belts having the support .due to the rollers they allow the friction generated by the belt. Belt conveyors can now be manufactured with curved sections which use tapered rollers and curved belting to convey products around a corner. This type of conveyor systems are commonly used in postal sorting offices and at the airport where handling of baggage is required. A sandwich type of belt conveyor uses two conveyor belts, face-to-face, to firmly contain the item being carried, making steep incline and even vertical-lift runs achievable.

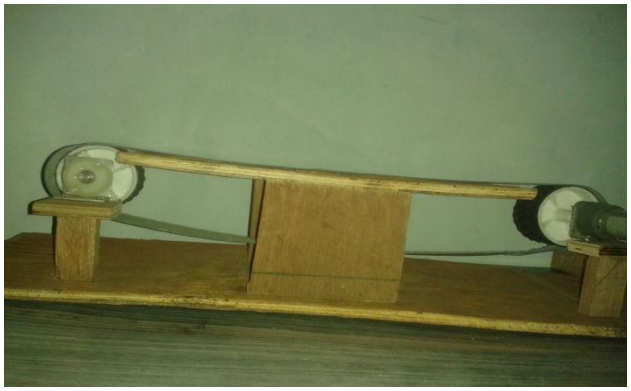


Fig 3: Conveyor Belt

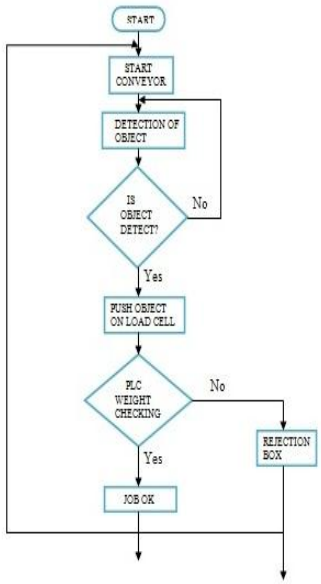
PNEUMATIC CYLINDER:-

Pneumatic cylinder is used to reject or accept the object depending on the signal send by the PLC. Pneumatic cylinder is mechanical device which is use to power of compressed gas to produce a force in a reciprocating linear motion. Like hydraulic cylinders something forces a piston to move in the desired direction. The piston may be disc or cylinder, and the object is move due to piston rod transfers force to it. Engineers sometimes select the pneumatics because they are quiet, clean, and it do not require large amounts of space for storage of fluid .Because the operating fluid is a gas, leakage in the pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement. For example, in the mechanical puppets of the Disney Tiki Room, for prevent fluid from dripping onto people below the puppets pneumatics are used.

INDICATOR:-

Indicators is used to show whether the job is reject or accept by the pneumatic cylinder. Indicator is nothing but the one single small LED.

FLOWCHART:-



IV. ADVANTAGES

1) Accuracy and Speed is more.
2) Faster Control Action.
3) Operate in hazardous environment.
4) Programming of ladder is short and easy.

V. APPLICATIONS

To measure the accurate weight of object or job in industrial applications and reject inaccurate job automatically. Also it can be used in packaging industry for packing different food of accurate weight and reject extra weight of food.

VI. CONCLUSION

In industry the production speed should be high because the demand of the product is more.but when we check weight of the object manually then it will take more time for checking the weight and overall speed the production will decrease. So by using this auto weighing control system we totally overcome this problem.PLC will handled all the operation regarding the weight of the job. And operate the pneumatic cylinder according to the weight of the job. The pneumatic cylinder will remove the faulty job from the

conveyor belt and pass the accurate job successfully. This is the conclusion of our project.

VII. FUTURE SCOPE

In future it will be more accurate and speed of the process of auto weighing control system should be high also we can used more powerful components to increase the overall effect of the system.

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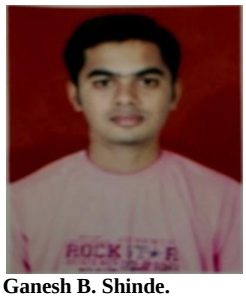

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