*International Journal For Technological Research In Engineering*
*Volume 1, Issue 7, March-2014* *ISSN (Online): 2347 - 4718*

# AUTOMATIC DRILLING SYSTEM USING PLC

P.A.Mehta[1], A.A.Sagare[2], V.S. Samse[3], Dr. A.D. Rahulkar[4]
Department of Instrumentation and Control Engineering
AISSMS Institute of Information Technology, University of Pune
Pune, India.

***Abstract*: To understand the application and importance of the involvement of automation in conventional drilling machine in manufacturing. A drilling machine comes in many shapes and sizes, from small hand-held power drills to bench mounted and finally floor-mounted models. They can perform operations other than drilling, such as countersinking, counter boring, reaming, and tapping large or small holes. Because the drilling machines can perform all of these operations, this paper will also cover the types of drill bits, tool, and shop formulas for setting up each operation. Safety plays a critical part in any operation involving power equipment. This paper will cover procedures for maintaining, and setting up the work, proper methods of selecting tools, and work holding devices to get the job done safely without causing damage to the equipment, yourself, or someone nearby.**
***Keywords:* Pneumatic System, PLC.**

## I. INTRODUCTION

To evolve and admit automation by the involvement of various types of drives, cylinders and man motion study. In this paper it has been innovated that how we can use or convert conventional drilling process with the help of PLC, Pneumatic Cylinder, dc motor and sensors into the process. It is a time saving with good quality procedure. In the paper the various Man Motion has been done with help of cylinders. Such kind of conversion can be done easily anywhere where high volume with good quality to be produced. The industrial CNC machine components are fabricated using quality material and technology. These are available in varied sizes and diameter at the leading market prices. We ensure to monitor its quality before offering to our esteemed clients across the world.

## II. MANUFACTURING&APPLICATION

A drilling machine, called a drill press, is used to cut holes into or through metal, wood, or other materials. Drilling machines use a drilling tool that has cutting edges at its point. This cutting tool is held in the drill press by a chuck or Morse taper and is rotated and fed into the work at variable speeds. Drilling machines may be used to perform other operations. They can perform counter sinking, boring, counter boring, spot facing, reaming, and tapping .Drill press operators must know how to set up the work, set speed and feed, and provide for coolant to get an acceptable finished product. The size or capacity of the drilling machine is usually determined by the largest piece of stock that ca n be center-drilled. For instance, a 15-inch drilling machine can center-drill a 30-inch-diameter piece of stock. Other ways to determine the size of the drill press are by the largest hole that can be drilled, the distance between the spindle and column, and the vertical distance between the worktable and spindle. The system aspects of manufacturing are more important than ever today. The word manufacturing was originally derived from two Latin words, Manus (hand) and factus (make), so that the combination means made by hand. In terms of the human participation in the manufacturing process performed by the manufacturing system following three categories can be distinguished:

a) Manual work systems
b) Worker-Machine systems
c) Automated systems

a) **Manual Work Systems:** A manual work system consists of one or more workers performing one or more tasks without the aid of powered tools.
b) **Worker-Machine Systems:** In a worker machine system, a human worker operates powered equipment such as machine tool or other production machine.
c) **Automated systems:** An automated system is one in which a process is performed by a machine without the direct participation of a human worker.

## III. DRAWBACK OF CONVENTIONAL SYSTEM

In earlier era, drilling technology could not meet the needs of smart drilling system. Generally, manual and semi-automatic systems had serious reliability problems, did a poor job. Some problems regarding existing system are as follows-

1) Manual operation.
2) Discontinuous operation because of manual working less speed of operation.
3) Startup time is more.
4) Less production rate.
5) It cannot detect metal pieces in object.
6) Unsafe working due to more manual efforts. High maintenance.

As my paper is based on automation so I will emphasize on it more. Before discussing on paper I would like to give a brief idea about automation. The automated elements of the production system can be separated in two categories:

1) Automation of the manufacturing systems in the factory.
2) Computerization of the manufacturing support systems.

