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An efficient approach of mechanical pump sealing filter system using PIC PLC

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ABSTRACT

Water could be an important resource for the chemical, paper, steel and oil purification industries. Usually, industries use a huge quantity of water to flush the impurities and to cool down the product because the industries area unit in want of water for multiple functions, they have an inclination to utilize water by a mechanism known as Filtering within the existing standard filters, the filter components area unit cleansed manually once it gets clogged, resulting in additional workforce and old. In Automatic back-wash filtering system, once filter components get clogged, a pressure distinction is made between water and outlet valve this can be perceived by a differential pressure sensing element connected to the Programmable Logic Controller that initiates the backwash cycle that mechanically cleans the filter components. Associate in nursing alarm and Human Machine Interface show are provided for the aim of continuous watching and troubleshooting. The projected Automatic back-wash filtering system is additional economical and overcomes the constraints of standard filters.

Index Terms: PIC Programmable Logic Controller, Inlet valve, Outlet Valve, Filter

INTRODUCTION

The basic need for every individual is clean water. Due to urbanization and industrialization enormous amount of water is being used for various purposes. The waste water from industries is polluting the pure water. Water being vital resource, has to be preserved for future generation else leading to scarcity of water. The water pollution can be prevented by wastewater treatment. One such water treatment includes filtration.

Especially the steel plants use a tremendous amount of water for cooling, wastewater transfer and dust control. The plants have sintering mills, water-cooled rolls, pumps, slab furnaces and extrusion equipment's that needs pure water. The water filters separate the solid and chemical impurities by using strainers. The earlier conventional filters are cleaned by a manual method which is less reliable and requires more manpower.

In the modern strainers, the filtering mesh is cleaned automatically by a mechanism called back-wash. This mechanism reduces the need for manpower, improves the capacity and efficiency of filtration.

The term Back- wash refers to pumping water backward through the filters using media like water. Thus, the auto back wash system is an ideal situation which cleans the filter at regular intervals of time. As well it provides the most productive and labor free solution to overcome the above constraints in the manual methods. This is done by continuous monitoring and controlling the system through the human-machine interface (HMI) connected to Programmable Logic Controller (PLC). Needs of automation systems are reliability, safety in exploitation, low maintenance cost, service period as less as possible, simple way of detecting and solving alarms, by implementing a new and modern alarm logging management

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system. The proposed work ensures effective water treatment which will be helpful to society and industries as well.

RELATED WORK

Most of the authors in this field system done their related work to overcome the existing method by step by step process. The idea innovated by the authors are related to our project is used to develop the backwash filtering system and it helps to attain the some water wastage from the water and backup it for further usages

- The BP network model for the control of the coagulation and the filter backwashing system
- PLC Based Apartment Waste Water Filtration System
- Design a WSN Control System for Filter Backwash Process

The BP network model for the control of the coagulation and the filter backwashing system

XueNong Yi, QiuMei Wei, and ChenGuang Li

The optimization of coagulant dosage in drinking water treatment has become a problem of particular concern for utility managers. We studied the shortage of the operational control methods. And this paper presents the application of ANN to model the prediction of coagulant dosage. The model is constructed based on the database of operating parameters and water quality. The structure and the parameters of the neural networks for engineering control are obtained through the optimization algorithm. The present model is building for the coagulant dosing system and filter system And this model realized in the Matlab environment. It is applied to the engineering operation and therefore the field experiment. The result shows the BP networks model can predict the coagulant dosing rapidly and effectively. Compare with the ordinary In this methods, use this BP model can reduce the operational cost.

PLC Based Apartment Waste Water Filtration System

Miss.Poladi Snehal Shirttail, Miss.Phalake Ganga Bharat, Miss.Ghatge Kalyani Sadashiv, Asst.Prof.Mrs.Patil G.A This research paper is an attempt to develop waste water filtration and recycling system. It uses control system such as plc, microcontroller to control machinery and processes to reduce the need of manpower. A Programmable Logic Controller is a digital computer used for automation of electromechanical processes control of different processes used for manufacturing. A PLC is an example of a real time system because output results must be produced in response to input conditions applied within a specific time. The filtration system is used for filter the waste water that collects from apartment. It consist of MGF, ACF, UF filters. After filtration of waste water the filtered water use again for regular use, garden, bathroom, washing vehicles.

Design a WSN Control System for Filter Backwash Process

Magdi Osman Ali, Muawia Mohamed Ahmed Day by day, there is a better rate of need for accurate automation system to be utilized in industries and environment monitoring and control. In water treatment plants during the filtration phase, there is a process called backwashing, which particles suspended within the filter basin are removed. During this enough speed to expand the filter media. Therefore, various kinds of valves used, which are opened and closed a times sequencing manner. The automation backwashing process to be initiated and completed automatically using PLC, level sensors and valves installed inside the filter basin. Practically, an impression system has been applied which all valves are opened and closed according to wireless signals coming from PLCs on its suitable time. In summary, the control within the method demonstrated that the proposed system is efficient, effective, and prepared to be reliable.

