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PLC BASED ON RO SYSTEM

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ABSTRACT

Reverse osmosis (RO) is end up being the most dependable, savvy, and energy efficient in delivering new water contrasted with other desalination innovations. The present Reverse Osmosis plants are a broadly utilized application of water treatment designing everywhere on the world, applied for water conservancy projects, arisen by the innovation of automation control system is to guarantee safe, proceeds, great water supply to municipal and for multi-reason utilization in Industries. The Input of the PLC is start and stop press button LS1, LS2, WS and water virtue sensor. The yield are water pump, indicators, SV1, SV2.The LS1 is fixed in the upper, in tank1.It detected the water the pump is "STOP".LS2 is fixed in the lower part of the tank1.It isn't detected the water the pump is "ON". In tank2 the WS is fixed in lower part of the tank, it doesn't detect the water the pump is "STOP". On the off chance that manual ON catch is squeezed the pump is OFF position. At long last the water virtue level is detected. The indicators will indicate motor is in running position. Which sensor is in ON position (LS1 or LS2). WS indicate. Level of water immaculateness is low the pump will be switched off. Subsequent to changing the channel just the machine will start. It will deliver the great mineral water.

Keywords: reverse osmosis, PLC, automation.

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1. INTRODUCTION

1.1 History of Reverse Osmosis Systems

Reverse Osmosis (RO) was developed in the late 1950's under U.S. Government funding, as a method of desalinating seawater. Reverse osmosis (RO) is a separation process that uses pressure to force a solvent (water) through a membrane, which retains the solute (contaminant) on one side and allows the pure solvent (water) to pass to the other side [1]. More formally, it is the process of forcing a solvent from a region of high solute concentration through a membrane to a region of low solute concentrate by applying pressure in excess of osmotic pressure [2]. This process is the reverse of the normal osmosis process, which is the natural movement of solvent from an area of low solute concentration, through a membrane, to an area of high solute concentration when no external pressure is applied [3]. The membrane here is semi-permeable, meaning it allows the passage of solvent (water) but not of solute (contaminant) [4]. This article is aimed towards an audience that has little or no experience with Reverse Osmosis and will attempt to explain the basics in simple terms that should leave the reader with a better overall understanding of Reverse Osmosis technology and its applications [5].

1.2 Reverse Osmosis

Reverse Osmosis is capable of removing up to 99%+ of the dissolved salts (ions), particles, colloids, organics, bacteria and pyrogens from the feed water (although a RO system should not be relied upon to remove 100% of bacteria and viruses). A RO membrane rejects contaminants based on their size and charge. Any contaminant that has a molecular weight greater than 200 is likely rejected by a properly running RO system (for comparison a water molecule has a MW of 18). Likewise, the greater the ionic charge of the contaminant, the more likely it will be unable to pass through the RO membrane. For example, a sodium ion has only one charge (monovalent) and is not rejected by the RO membrane as well as calcium for example, which has two charges. Likewise, this is why a RO system does not remove gases such as CO_2 very well because they are not highly ionized (charged) while in

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solution and have a very low molecular weight. Because a RO system does not remove gases, the permeate water can have a slightly lower than normal pH level depending on CO2 levels in the feed water as the CO2 is converted to carbonic acid.

Reverse Osmosis is very effective in treating brackish, surface and ground water for both large and small flows applications. Some examples of industries that use RO water include pharmaceutical, boiler feed water, food and beverage, metal finishing and semiconductor manufacturing to name a few.

1.3 DRAWBACK OF PRESENT SYSTEM

It is important to build up feedwater quality rules to advance system performance and forestall the three primary issues related with RO: scaling, fouling, and corruption of RO membranes (Kucera 55) [6]. These issues will in general diminish system profitability since they decrease squander water immaculateness [7]. Scaling happens on RO membranes when the convergence of scale-shaping species surpasses immersion, creating extra solids inside the RO feedwater [8]. Scalants incorporate such chemical species as calcium carbonate, calcium sulfate, barium sulfate, strontium sulfate, and responsive silica (Kucera 55). Since these species have low solubilities, they are difficult to eliminate from RO membranes. Scaling diminishes the adequacy of the membranes in lessening the solids and causes more regular cleanings [9]. A scale on a membrane gives nucleation locales that increment the pace of development of extra scale [10].

1.4 NEED OF THE PROJECT

Reverse osmosis (RO) is a water purification innovation that utilizes a semipermeable membrane to eliminate particles, molecules, and bigger particles from drinking water. In reverse osmosis, an applied pressure is utilized to defeat osmotic pressure, a colligative property, that is driven by chemical likely contrasts of the solvent, a thermodynamic boundary. Reverse osmosis can eliminate numerous kinds of disintegrated and suspended species from water, including microbes, and is utilized in both modern cycles and the creation

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of consumable water. The outcome is that the solute is held on the compressed side of the membrane and the unadulterated solvent is permitted to pass to the opposite side. To be "specific", this membrane ought not permit huge molecules or particles through the pores (openings), yet ought to permit more modest segments of the arrangement (like solvent molecules) to pass uninhibitedly.

