

# **Automatic Liquid Mixing System**

## **Project Overview:**

Implemented ladder program and HMI for Automatic Liquid Mixing System application using OpenPLC editor, OpenPLC Runtime and SCADABR. In this project, material A and material B are collected in a tank. These materials will be mixed for a particular time using an agitator motor and then mixed product drained out through an outlet valve.

## **Project Description:**

In this project, we are using PLC programming of an OpenPLC editor. Two level sensors are used for detecting the level of material A and material B. To control the level of the material, a single acting valve is used which has two states, either fully opened or fully closed. Agitator/stirrer motor is provided to mix the material A and material B in a tank for a particular time. After successful completion of mixing, the mixture outlet valve is operated to drain the mixed material. When the mixing process is completed for a particular time, then the mixture valve will be automatically turned OFF. The emergency stop is provided to halt the whole process if anything goes wrong.

OpenPLC Runtime is used to execute PLC programs. Finally, ScadaBR, an open source Supervisory Control and Data Acquisition (SCADA) system, is used to create interactive screens, also called Human Machine Interface (HMI), for our automation projects.

The following are the number of PLC components required for this project:

### **Number of PLC Inputs Required:**

- Start Switch.
- Low level sensor. Turn ON when the liquid level reaches this level.
- High level sensor. Turn ON when the liquid level reaches this level.
- Emergency Stop button. Turns ON when the button is pressed.

### **Number of PLC Outputs Required :**

- Liquid A Inlet
- Liquid B Inlet
- Mixture Outlet
- Agitator /Stirrer Motor

### **Number of PLC Timer Required :**

- Stirrer Timer– 20 second Timer, 100 ms Time Base

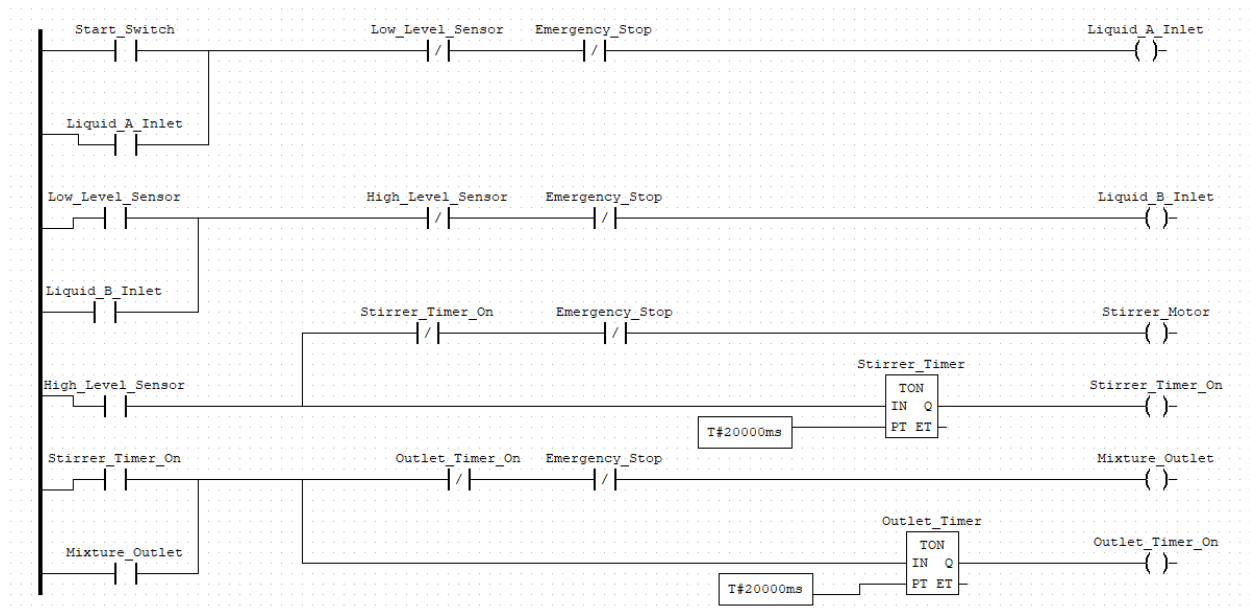
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- Mixture Outlet Timer – 20 second Timer, 100 ms Time Base.

## Components:

#	Name	Class	Type	Location	Initial Value
1	Start_Switch	Local	BOOL	%QX0.0	0
2	Low_Level_Sensor	Local	BOOL	%QX0.1	0
3	High_Level_Sensor	Local	BOOL	%QX0.2	0
4	Emergency_Stop	Local	BOOL	%QX0.3	0
5	Liquid_A_Inlet	Local	BOOL	%QX0.4	0
6	Liquid_B_Inlet	Local	BOOL	%QX0.5	0
7	Mixture_Outlet	Local	BOOL	%QX0.6	0
8	Stirrer_Motor	Local	BOOL	%QX0.7	0
9	Stirrer_Timer	Local	TON		
10	Stirrer_Timer_On	Local	BOOL	%QX1.1	
11	Outlet_Timer_On	Local	BOOL	%QX1.2	
12	Outlet_Timer	Local	TON		
13	Reset	Local	BOOL	%QX2.0	

## Ladder Logic:



## PLC Ladder Programming:

- When the START button is pressed. Liquid A Inlet valve will be ON and latched, and the valve will be opened for infusing liquid A until the level reaches the low-level sensor. When the low level sensor turns ON, Liquid A Inlet valve will be turned off.

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- Low level sensor will be ON when the liquid level reaches the low-level float sensor. Then the Liquid B Inlet valve will be ON and latched, and the valve will be opened for infusing liquid B until the level reaches the high-level float sensor. When the high level sensor turns ON, the Liquid B Inlet valve will be turned off.
- High level sensor will be ON when the liquid level reaches the high-level float sensor. Now the agitator/stirrer motor will be ON and activate the agitator. Also, the stirrer timer will start to count for 20 sec. After 20 sec, the agitator motor will stop working and Mixture Outlet Valve will be ON and latched, and the mixture will drain out of the container.
- When the Mixture Outlet Valve turns ON, the mixture outlet timer will start to count for 20 sec. After 20 sec, Mixture Outlet Valve will be OFF. The draining process will be stopped.
- If any error occurs, press the Emergency Stop button. This emergency stop will be ON to disable all the outputs. The whole system will then stop running

## HMI:

