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Report on Mixing of liquid in tank using PLC

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Report on Mixing of Liquid in a Tank Controlled using PLC

Problem Statement:

- In these rapid growing worlds, the manual work become one of the major tasks, because as it is one of the most time-consuming tasks and now a days everyone needs to get their work on or before time. There are several industrial automation systems that can change the world, so with the coming with the solution we made a system of mixing tank with the help of PLC (Programmable Logic Controller). Which can make the industrial sector much faster, efficient and accurate.

Introduction:

- PLC is an abbreviation for Programmable Logic Controllers. They are mostly employed in industries to regulate automated systems. They are one of the most advanced and simplest types of control systems, and they are now widely replacing hard-wired logic relays.
- The programming of the PLC can be generally done through Ladder Diagram, Structured Test, Function Block.

Advantages:

- PLCs are meant to be dependable and robust, and they can run for extended periods of time without requiring maintenance. As a result, they are suited for usage in industrial and manufacturing situations where continuous operation is required.
- PLCs are simple to operate and may be programmed using simple programming languages. As a result, they are usable by people with a variety of technical backgrounds and skill levels.
- PLCs are often more cost-effective than other forms of control systems, especially in the long run. They can be used to automate operations and minimize the need for manual labor, thereby saving money.
- Safety - PLCs may be configured to guarantee equipment and employee safety.

Disadvantages:

- PLCs may be costly to acquire and install at first, especially in bigger or more complicated systems. This can be a challenge for certain businesses, particularly those with limited resources.
- Programming abilities - In order to be used successfully, PLCs require

programming abilities. This might be a disadvantage for businesses that lack the essential programming expertise, since they may need to recruit more workers or outsource out the programming job.

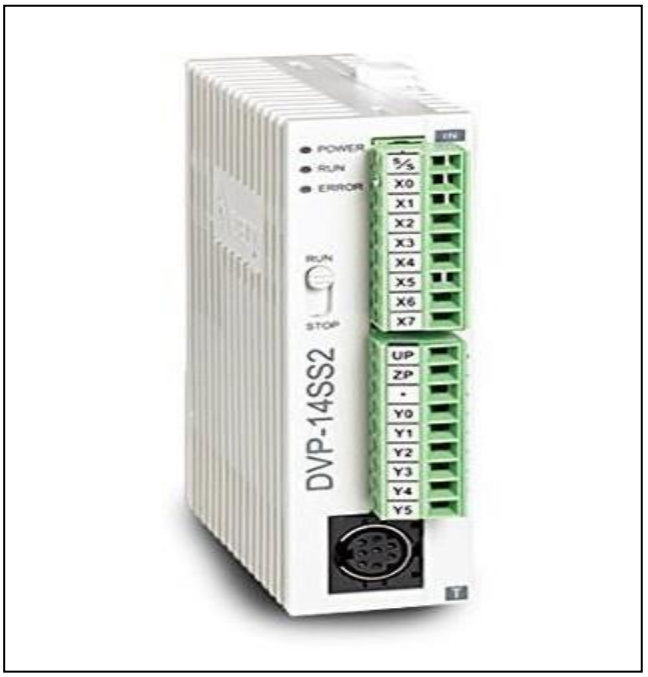
- PLCs have limited versatility since they are designed to control certain processes and equipment. They can be designed to execute a variety of functions, but they may not be as adaptable as other types of control systems.
- PLCs may be complicated systems, particularly in bigger or more sophisticated applications. For people who are unfamiliar with them, this might make them difficult to understand and use.
- Maintenance - PLCs must be serviced on a regular basis to guarantee optimal operation. This can be time-consuming and costly, and it may necessitate the use of specialized skills and expertise.

Components:

- The components used in PLC project are as follows:
  1. Delta PLC DVP14SS2.
  2. Solenoid Valve – 24V.
  3. Level Sensors.
  4. SMPS – 24V.
  5. DC Motor.
  6. Relay.
  7. Containers for liquids.

Descriptions:

1. Delta PLC DVP14SS2:



Working:

- The delta PLC will help us to connect each and all sensors and actuators.
- There are 7 input and 7 output modules.
- It has RS485 Communication Protocols.
- It is simple to interface with the laptop or Pc.
- Load your ladder diagram and it will start work accordingly

2. Solenoid Valve:

- A solenoid valve is an electrically controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core (plunger) in its center. In the rest position, the plunger closes off a small orifice. An electric current through the coil creates a magnetic field.