PROPOSED SYSTEM

Block diagram

The filter operates within the service mode; it traps and holds particles within the filter. Nature of water is to follow the trail of least resistance, after a time it begins to cut channels through the medium. As channels or holes within the media

bed form, water begins to flow around instead of through the medium. This process is understood as "channeling," and it can reduce the effectiveness of the filter considerably. At this time, the control valve initiates a "backwash" to clean the medium of collected particles and to resettle the bed and eliminate channels that have formed. The backwash is accomplished by sending water down the riser tube from which it enters the filter tank at rock bottom. The force of the water is such it actually lifts the media bed, swirling and tossing the granular medium. The water leaves the filter tank through the control valve, which routes it through the drain line of the filter. Particles being held within the bed are washed to empty. The backwash is an intense rinsing and tossing of the medium that lasts for several minutes. During a very standard residential filter, a typical backwash lasts about ten minutes. After the backwash process, the control valve initiates "rinse" of the bed during which water flows downward through the medium, up through the riser tube, and out the drain. The aim of this rinse is to rinse and settle the bed and prepare it for return to service flow.

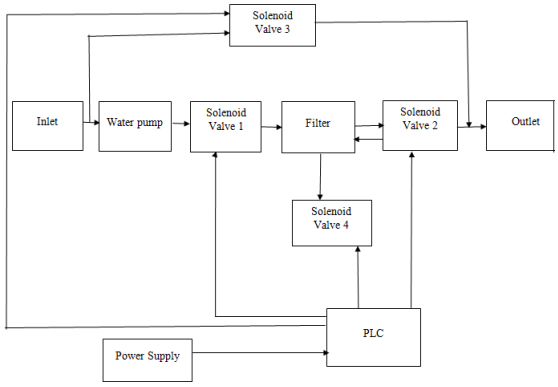

Figure 3.1 Block diagram

HARDWARE DESCRIPTION

Programming logic controller

Core plc board was comprised of 16 digital inputs and 16 digital outputs. Inputs are optic isolated. Opto couplers are wont to protect the circuit/processor from heavy loads damage. Diodes are used at inputs from reverse polarity protection. At output side is employed 16 relays for switching heavy loads. Relays are rated as +12v. They're derived from Uln2803 Ic.Uln2803 is an 8-channel darling-ton array high output current. Uln2803 can sink 500mA of current from a 50V power supply. It inbuilt fly-back diodes for driving coils and prevents from back damage. Relay coils are directly connected to the ULN2803 output and doesn't need the fly back diodes, since they're build inside. Core plc board processor is pic16f877a performing at 20MHz. Whole board is powered employing a +12v dc supply. LM7805 regulator is employed to convert the +12v to +5v for power supply to microcontroller, opt couplers and uln2803 relay driver. For programming the board microcontroller pic16f877A picket 2 programmers is formed on the board.

Pump motor

A submersible pump (or sub pump, electric submersible pump (ESP) may be a Device. Which features a hermetically sealed motor close-coupled to the pump body the whole assembly is submerged within the fluid to be pumped. The main Advantage of this sort of pump is that it prevents pump cavitations, a problem Associated with a high elevation difference between pump and therefore the fluid surface Electric submersible pumps are multistage centrifugal pumps operating in a vertical position. Liquids, accelerated by the impeller, lose their kinetic Energy within the diffuser where a conversion of kinetic to pressure energy takes Place. This is often the most operational mechanism of radial and mixed flow pumps. The pump shaft was connected to the gas separator or the protector by a Mechanical coupling at rock bottom of the pump. Fluids enter the pump through an intake screen and they are lifted by the pump stages. Other

parts include the radial bearings (bushings) distribute along the length of the shaft providing radial support to the pump shaft. An optional bearing takes up a part of the axial forces arising within the pump but most of these forces are absorbed by the protector's bearing.

Solenoids valves

A solenoid valve could also be a mixture of two basic functional units. A solenoid (electromagnet) with its core. A valve body containing one or more orifices Flow through an orifice is shut off or allow by the movement of the core when the solenoid is energized or de-energized. ASCO (Automatic switch co.) valves have a solenoid mounted directly on the valve body. The core is enclosed during a sealed tube, providing a compact, leak tight assembly. When the solenoid is energized during a direct acting valve, the core directly opens the orifice of a Normally Closed valve or closes the orifice of a Normally Open valve. When de-energized, aspiring returns the valve to its original position .The valve will operate at pressures from 0 psi toots rated maximum. The force need to open the valve is proportional to the orifice size and fluid pressure. As the orifice size increases, so does the force required. To open large orifices while keeping solenoid size small, a Pilot Operated construction is employed.

SOFTWARE DISCRPTION

Ladder logic compiler for pic16

Modern sub-3.00 USD microcontroller probably have about the computing power of a PLC circa 1975. They therefore provide quite enough MIPS to run reasonably complex ladder logic with a cycle time of a couple of milliseconds. I feel PLCs usually have some quite runtime that's kind of like an interpreter or a virtual machine, but if we're doing simple logic on a processor without much memory then a compiler could be a far better idea. So I wrote a compiler. You begin with an empty rung. You'll add contacts (inputs) and coils (outputs) and more complicated structures to create up your program. Timers (TON, TOF, RTO) are supported. The max/min durations depend upon the cycle time of the `PLC,' which is configurable; timers can count from milliseconds to tens of minutes. There are counters and arithmetic operations (plus, minus, times, div). Circuit elements could also be added serial or in parallel with existing elements. An I/O list is made from the ladder logic drawn. You'll have internal relays (Rfoo), that memory is automatically allocated, or inputs (Xfoo) and outputs (Yfoo), to which you want to assign a pin on the microcontroller

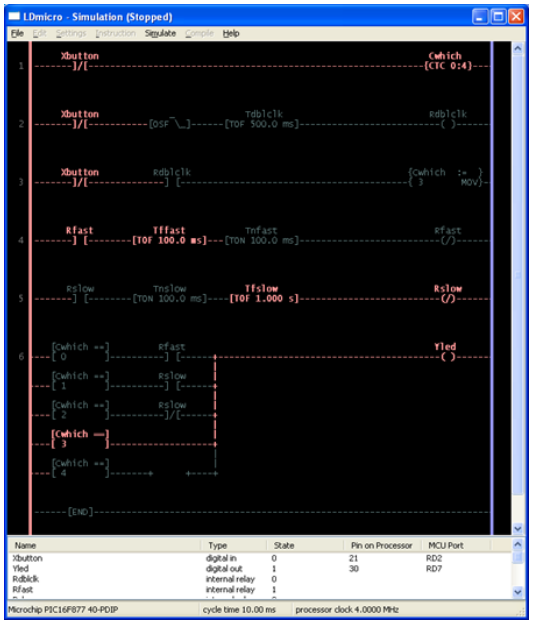

Figure 3.3.1 A Ladder Logic Compiler for PIC16

RSLOGIC 500

RSLogic 500 is a ladder logic programming package for the SLC 500 and Micro Logic processors. RSLogic 500 is compatible with SLC 500 and Micro Logic programs created with any Rockwell Automation programming packages. RSLogic Micro is also a ladder logic programming package for Micro Logic processors The RSLogic Classic driver provides the connection between your computer and the processor. You have to tell RSLogic Classic what driver you want to use to make that connection. The driver you use depends on the physical connection between the processor and the computer. You need to know the type of connection your system is using and how the physical connection is configured.

To configure a driver in RSLinx Classic

Click Start -> Programs -> Rockwell Software -> RSLinx-> RSLinx. RSLinx Classic starts in a minimized mode, with an RSL inxicon in the Windows notification area.

1. In RSLinx Classic, click Communications > Configure Driver, to open the Configure Drivers dialog box.
2. In the Configure Drivers dialog box, select the driver.
3. Click Add New.
4. RSLinx Classic prompts you to name the driver. You can use the default name, or enter a name. Click OK to open the driver's configuration dialog box.
5. Configure the driver to match your connection to the processor.
6. The driver appears in the Configured Drivers list of the Configure Drivers dialog box. Click Close.
7. To verify that the driver is working properly, click Communications > RS. This function shows what processors and other communication devices are available through the driver.
8. In the RS, open the driver you configured and verify that the processor is one of the displayed devices.
9. If you cannot see the processor, the driver is not configured correctly or there is a communication.

Figure 3.3.2 RS Logic 500

RESULT AND ANALYS

Figure 4 Hardware kit

The usage of atomization in water system control and anti-theft system for drinking the usage of atomization in water system control and anti-theft system for beverage supply. It also included self power generation and control's the beverage theft within the domestic areas. The proposed system. The working process is as follows, the raw water from the aerator is mixed with aluminium and chlorine. The opening and shutting of valve from alum tank is completed manually in existing system which ends up in less or more release of alum into raw water channel. This is often overcome by automatic open and shut of valves by using PLC.

CONCLUSION

The proposed system for water filtration and also recycling can be easily implemented by using PLC. The automation can be implemented in water filtration system ensures to avoid wastage of water and reduces time, manpower and give better quality of water. This system can also be used in housing societies for recycling the wastewater. The important is to minimize the water pollution and water wastes. Through the optimization for coagulation dosage and filter backwashing control, can reduced the operating cost. Automation control has been suggests for these filters; therefore, the backwashing process for these filters accomplished automatically using level sensors installed inside the filter and automated valves. The system based PLC controller that provides a platform for programming the filters valves. When the water reached impermissible level, the sensor send a sign to the controller to start out the backwashing, the filter valves are opened and closed consistent with wireless signals coming from PLCs on in a different sequencing manner.

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