PLC Controller for Hydraulic operated unscrewing machine: Issues and Proposed System

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Abstract— In this article about the important concept of PLC and its application has been discussed. Early PLCs were designed to replace relay logic systems. These PLCs were programmed in "ladder logic", which strongly resembles a schematic diagram of relay logic. The main difference from other computers is that PLCs are armored for severe conditions (such as dust, moisture, heat, cold etc) and have the facility for extensive input/output (I/O) arrangements. PLC applications are typically highly customized systems so the cost of a packaged PLC is low compared to the cost of a specific custom-built controller design. On the other hand, in case of mass-produced goods, customized control systems are economic due to the lower cost of the components, which can be optimally chosen instead of a "generic" solution, and where the non-recurring engineering charges are spread over thousands or millions of units.

Index Terms—PLC, Application of PLC and Ladder Logic, Hydraulic pimp, Injector.

I. INTRODUCTION

This is the automation based project which is used the LOGO PLC the previous system of the unscrewing machine is based on the pneumatic pressure system .but using this system there is various problems which is face by the worker and it is very time consuming to work with this system so we try to overcome this all the problem through our project. Previously the system was pneumatic means air pressure was used for untighting nut bolts but the torque was very low to perform this function because of this the unscrewing function was not proper. A human operator was needed to unscrew the remaining parts ,so it was very time consuming and complex too. Manual errors was introduced. To overcome this problem we decided to do our Project with Hydraulic Pressure System. In Hydraulic system coolant is used to pressurize and torque is very high so that unscrewing function works properly.

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Fig.1.Injector Nut on this system work

II. CURRENT SYSTEM

The current system mainly consists of Pneumatic based Unscrewing machine which is fully operated with the air pressure. The Whole system is operated with pneumatic pressure the equipment for this are: air compressor, cooler, dryer, receiver, distribution equipment, accumulator, liquid plumbing filtering, FRL air server unit, valves, actuators, seals Pneumatic systems are low pressure system. There are some problem with the running system like:
1) Low torque
2) System reliability is decreased
3) Risk of absolute spare

So we proposed the overcome the above problem by changing the system we decides the hydraulic system which greatly decreases all the Failures which are occurs in the system.
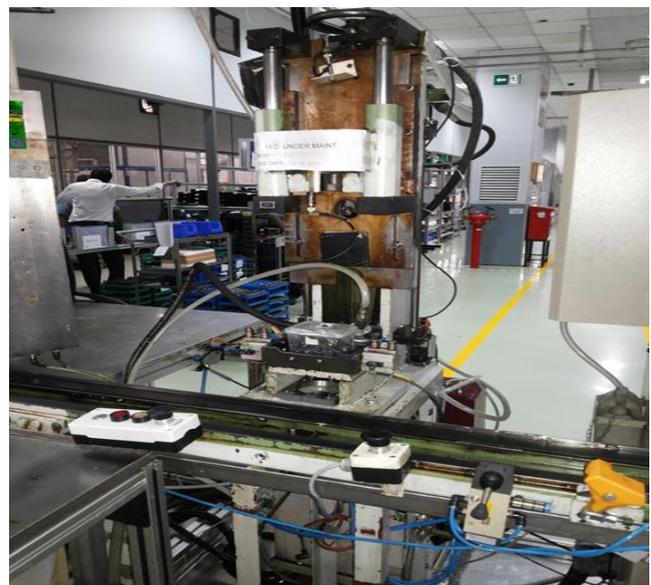

Fig.2. The current Pneumatic based system

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**Fig.3.This is the Control Panel**

III. PROPOSED SYSTEM

The proposed system will overcome all the failures of previous system. Previous System was giving low torque, low system reliability, risk of absolute spare parts which is difficult and time consuming .One more drawback of the earlier system was that the system was not stand alone so the maintenance of the system was difficult. To overcome all this problems we used hydraulic mechanism and the logo PLC. This proposed system gives the higher accuracies and precise output to the industry. In my project I prefer the ladder diagram to design the functional input outputs. And the Hydraulic liquid pressure system is used for unscrewing the NUT which is used in the injector part they are unscrew with the help of solenoid spindles and valves which is used for the Valves are necessary to control the pressure. Flow rate and direction of hydraulic valve are made to control the high pressure Three phase induction motor is used in this system the 440 V supply is required for the three phase induction motor. And the PLC system required the 24v DC supply for its operation.

