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Filter Press Automation for Dewatering

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ABSTRACT: Anthropogenic contaminant in waste water does not support human use and biotic communities. The industrial wastewater treatment plants are usually require to protect water bodies from untreated waste water .It can be reclaimed for industrial purpose using PLC automation .It is to achieve the high productivity, pre dominant quality and efficient use of energy.PLC is an industrial computer monitors makes inputs, makes decision based on its program and controls output to automate a process on machine. It is used to reduce human efforts to get maximum efficiency from machine and control them with human logic. The plc used in this project is SIMENS LOGO 8.1.The operation of PLC can be done through control panel. Conventional control panels are most often equipped with analog instruments. It is designed to control the pressure of filter press. The panel wiring reduces the complexity in system hardware. This system is widely used in dyeing industries, marble cutting industries and oil filtering industries. It is more suitable accurate operation of a machine.

KEYWORDS: Waste water, PLC, Conventional, Press, Accurate, LOGO.

I. INTRODUCTION

The anthropogenic contaminant in water bodies the industries had implemented the filter press technology using PLC automation. To avail on-selloff waste water to reduce the water pestilence. An industrial filter press is a simple tool used in separation process, specifically to separate solids and liquids during its press operation. The process uses the principle of pressure drive, which means PASCALS LAW. It consist of a series of chambers containing plates supported in frame. It can generate enormous amount of pressure to filter, the proposed machine is used for dewatering the pestilence. It consist of press, power pack and control panel. The machine is entirely controlled and operated by PLC. In control panel PLC kit, Relays, Fuse connector, SMPS, transformer, OLR, Contactor and MCB are used to operate the filter press. In existing, there is no monitoring system to view the current position of machine and to give notification if there is any fault occurs. Here LOGO is used to view the current status, position and if any fault occurs means it give notification to system. To filter the contaminant it will give a pressure (Bars).



fig.1 filter Press

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II. PROPOSED SYSTEM

In this system, the Filter press is simply a kind of machine, which performs Filtration & separation during its operation. It consists of a series of chambers containing plates supported in a frame. Once the filter chambers are loaded with slurry, the plates are forced together that generate pressures (Bars). Each plate is covered by a material or membrane that acts as the initial filter when the press is in operation. At the end of the compression, the solid filter cake can be removed. The whole process is often computer controlled to make it automatic or semi-automatic.

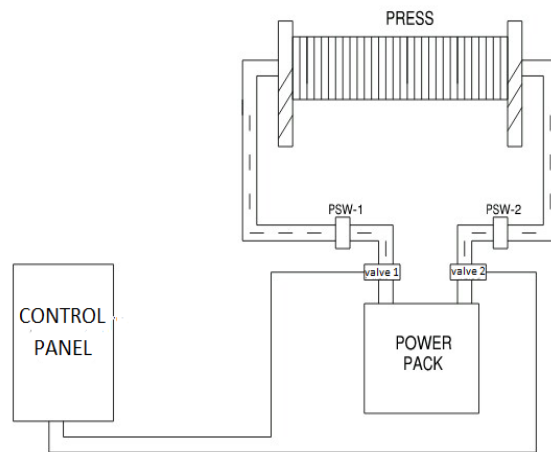


Fig.2. Block Diagram for press

The overview of this project is shown in above figure. The power pack will provide current to the control panel, it controls the opening and closing of valve 1 and 2. Then the pressure switch 1 and 2 controls the pressure inside the piston of the filter press.

BLOCK DIAGRAM

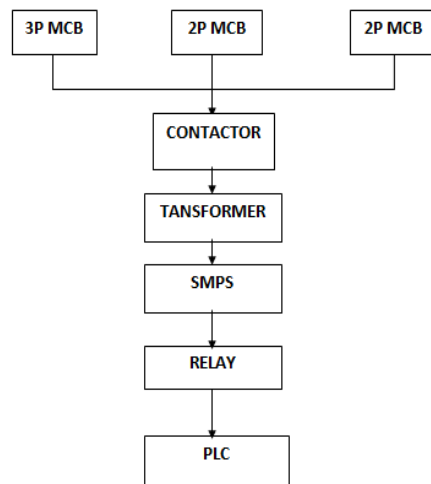


Fig.3. Block Diagram for Control Panel

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III. COMPONENTS OF CONTROL PANEL

a) PUMP ON/OFF

Emergency push buttons are used for increasing safety. Reset button can reset a device.