Working:

- A solenoid valve consists of two main components: a solenoid and a valve body (G). Figure shows the components. A solenoid has an electromagnetically inductive coil (A) around an iron core at the centre called the plunger (E). At rest, it can be normally open (NO) or normally closed (NC). In the de-energized state, a normally open valve is open and

a normally closed valve is closed.

- When current flows through the solenoid, the coil is energized and creates a magnetic field. This creates a magnetic attraction with the plunger, moving it and overcoming the spring (D) force.
- If the valve is normally closed, the plunger is lifted so that the seal (F) opens the orifice and allows the flow of the media through the valve. If the valve is normally open, the plunger moves downward so that the seal (F) blocks the orifice and stops the flow of the media through the valve.
- The shading ring (C) prevents vibration and humming in AC coils.
- Solenoid valves are used in a wide range of applications, with high or low pressures and small or large flow rates. These solenoid valves use different operating principles that are optimal for the application. The three most important ones are explained in this article: direct acting, indirect acting, and semi-direct acting operation.

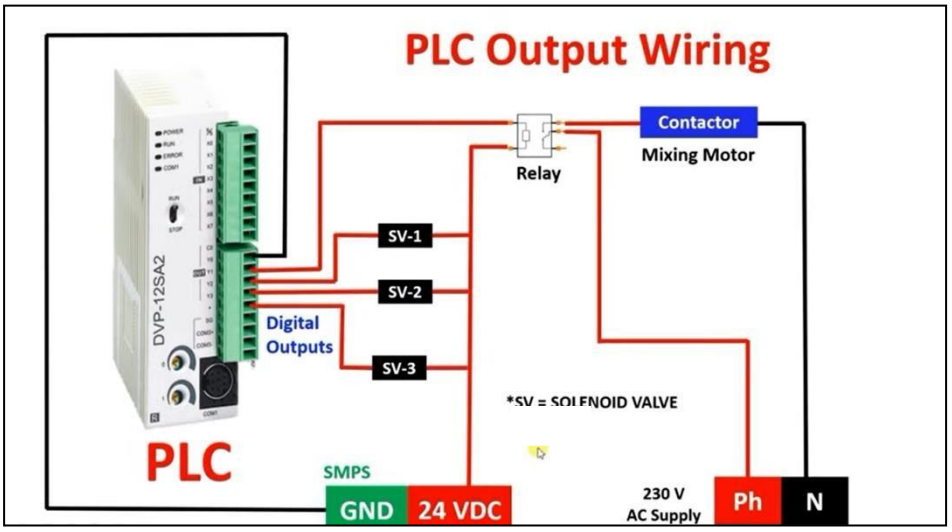
3. Level Sensors.

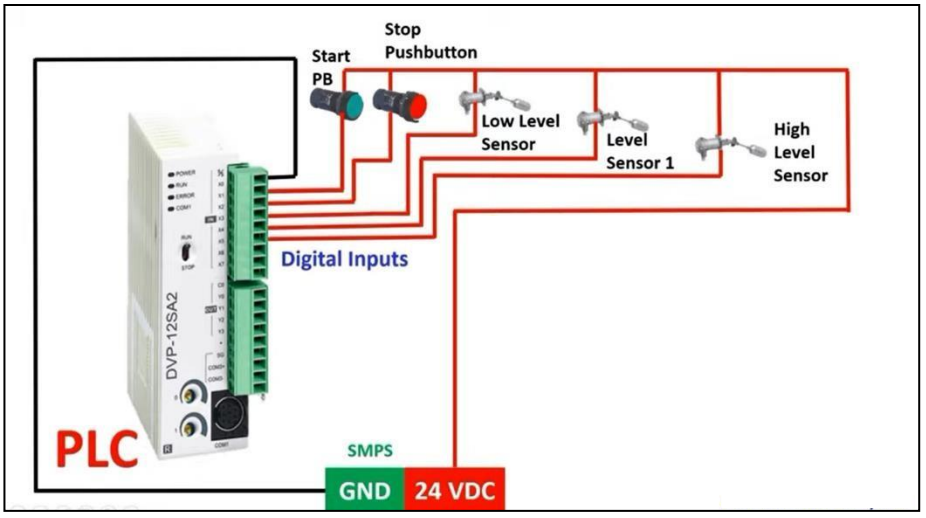
- Level Sensors are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. Level measurements can be done inside containers or it can be the level of a river or lake.