1. Miniature circuit breaker (MCB)
2. Motor protection circuit breaker (MPCB)
3. Relays
4. Contactor
5. SMPS (switch mode power supply)
6. Motor (3 phase induction motor)
7. Hydraulic system
8. Sensors

IV. SYSTEM ARCHITECTURE

The proposed PLC Controller for Hydraulic operated unscrewing Machine system consist of LOGO PLC Hydraulic system, induction motor ,relays,contactor, MCB all the control circuit component and Injector Nut.
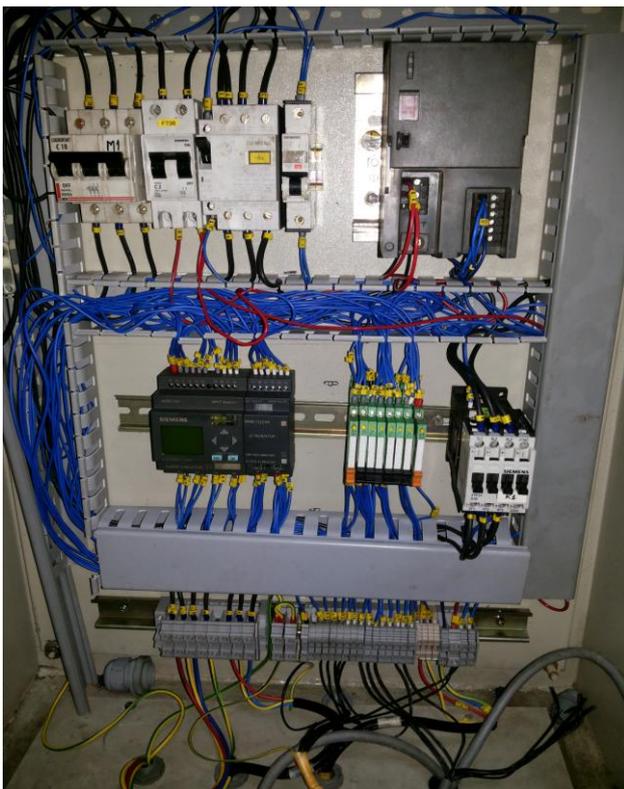
V.OPERATION

MAINS SWITCH:-
The main switch is the over current device,that is placed after the utility, company meter base. It could be in the form of a breaker,that is placed at the top of the combination panel. This fusible switch holds the fuses that controls the size of the service. The switch removes all the power from the circuits that has been connected to that service. Many commercial and industrial buildings have more than one service.

LOGO PLC:-
LOGO! is successfully used in millions of applications, offering a user-friendly interface and maximum ease of operation, combined with its typical quality features. For years, LOGO! has been successfully performing simple automation tasks in industries. The high storage capacity and efficient use of memory create a host of Benefits and excellent functionality. Operation could not be easier, so the LOGO! Soft Comfort software has been used.

SMPS:-
It is an electronic power supply that includes a switching regulator to convert electrical power more efficiently. Like some other power supplies, an SMPS passes power from a source, to a load such as computer, while converting voltage and current features.

RELAY:-
A relay is an electrically operated switch. Many relays uses an electromagnet to operate a switch, but some other operating principles can also be used such as solid-state relays. Relays are used for controlling a circuit by a low-power signal or where several circuits must be controlled by one signal.

Hydraulic motor:-
A hydraulic motor is a mechanical device which converts hydraulic pressure into torque and angular displacement. The hydraulic motor is the rotary part of the hydraulic cylinder. Whereas, most hydraulic pumps cannot be used as hydraulic motors because they cannot be back driven. Also, a hydraulic motor is designed for working pressure at both sides of the motor.