b) ILLUMINATED SWITCH

It has an integral lamp that illuminates when the switch is connected to an energized circuit. This makes locating the switch and identifying the on/off position easier. It depends on filter press signal.

c) THREE POSITION SWITCH

It is the interconnection of two or more electrical switches to control the electrical load from more than one location.

d) HOOTER

Hooters are used in fault audible alarm and fire alarm systems to alert the people in case of fire. There are two contacts one is fixed and other movable .when current exceeds the predetermined limit a solenoid forces the movable contact to open and the MCB turns off thereby stopping the flow of current.

e) LOAD BREAK SWITCH

It is also called as disconnect switch used to provide limited switching capability. This switches are used to reenergizes or energize a circuit that posses limited amount of magnetic or capacitive current, such as transformer exciting current or line charging currents.

f) MCB

Miniature circuit breaker is an electrochemical device used to protect an electrical circuit from an over current. It may result in short circuit or faulty design.MCB functions by interrupting the continuity of electrical flow through circuit once the fault is detected. It automatically turns off when current flowing through it passes the maximum allowable unit. Three pole MCB is for motor, one automatically turns off when current flowing through it passes the maximum allowable unit. Three pole MCB is for motor, one –two pole MCB is for transformer and another for SMPS.

g) CONTACTOR

It is the control of electrical motor .the contactor ranges from (0-32)amps ,here we use 12amps only for remote purpose. Three –phase ,480v AC power supply comes into the three normally-open contacts at the top of the contactor. NO and NC are normally open and close i.e. the contacts are normally open and close when the switch is actuated. To ON the contactor point use 230v power supply, so the coil will be energized.

h) OLR

Over load relay protect a motor by sensing the current going to the motor. The range of OLR is 1.6-2.5amps. When the current exceeds 2amps, it interrupt the main power to the motor.

i) TRANSFORMER

It is used to transfer electric power from primary to secondary circuits. The step down control transformer is used to reduce the voltage from 440-230v, which is given as the input to SMPS.

j) SMPS

Switch mode power supply is used to get the dc output voltage from the dc input voltage or unregulated AC.It provides supply from source to load. It converts power using switching devices that is turned on and off at the high frequencies. It gives output of 24v, which is given as the input to PLC.

k) FUSE CONNECTOR

It is a electrical safety device that operates to provide over current protection to electrical circuit. It is to get supply from outside source. It is passive component.

l) RELAY

It is a switch controls one electrical circuit by opening and closing contacts in another circuit. It controls the circuit by low power signal. In NO relay, when the coil energized the contacts are closed, vice versa for NC.

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m) PLC

Programmable logic controller used for industrial automation of various electro -mechanical process .it consists of microprocessors, which is programmed using computer language. The program is written on computer and is downloaded to PLC via cable. Then loaded programs are stored in non-volatile memory of PLC. During the transition of relay control panels to PLC the hard wired relay logics are exchanged for program fed by the user. A visual programming language known as the ladder logic was created to program the PLC.

n) SOFTWARE USED

SIEMENS LOGO 8.1 is a universal logic module made by Siemens. It integrates- controls, interface for expansion module and interface for program module and pc cable. It has eight inputs and four outputs. Ethernet cable is used as Communication module.

CONTROL PANEL

A panel board is an element of the system used to supply electricity. Primary function is to divide an electrical feed into supplementary circuits while providing shielding and protection for each circuit in an enclosed space.

Panel board is tends to made up of circuit breaker, bus bars, switches, relays and other protective equipments. The panel board consists MS channel to place the components and PVC channels to provide wiring.

The machine control box was separately placed which consist push buttons, selector switches & load cell meter.