Project Descriptions:

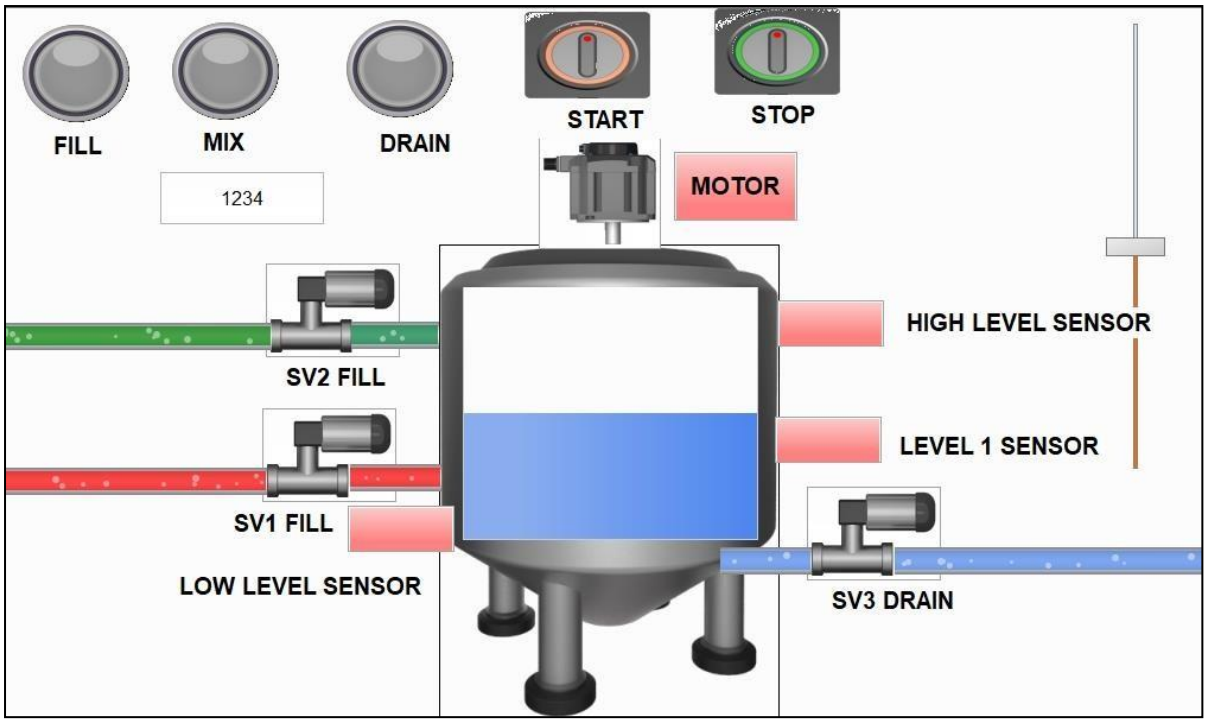
- There is several software related programmable logic controller but every software has some limitation and it has their own advantages, so we had used Delta company software to make our project and as this is an open-source software also available with the HMI (Human Machine Interface).

Circuit Diagram:



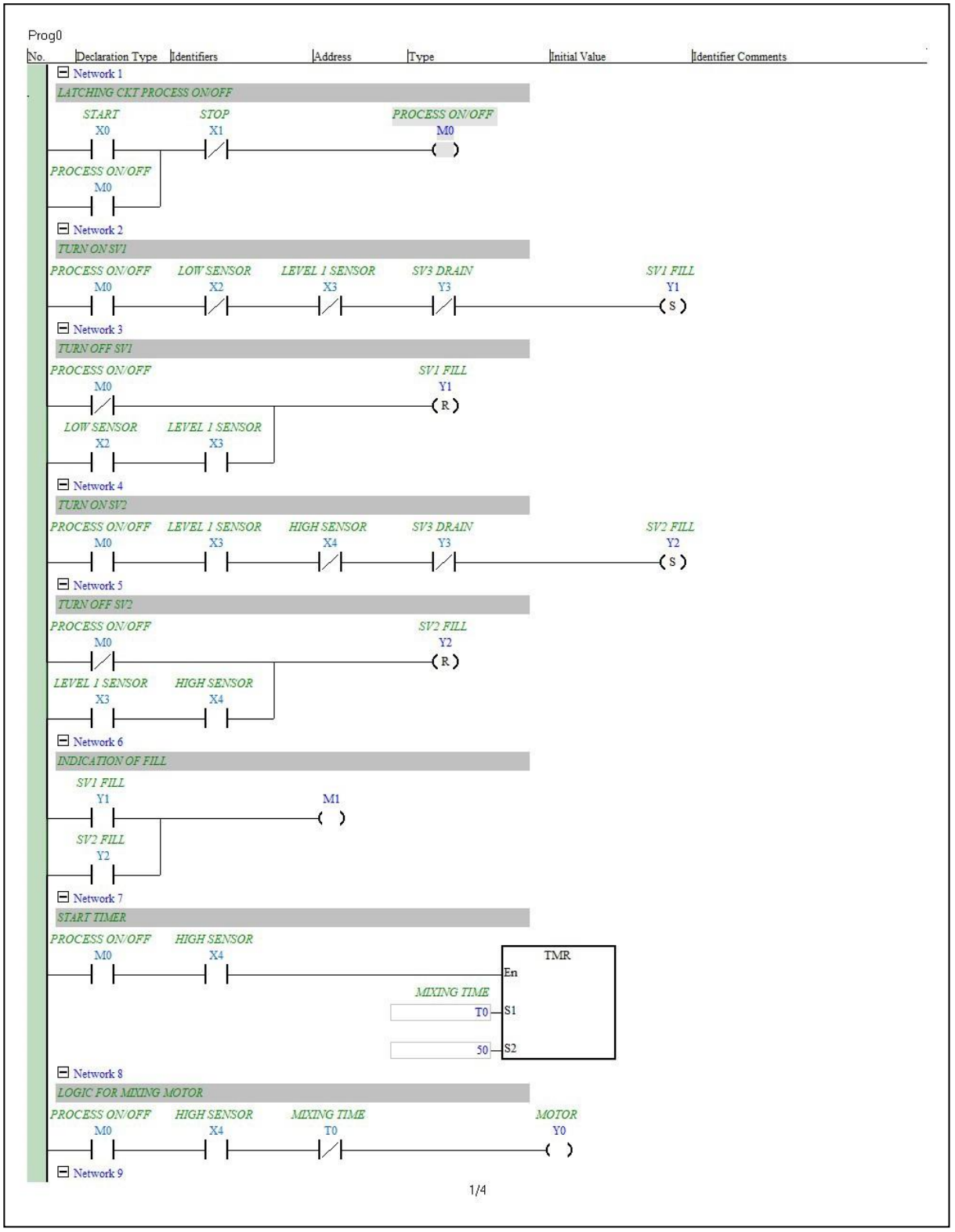


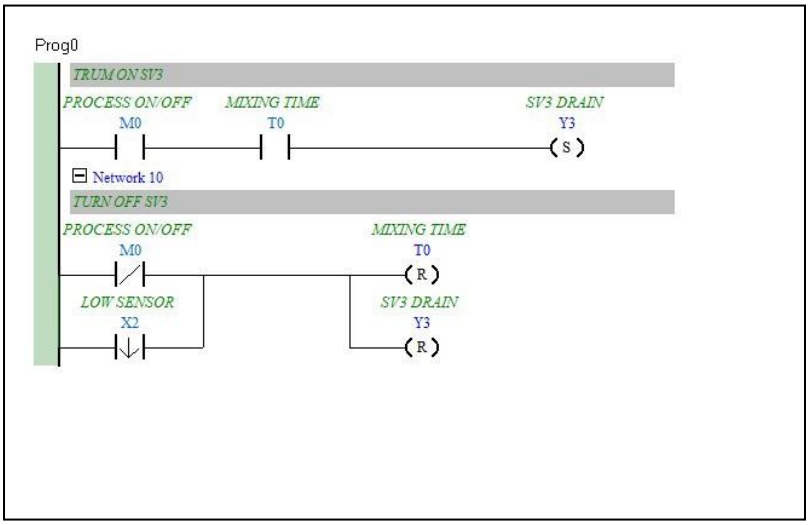
HMI (Human Machine Interface):



- There is total 3 tank, out of which two are used for Inlet the chemicals in tank-3 for mixing both the materials.
- The system will start by pushing the start button.
- The level sensors are used to make the system fully automatic. As the low level reaches the SV1 and SV2 valve will open and the material will get into another tank.
- As the level of the tank will reach to the level 1 sensor the motor will start and it will start mixing the materials.
- When the material level will reach to the high-level sensor the SV1 & SV2 valve will automatically close and after some part of delay the SV3 – drain valve get energized.

Ladder Diagram:





Conclusion:

- To conclude, we observe and understand different types of sensors, actuators, HMI, Programming logic controller, etc.