Automated manufacturing system can be classified into three basic types:

1) Fixed automation
2) Programmable automation
3) Flexible automation

1) **Fixed automation:** It is a system in which the sequence of processing operations is fixed by the equipment configuration.
2) **Programmable automation:** In programmable automation, the production equipment is designed with the capability to change the sequence of operations to accommodate different product configuration.
3) **Flexible automation:** It is an extension of programmable automation. It is capable of producing a variety of parts with virtually no lost production time while reprogramming the system and altering the physical set up (tooling, fixtures and machine settings).

**Opportunities for automation:** There are vast opportunities for automation in different manufacturing operations whether the operations are related to machining or assembling of component.

**Project requirement:**
**a)** To increase the productivity
**b)** To reduce the manpower
**c)** To reduce the processing time
**d)** To reduce the overall manufacturing cost
**e)** To improve quality

## IV. HARDWARE

### A. Block diagram of system

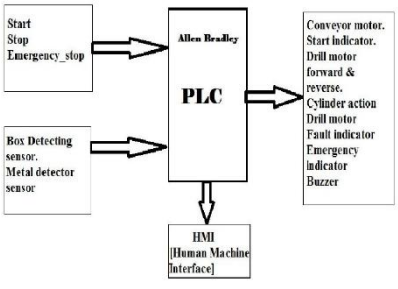



Fig.1. Block diagram of the Proposed System

Block diagram consists of:

1) Pneumatic Setup PLC
2) Proximity sensor
3) Conveyor assembly
4) Control Panel
5) Drilling Setup

### B. Block diagram description

The system consists of the main conveyor assembly, drill spindle with lead screw arrangement, metal detecting and faulty box rejection assembly, pneumatic cylinder, proximity sensors and limit switches.

The proposed system is an integration of Pneumatic system and PLC. Here PLC is the main controller which will accept the inputs from proximity sensors, and then will control the conveyor, pneumatic cylinder and necessary drilling process assembly. Pneumatic Setup: It is an arrangement of pneumatic actuators integrated together with the help of a mechanical frame controlled through PLC via Solenoid valves. Pressurized air is supplied through air compressor.

Programmable Logic Controller (PLC): It is the main element of the system which is used to control the proposed system. It accepts the inputs from Proximity Sensors and gives control output signals to Pneumatic Setup, Conveyor and drill motor.

Proximity Sensor: One Inductive proximity sensor used for counting and other for rotation counting. Optical proximity sensors are used for object detection. Both these type of sensors gives signals to PLC for taking the necessary control action.

Conveyor Arrangement: It is used for carrying the object from one location to another desired location.

### C. System working

Is necessary to describe the proper sequence of events or operations which helps to run the control system is successful manner. The sequence of events can be described using narrative statements. These statements describe in brief what must happen in the system and in what way to achieve the required result. The steps involved in this project are as follows:

1) Place the job on the conveyer
2) Press START button on the control panel
3) Conveyer motor starts (M1), Start indicator glows and the inductive sensor (S3) detects for any presence of metal contains in the box.
4) If any metal is present, fault indicator and buzzer gets ON to indicate that the box is faulty. After some delay, the cylinder (C2) rejects the faulty box and process continue.
5) If no metal is detected, the box proceeds towards

drilling panel.

6) Sensor (S1) detects the box and after some delay the con-veyer stops. The pneumatic cylinder (C1) gets activated and clams the box.
7) The proximity switch (PS1) sense that the box is clamped, the drilling motor (M3) starts and the spindle motor (M2.1) moves in forward direction to bring the drilling motor in downward direction for drilling.
8) Inductive sensor (S2) senses the no. of rotations of the spindle and the spindle motor stops when the number of rotations matches with the specified rotations in the programme.
9) The drilling motor continues and the spindle motor moves in reverse direction to bring the drilling motor upwards after the drilling process and stops after the same number of rotations.
10) The job is unclamped and conveyer starts again. Sensor acts as the feedback sensor and the loop is repeated.