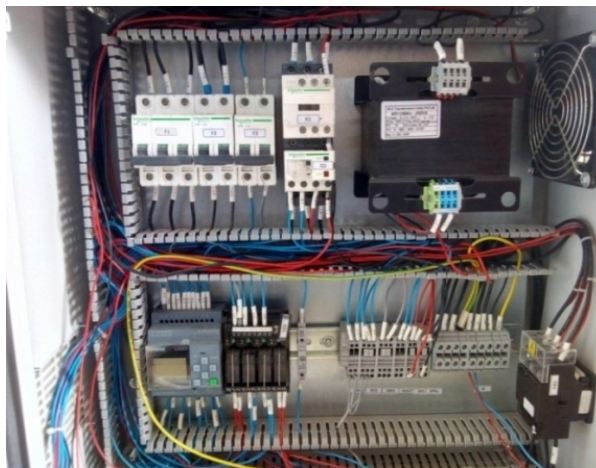


Fig.16.Design of Control Panel

Algorithm and Flowchart : Pump ON/OFF

1. Check the input power supply.
2. Check the Push Buttons.
3. Set the Parameters.
4. If the Press Filter is in Closed Position, the Valve opens then pump start.
5. According to PLC logic they will operate.
6. If any fault occur then it give notification to PLC by Message.
7. Then Hooter give alert.

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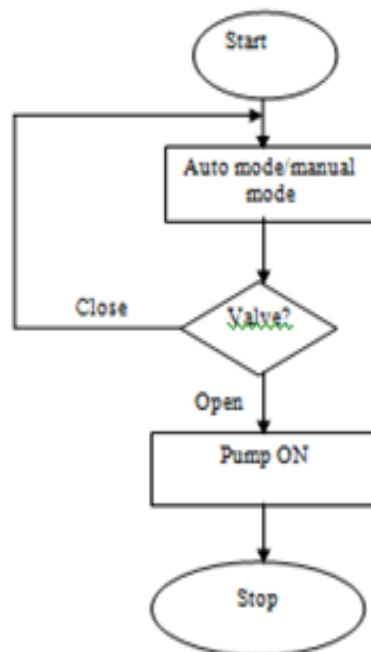


Fig17.Flowchart for pump

Algorithm and Flowchart : Filter press

1. Check the input power supply.
 2. Mode Selection.
 3. Check the valve positions.
 4. Start pump.
 5. Check the pressure.
 6. Once the filter is full then the pressure beyond set point at that point pump will stopped.
 7. The filter pump will start opening of filter.
 8. Once it is filled then it will close.
 9. Cycle is continually running for few minutes/hour.
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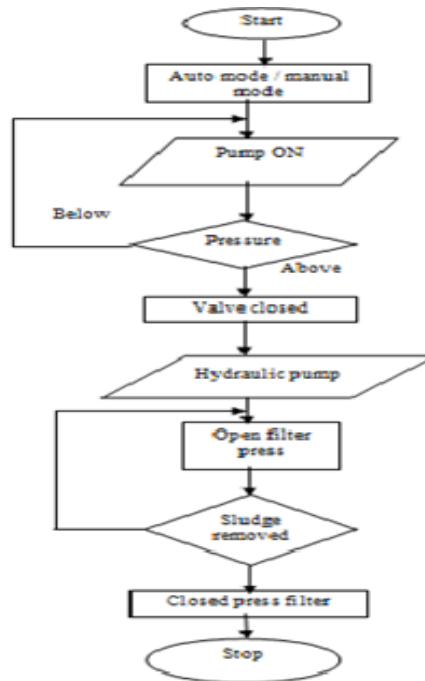


FIG. 19 Flowchart for press

DESIGN STEPS FOR LOGO 8.1

- Step 1: Start
- Step 2: Create a new project
- Step 3: Add devices
- Step 4: Device configuration
- Step 5: Communication through Ethernet
- Step 6: Program downloading
- Step 7: program execution in machine
- Step 8: stop