In the typical osmosis measure, the solvent normally moves from a region of low solute focus (high water potential), through a membrane, to a territory of high solute fixation (low water potential). The main thrust for the development of the solvent is the decrease in the free energy of the system when the distinction in solvent focus on one or the other side of a membrane is diminished, creating osmotic pressure because of the solvent moving into the more thought arrangement. Applying an outside pressure to reverse the common progression of unadulterated solvent, accordingly, is reverse osmosis. The cycle is like other membrane innovation applications. Notwithstanding, key contrasts are found between reverse osmosis and filtration. The prevalent evacuation instrument in membrane filtration is stressing, or size avoidance, so the cycle can theoretically accomplish amazing efficiency paying little heed to boundaries like the arrangement's pressure and fixation. Reverse osmosis likewise includes diffusion, making the interaction subject to pressure, stream rate, and different conditions. Reverse osmosis is most regularly known for its utilization in drinking water purification from seawater, eliminating the salt and other gushing materials from the water molecules.

1.5 Aim of the project

Reverse osmosis (RO) is end up being the most solid, savvy, and energy efficient in creating new water contrasted with other desalination innovations. The present Reverse Osmosis plants are a broadly utilized application of water treatment designing everywhere on the world, applied for water conservancy projects, arisen by the innovation of automation control system is to guarantee safe, proceeds, excellent water supply to municipal and for multi-reason utilization in Industries.

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The Input of the PLC is start and stop press button LS1, LS2, WS and water immaculateness sensor. The yield are water pump, indicators, SV1, SV2.The LS1 is fixed in the upper, in tank1.It detected the water the pump is "STOP".LS2 is fixed in the lower part of the tank1.It isn't detected the water the pump is "ON". In tank2 the WS is fixed in lower part of the tank, it doesn't detect the water the pump is "STOP". On the off chance that manual ON catch is squeezed the pump is OFF position. At long last the water virtue level is detected. The indicators will indicate motor is in running position. Which sensor is in ON position (LS1 or LS2). WS indicate. Level of water virtue is low the pump will be switched off. Subsequent to changing the channel just the machine will start. It will create the great mineral water.

2. Methodology

The square chart of the undertaking is as demonstrated in figure 1. It comprise of five significant square. The main square is working board, it comprise of press catches. The subsequent square is level identification and control. In this square limit switch and solenoid esteem is utilized to control the level. Third square is pumping unit. The pump is controlled by relay. Fourth square is indicating board. In this venture LED is utilized to indicate the working status. At long last PLC unit is organizing info and yield.

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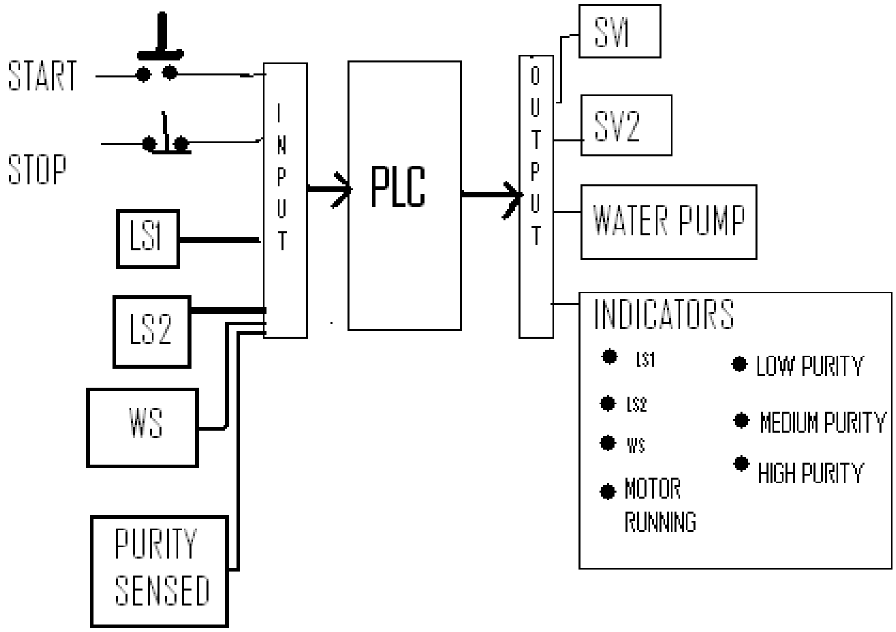

Figure: 1 Block diagram of PLC.

