

AUTOMATIC WASHING MACHINE USING PLC

Authors: Menaka Kural¹, H. Prasanna Kumar²

PG Scholar(C&I), Dept. of EEE, University
Visvesvaraya College of Engineering,
Bangaloremenaka.kural@gmail.com

Assistance Professor, Dept. of EEE, University
Visvesvaraya college of Engineering,
Bangaloreuvcehpk@gmail.com

ABSTRACT: *This project represents a design of automated washing machine which is controlled using programmable logic controller. Programmable logic controller(PLC) was used to control a mechatronics system using specific functions. Basic PLC functioning like timing, sequencing, controlling & relaying were implemented. The hardware contains one pulsator and one tub. A DC motor is used to run the pulsator as per the sequence programmed. Pump is used for the water inlet and solenoid valve is used for the water drain out. Operation of these devices(motor, pump & solenoid valve) is completely automated using PLC.*

Keywords: Allen Bradley PLC, Solenoid Valve, Pump, DC motor, Float sensors.

1. INTRODUCTION

Automation plays an increasingly important role in the world economy. A washing machine is an automatic machine, controlled by motor and different hardware equipment, whose operation is sequenced and automated without human interference and is designed to wash laundry, such as clothing, towels and sheets. The term is mostly applied only to machine that use water as primary cleaning solution. Washing entails immersing, dipping, rubbing and scrubbing in water, usually accompanied by soap, detergent or bleach. The washing machine may simply agitate the cloths in water while switched on; automatic machine may fill, empty, wash and spin in an automatic complex cycle.

Allen Bradley PLC is used for the automatic washing machine. A sequence of operation like washing and rinsing are programmed in ladder program.

2. PROGRAMMABLE LOGIC CONTROLLER:

PLC is miniature computers that control the automated systems to run the everything around us. It controls the equipment according to pre-programmed set of instructions. PLC is an electronic device; in past it is pronounced as "Sequence Controller".

PLC reads the status of the external input devices, such as keypad, sensors, switch and pulses, and execute by the microprocessor logic, sequential, timing, counting and arithmetic operation according the status of input as well as pre-written program stored in the PLC. The input/output of PLC includes DI (Digital Input), AI (Analog Input), PI (Pulse Input), NI (Numeric Input), DO (Digital output) and AO (Analog Output). Hence, PLC will still evergreen in the industrial automation field in the future.

The mostly used languages in designing a PLC program are Ladder Diagram(LD), Functional Block Diagram(FBD).

3. METHODOLOGY:

3.1. Classification of washing machine:

1. Top loading washing machine
2. Front loading washing machine

3.2. Components of washing machine:

There are various components are used in our project. We have DC motor, Pump, Valve and Water level sensors. A DC motor is used to rotate the pulsator. Pump is used to fill the tub and valve is used to drain the water from the tub. Two water level sensors are high level and low level sensor are used to detect the water level. The main component of the project is PLC.

3.3. Block Diagram:

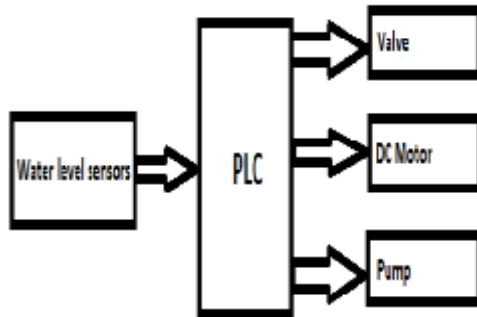


Fig 1:

1: Block Diagram of Automatic Washing Machine

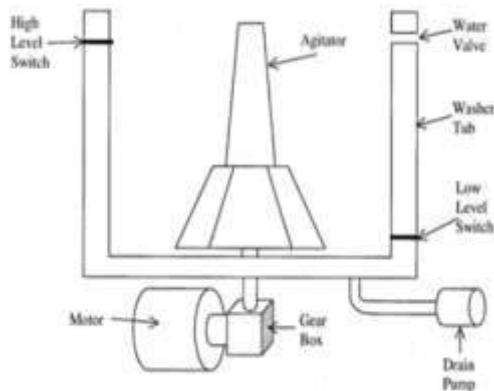


Fig 2: Schematic Diagram of Automatic Washing Machine

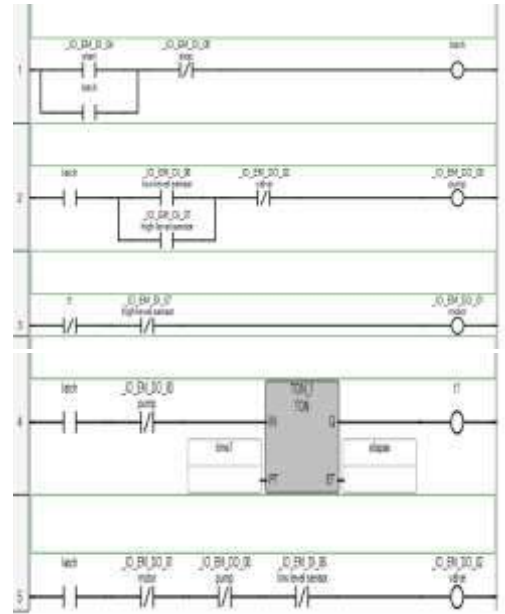
3.4. Working:

The washing time of the washer comprises 2 cycles: wash and rinse cycle. During the wash cycle, water is added until a high level sensor is triggered on. Then, the water pump is shut off and the agitator is activated for 10 min. After 10 min timer has expired, the dirty water is drained out through a valve that is activated as soon as the agitator stops. The valve is stopped when the low level sensor is triggered low. Then, the rinse cycle starts.

The rinse cycle when the low level sensor is triggered low (end of wash cycle). The cycle starts by adding water into tub until the high level sensor is triggered. As soon as high level sensor is triggered, the water pump is shut off and the agitator is activated for 10 min. after 10 min clock will

expire, then agitator is stopped and water is drained out. The valve continuous to drain the water until the low level sensor is triggered low.

3.5. Software and Hardware Implementation:



4.

Fig 3: Ladder logic program



Fig 4: Experimental setup of washing machine

3.5. Rating of the components:

The DC motor used in this project gives a supply voltage of 12v and 500 rpm for pulsator. The solenoid valve used has at an operating voltage of 24v DC. The pump used has at an operating voltage of 5v and operating voltage of 24v given to the two water level sensor(High&Low).

3.7. Advantages:

1. Cost efficient
2. Less space required
3. No human efforts
4. Fully automated

3. Result and Conclusion:

This project is done to automatic a model of washing machine by controlling the inlet, outlet and rotating mechanism in washing machine by using PLC which is the future and present technology which is widely used in home automation.



Figure 5: complete setup of washing machine

The above picture shows the complete setup of demonstration of a PLC based Automatic Washing Machine.

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