a) EXPERIMENTAL RESULTS & ANALYSIS

a) Input for filter press

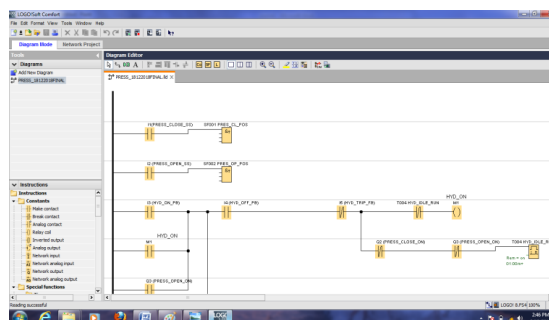


Fig.19 (i).Input For Press

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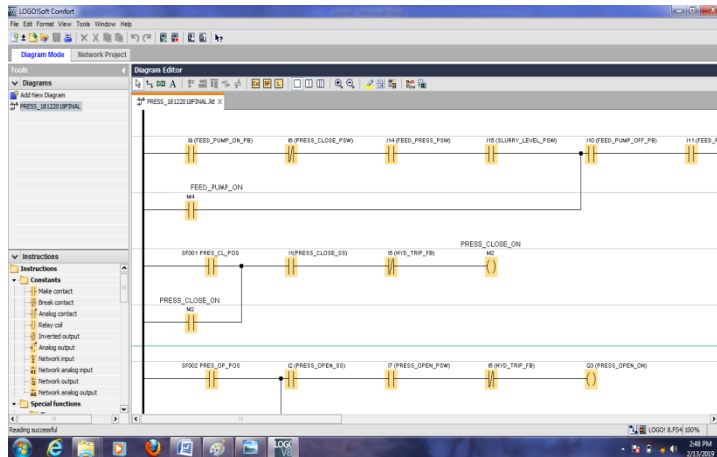


Fig.19(ii).Input for Hydraulic ON

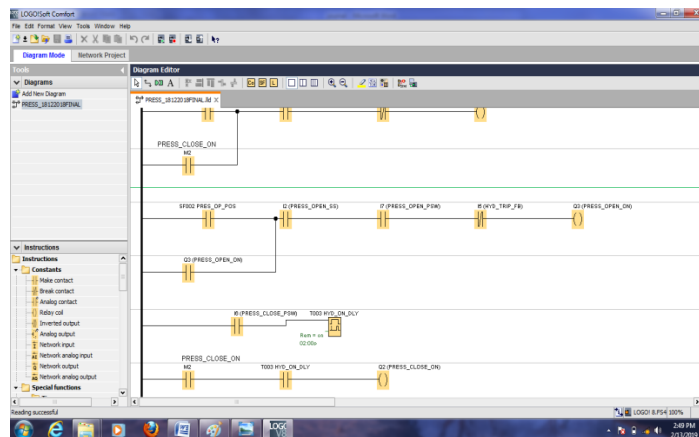


Fig. 19(iii).Input feed pump ON

b) Output for filter press:

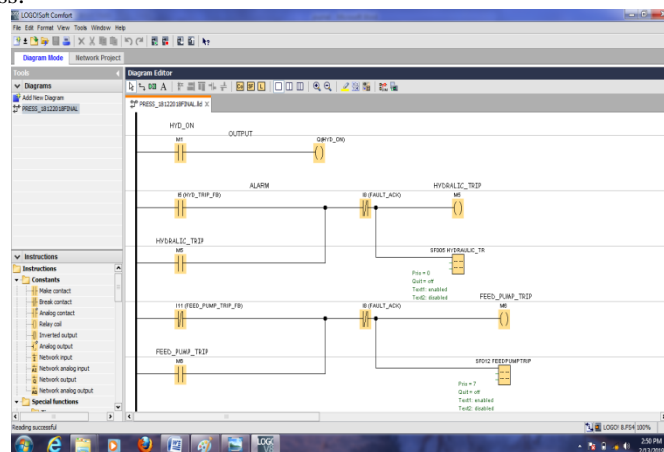


Fig. 20(i).Output for press

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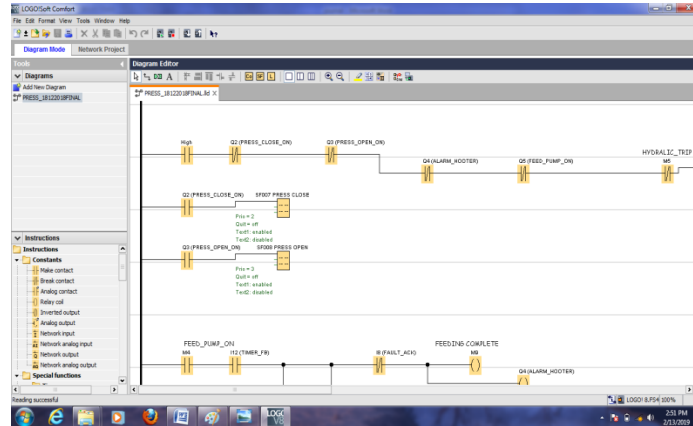


Fig. 20(ii).Output for feed pump

c) Alarm to find fault:

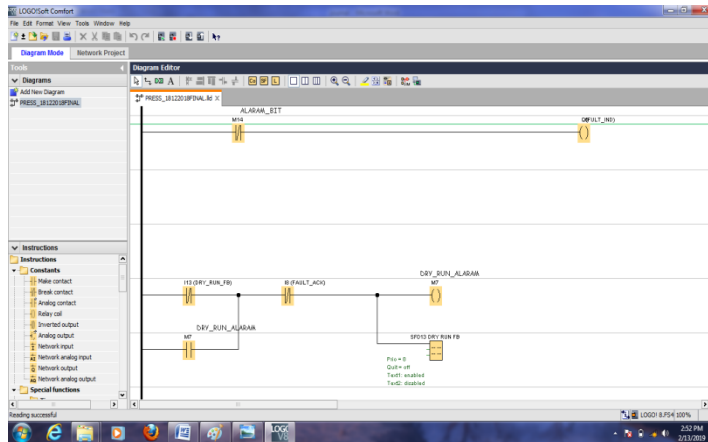


Fig.21.Alarm output

d) When press filter opening position:

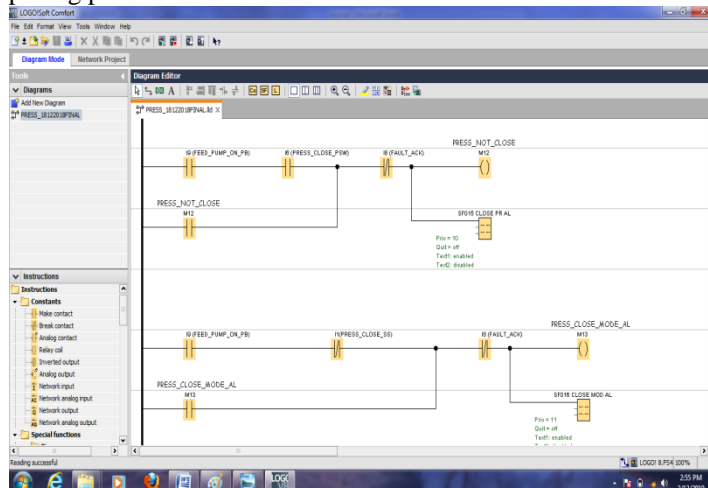


Fig.22.Filter for opening position

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b) PLC Indication

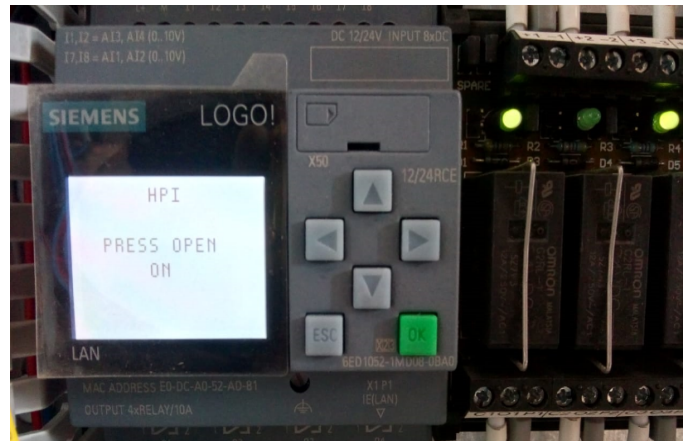


Fig.23.Operation Indication in Display

IV. CONCLUSION

It can be concluded that the use of the plate and frame filter press is efficient. We make the manual operations by automatic thus it reduce the manual work and accidents occurring to the operators can be avoided. The PLC operation is done by LOGO software, it is reprogrammable and easy to operate. In case of pressure drop it gives notification message and the system generate the alarm, pump will be turned off automatically. So it increases the motors life which makes the less replacement of motor and other parts. Due to this, the maintenance cost is lowered. Thus the processing time is reduced and the production is increased.

V. FUTURE SCOPE

All parameters of filter press are coming under LOGO operation. Once this is implemented the method can be executed anywhere through LAN and operator can take immediate precautionary action. This system helps in reducing the breakdown time.GSM module can be used to get message on mobile for any abnormalities in press filter.

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