The input devices are press catches, Reed sensors, limit switches. The all the devices are worked by +24 V in particular. The table 1 shows the status and connecting purpose of the PLC.

Table 1 Selection Input devices

INPUTS			
SL.NO	**ADDRESS**	**DESCRIPTION**	**TYPE**
1	I0.0	Start the Process	Push Button
2	I0.1	Stop the Process	Push Button
3	I0.2	Level Indication	Limit Switch

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One finish of the info devices are connected to the +24V supply terminal. Another end is connected to PLC terminals. These connections are as demonstrated in figure 2. The PLC itself indicates the situation with the info devices. On the off chance that the LED will be ON methods input signal is available. In any case LED is OFF methods no info signal. So it is helpful to the client. It will indicate disappointment notification of info devices..

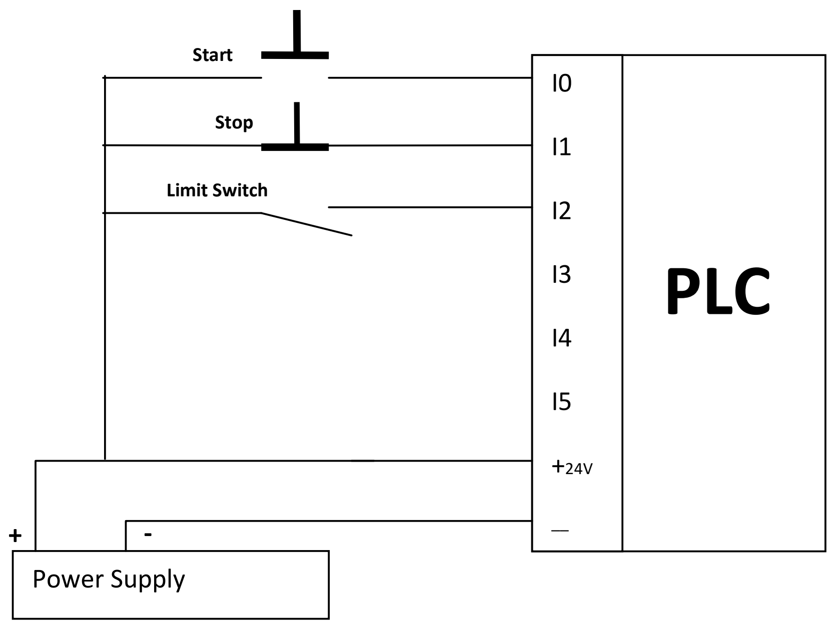

Figure 2: Connection of Input devices to PLC

2.1 PLC TO OUTPUT DEVICES CONNECTION

In this venture, the yield devices are LEDs, Siren and transport motor. LED's are indicating the situation with the length. In this system comprises of three LEDs. First LED indicates the right length of the article. Second LED is indicating resilience Value of the length of the article. Last LED is indicating surpass length or underneath the reference esteem. This LED is fault indication. The table 2 shows the yield devices to connecting purpose of the PLC.

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Table 2 Selection Output devices

OUTPUTS			
SL.NO	**ADDRESS**	**DESCRIPTION**	**TYPE**
1	Q0.0	Pump Motor Control	Relay(24V)
2	Q0.1	Status Indication	LED (24 V)
3	Q0.2	Status Indication	LED
4	Q0.3	Water Control	Solenoid Valve (24 V)

One finish of the yield devices are connected to the PLC yield terminal. Another end is connected to supply terminal or normal point. These connections are as demonstrated in figure 3. The PLC itself indicates the situation with the yield signal. On the off chance that the LED will be ON methods yield signal is stream to the yield devices. In any case LED is OFF methods no yield signal stream to the yield devices. So it is valuable to the client and it will distinguish disappointment of yield devices.

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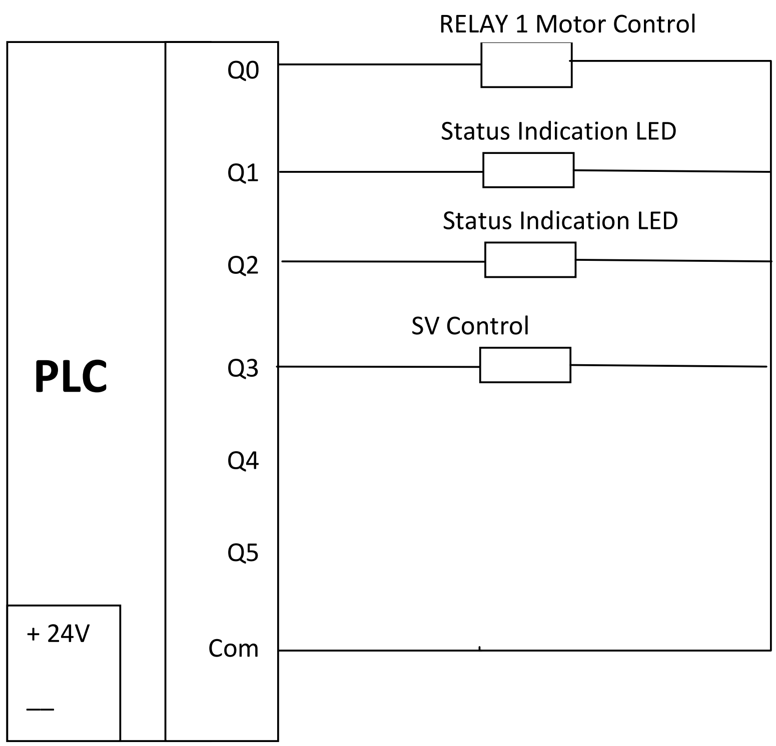