## V. SOFTWARE

### A. ALLEN BRADLEY PLC

Programmable Logic Controller or PLC is an intelligent system of modules, which was introduced in the control, & instrumentation industry for replacing relay based logic. Over a period of time, better I/O handling capabilities and more programming elements have been added along with improvement in communication.

Basics of a PLC function are continual scanning of a program. The scanning process involves three basic steps.

**Step 1: Testing input status**
First the PLC checks each of its input with intention to see which one has status on or off. In other words it checks whether a switch or a sensor etc., is activated or not. The information that the processor thus obtains through this step is stored in memory in order to be used in the following steps.

**Step 2: Programming execution**
Here a PLC executes a program instruction by instruction based on the program and based on the status of the input has obtained in the preceding step, and appropriate action is taken. The action might be activation of certain outputs and the results can be put off and stored in memory to be retrieved later in the following steps.

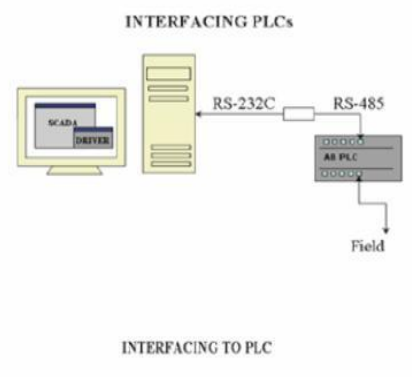
**Step 3: Checking and Correction of output status**
Finally, a PLC checks up output signals and adjust it has needed. Changes are performed based on the input status that had been read during the first step and based on the result of the program execution in step two? Following execution of step three PLC returns a beginning of the cycle and continually repeats these steps. Scanning time = Time for performing step 1+ Time for performing step 2+ Time for performing step 3.

### B. Input-Output Configuration for PLC

1) Input Configuration
   Start, Stop and Emergency stop, Limit switch - 4 inputs.
   Rotation counting &Metal detecting proximity sensor-2 inputs.
   Box counting sensors-2 inputs.
2) Output Configuration
   Pneumatic Cylinder - 2 outputs.
   Start, Stop, Fault, Emergency indicator-2 outputs.
   Conveyor motor-1 output
   Drill motor-1 output
   Chuck motor-2 outputs

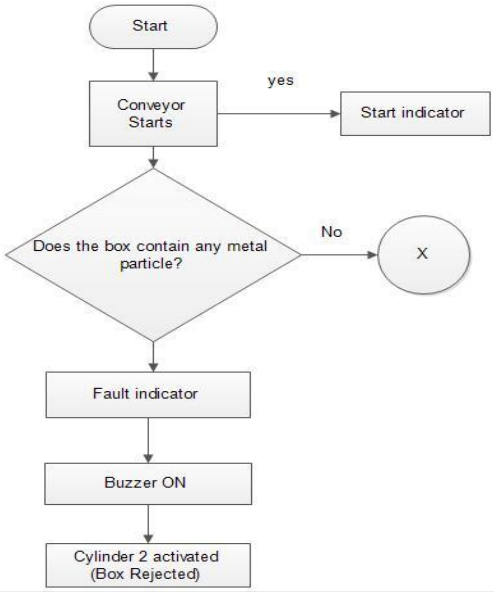
3) Total 8 Inputs and 8 Outputs are required for the given system.

### C. Interfacing

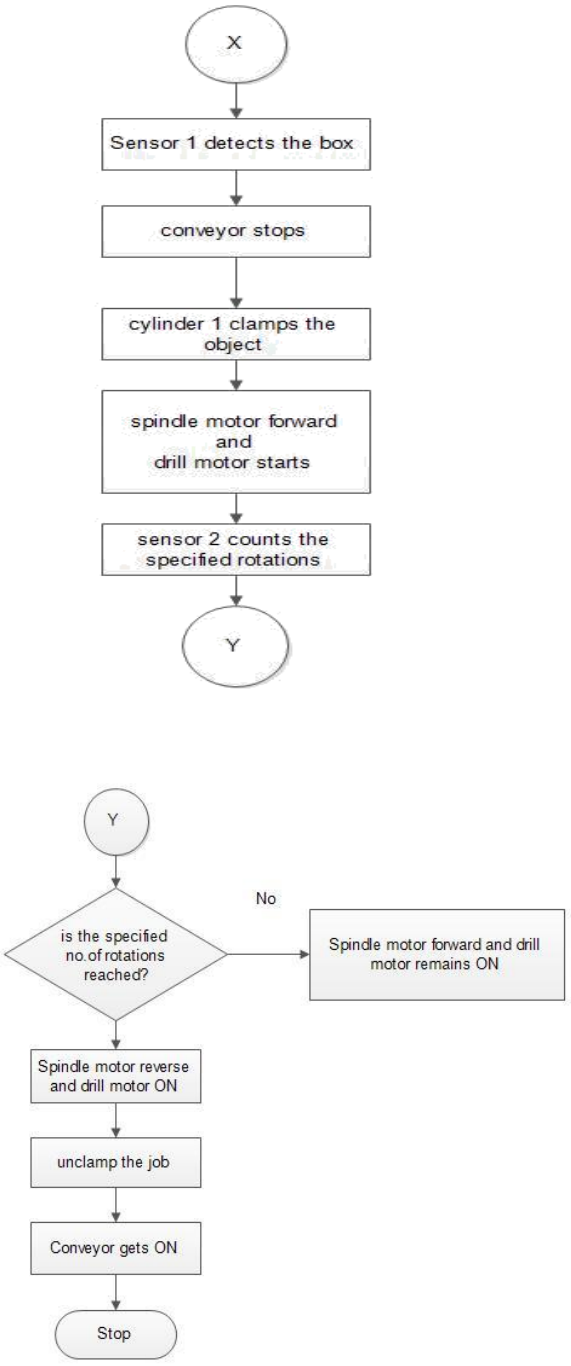



INTERFACING TO PLC

## VI. FLOWCHART






## VII. RESULT ANALYSIS

Automatic drilling system using PLC with Smart Conveyor Management has been successfully developed and testing was done in the dummy industrial environment developed in the laboratory. The objective is met by rejecting the fault object containing metal piece. An algorithm in PLC was successful created in order to drill the object to the required depth.

## VIII. CONCLUSION

For drilling machine based on programmable logic controller based machine has got faster execution time and is more efficient in working along with safety measures to reject faulty boxes and ease in operation. Due to relay contactor logic more hardware is required as well wiring is more complex which has now been overcome by present programmable logic controller machine. The present system is superior in both performance and is more flexible in operation. Moreover, the running time has got shortened. Thus, desired requirement of customers has been fulfilled by this automation.

## IX. ACKNOWLEDGEMENT

I am grateful to Prof .H.P. Chaudhari and I acknowledge with gratitude to my supervisor Prof Dr. A. D. Rahulkar, Department of Instrumentation Engineering, and all staff members for his innovative thinking, continuous guidance, genius role and encouragement throughout the whole project period.

## REFERENCE

[1] Programmable Logic Controller by J.W.Webb and R.A.Reis.
[2] Makoto Kikuchi, Masatake Shiraishi, Possibility of Flexible and Automatic Drilling such as Human Work, Proceedings of IEEE, International Conference of Mechatronics and Automation, Canada, July 2005.
[3] Pneumatic System Principles and Maintenance by S.R. Majumdar.
[4] International Journal Of Computational Materials Science and Surface Engineering R. Donni, R. Montanari, L. Santo, V. Tagliaferri, N.ucciardello, Vol.3, No. 2/ 3,pp 175-187.
[5] Karnopp, Dean C., Donald L. Margolis, Ronald C. Rosenberg, System Dynamics: Modeling and Simulation of Mechatronic Systems, 4th Edition, Wiley, 2006.
[6] Pneumatic Conveying Design Guide by David Mills.
**[7]** V.B. Bhandari,"Design of Machine Element", Tata Mc-Graw Hill, 2009, Page 214-217.