CONTACTOR:-
Contactor are often used in Control and regulating functions. They are used in large quantities for the indirect control of motors, valves, clutches and heating equipment. Automatic switches of power circuits are used to switch ON/OFF power to different types of industrial loads and machine.
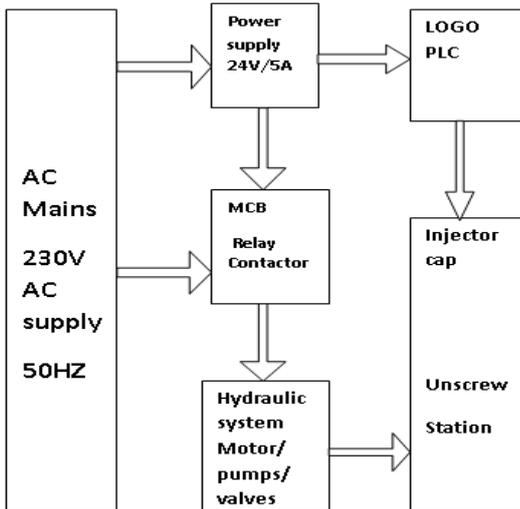
MPCB:-
All circuit breaker systems has a common features in their operations, although details vary substantially depending on the voltage class, current rating and types of circuit breaker. The circuit breaker must detect a fault condition in low voltage circuit breakers,this is usually done within the breaker enclosure.

MCB:-
The miniature circuit breaker has an vital role in providing over-current protection and in the electrical networks. Recently, the circuit breaker knowledge has increased the breaker performance and protection. A breaker is a device

that has been created for separating a circuit during an over-current event without use of the fusible elements.

VI. BLOCK DIAGRAM

Connection wiring of logo plc

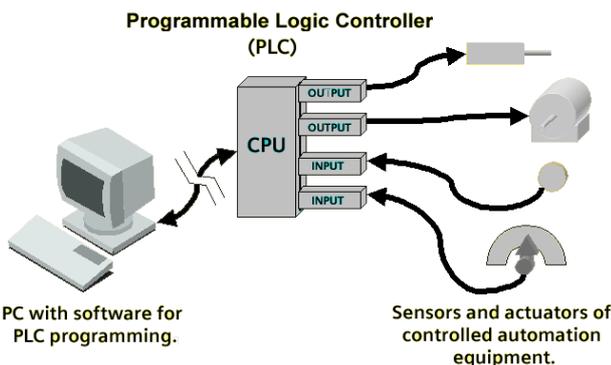**Fig.5.Logo Input Connections wiring diagram**

WORKING:-

The above fig shows the block diagram of the project .it consist of the various blocks Initially the AC Mains supply of 230v 50 HZ is applied to the controller box AC voltage is given to the SMPS MCB, relay Contactor block .the SMPS convert the 230 v ac supply into 24v dc supply and given to the PLC input Then ac voltage

is given to the hydraulic motor valves and dc supply is given to the LOGO PLC because which is operated on 24 v dc voltage then combined signal are given to unscrewing station then the automatic operation is perform.

VII. FEATURES

The feature of LOGO PLC are
1. It can handle severe conditions like dust,Humidity.
2. LOGO PLC is highly reliable,Fast and flexible.
3. It can be used for electric motors, pneumatic or hydraulic cylinders, magnetic relays, solenoids, or analog outputs. It can have external I/O modules attached to a computer network that plugs into the PLC.

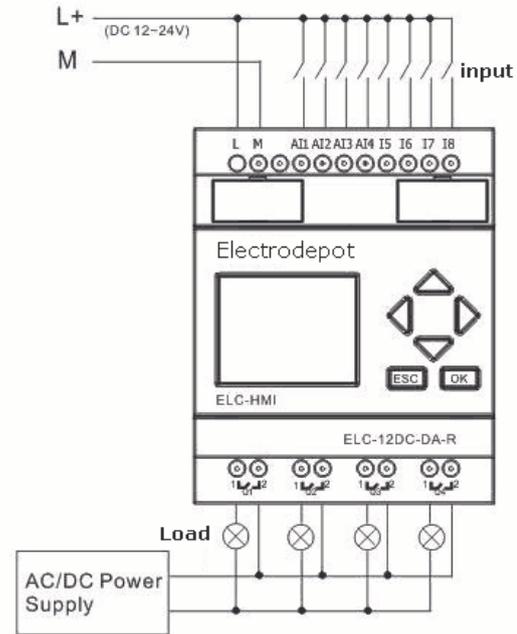## VIII.PLC ARCHITECTURE AND WIRING DIAGRAM

PLC HARDWARE CONSIST OF FOLLOWING PARTS:

Before writing PLC programs you should be familiar with the PLC hardware. You should be in a position to identify what can be an input and what can be an output for a PLC, and where exactly you connect the different inputs and outputs. As you studied in the first module, the Programmable Logic Controller is a device that can be programmed to perform control functions. Since it is a digital device, it stores information in the form of ON/OFF conditions referred to as binary digits or bits. Even though the PLC uses both digital and analog signals, the CPU can understand only digital signals.
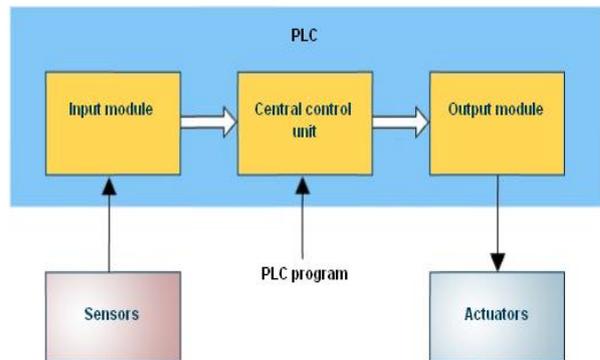

Fig.6.PLC Hardware Blocks

Input Module:-
[1] The input module consists of the digital inputs and the Analog inputs.
[2] Digital Input-Digital input recognizes either the ON or OFF condition like a switch.

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[3] Analog Input-It accepts signals that are varying like water level.

Output Module:-

[1] The output module is used to connect output devices to the PLC unit.

[2] Examples of output devices include lamps, motors, solenoids and buzzers. All of these outputs can be turned ON/OFF by the PLC output module.

Central Control Unit:-

1. The Central Control Unit contains the Central Processor which is the brain of the PLC. The CPU monitors the inputs and makes decisions based on instructions in its program memory. It performs counting, timing, data comparison and sequential operations.

Basic programming of the PLC:

Ladder diagram for the AND Operation:

Let I1 and I2 be the two NO input contacts, and let Q1 be the normal output coil. The LAD can be drawn as shown in Figure
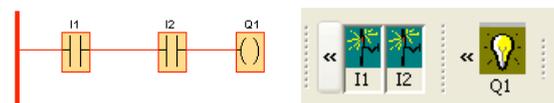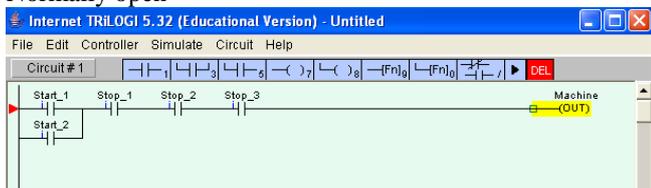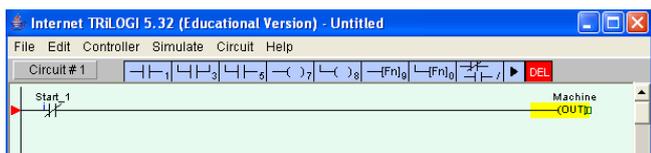

Fig: LAD for AND Operation   Fig : Simulating AND Operation

Normally open

Normally Closed

IX. CONCLUSION

In this article we major the issues for the pneumatic based unscrewing system & the proposed system is for the efficient torque and speed management with the used of Hydraulic principle .in this article with the help of LOGO PLC specification we design this system to work precisely. The most important features of PLCs. Soft wiring makes changes in the control system easy and cheap With this proposed system with the help of PLC we able to minimize the work load in the industry and also the save time as well as extra efforts with the higher accuracies and precision. It will greatly decrease the need for human sensory and mental requirements as well

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