Figure 3: Connection of PLC to output Devices

2.2 LADDER DIAGRAM

In this task utilized Siemens PLC to control the hardware. The Step 7 Microwin programming is utilized to build up the stepping stool logic. Stage 7-Micro/WIN is a Windows-based programming application utilized for programming the S7-200 Micro PLC (programmable logic controller). The STEP 7-Micro/WIN programming bundle gives a bunch of devices needed to program the S7-210 in either proclamation list (STL) or stepping stool logic (LAD) programming language.

To utilize STEP 7-Micro/WIN, you should have the accompanying hardware:

- Recommended: a personal computer (PC) with a 80486 or more noteworthy processor

- 8 Mbyte of RAM or a Siemens programming device, (for example, a PG 740); least
- computer prerequisite: 80386 with 8 Mbyte of RAM
- A PC/PPI link connected to your communications port (COM)
- A program improvement station (PDS 210)
- VGA screen, or any screen upheld by Microsoft Windows
- At least 35 Mbyte of free hard circle space (suggested)
- Microsoft Windows 3.1, Windows for Workgroups 3.11, Windows 95, or Windows NT 3.51 or more noteworthy

2.3 WORKING MODEL

The working model of the undertaking is as demonstrated in figure 4. This is project is plan and actualized the RO system. The PLC is control the pump and SV stream.

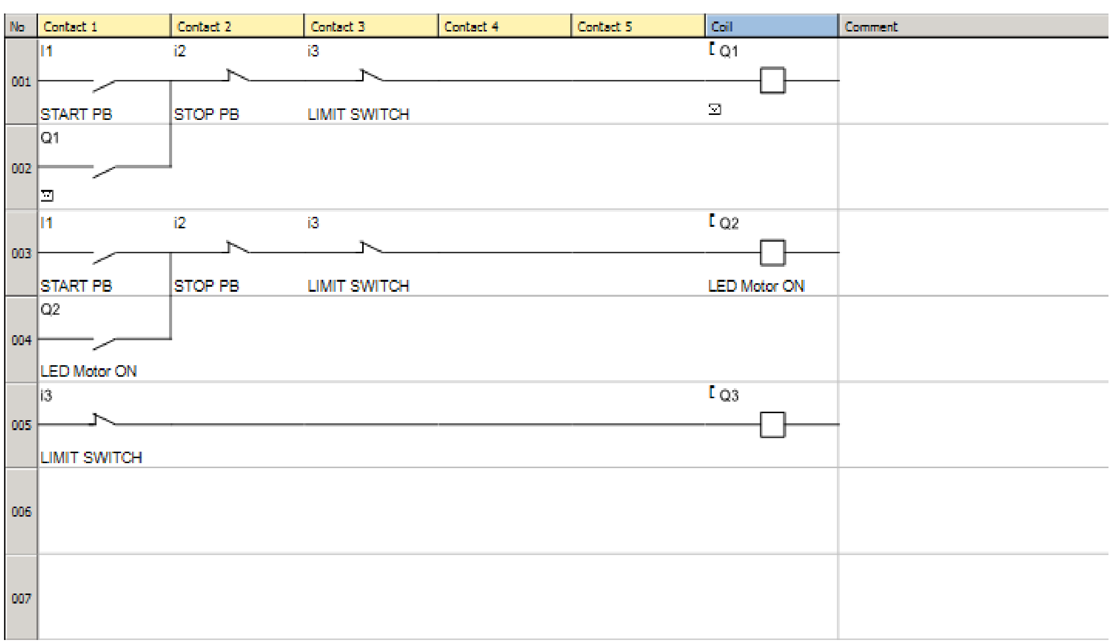

Figure 4: Ladder Logic

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3.CONCLUSION

In this venture, we found out about how the Reverse Osmosis measure assists with sanitizing the water by eliminating undesirable particles and micro-organism. We additionally found out about the various sorts of segments utilized in the OR system and we had acquired some knowledge of how to program and offer connections to the PLC.

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