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PLC Based Automatic Car Washing System

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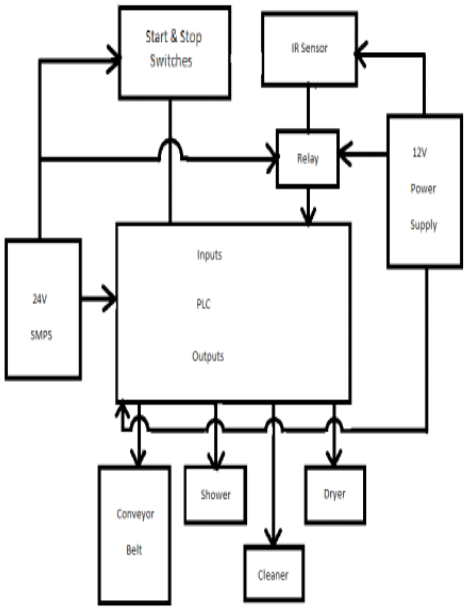
Abstract— *Currently necessity of man is to live life in automatic way so as to perform tasks at higher speed. Technology is best interconnecting channel in each part of world with the means of transportation or communication or business which led to a highly increase in the number of cars. So how to maintain or clean those? using automated washing system? All peoples face big issue called as Time i.e. time consumption essential for cleaning these vehicles or cars etc. Time management is directly proportional to reduction of cost for maintenance. Project helps us to use a conveyor belt on which customer stop the car. After it switch detector is used for detecting the car then conveyor belt start moving. Sensor plays vital role on conveyor belt for car detection. As soon as car is sensed functioning of conveyor assembly invokes. After specified delay for all activities to perform conveyor get stops. The main objective of this project is to perform exterior car washing automatically using Programmable Logic Controller integrated with PLC sends information like arrival or departure of vehicle. Car washing technique is collection of various things as spraying solution of detergent, cleaning with water and brushes, & then completing task with forced air drying fans.*

I. INTRODUCTION

There are many types of car washes like manual car wash where the vehicle is washed by employees, secondly Self services car wash where the customer has to perform the washing and 3rd chemical car washes which use chemicals to wash and polishing the car surface etc. In all automobile Industries manual car washing need more labour to carry out work which effects in time consumption and also the results may or may not be satisfactory to the customer that depends. So as to overcome these issues, car washing can be done automatically using Programmable Logic Controllers (PLC).

PLC is a specialized computer used for the control and operation of manufacturing process and machinery which functions using a programmable memory to store many instructions and execute functions including timing, counting, on/off control, data handling, sequencing & arithmetic. Most of the companies in industry use Programming as Updating or changes as per need in programming can be made easy as per requirement. Many electromechanical relays are observed in current existing systems which were replaced by Programming Logic Controller. Hence according to it, the user can be informed efficiently in case of completion of the process or any emergency. Car washing requires components like conveyor for motion, brushes to clean, dryers, sprayers which are driven by DC motors. Control of all these parts is made through PLC i.e. Programming Logic Control.

II. BLOCK DIAGRAM



2.1 Input Devices:

2.1.1 IR Transmitter/Receiver:

IR, or infrared, communication is an inexpensive, common, and easy to use wireless. Infrared light is similar to visible light, but only difference is that it has a slightly longer wavelength. This means Infrared rays are not noticeable to the normal human eye vision - perfect for wireless communication.

To detect car, Infrared TX/RX is used and simultaneously gives signal to PLC to trigger the respective compartment operation.

2.2 Output Devices:

2.2.1 DC Motor:

The DC motor works over a fair range of voltage. Voltage increases or if is at high level more is the RPM (rotations per minute) of the motor. Let's Consider the motor function ate in the range of x-y V, it will have minimum RPM at xV and maximum at y V.

In any DC motor, RPM and torque are inversely proportional. Resulting in the gear having less torque will provide a more RPM and converse it performs opposite. The concept of (PWM) pulse width modulation is applied in a geared DC motor. In this well structure, the gear that is connected to the gear head and motor is purposely small so as to transfers maximum speed to the larger teeth part of the gear head to rotate with speed. Further connection, larger part of the gear rotates the smaller duplex part which receives only the torque but not the speed from its predecessor which it transfers to larger part of other gear and so on. The 3rd gears duplex part has maximum number of teeth compared to other gears, which helps in transferring more torque to this gear which is connected to shaft.

2.2.3 Dryer:

Fan is used for drying purpose. Car wash utilizes a soft water that has been filtered of chlorine and others. Drying machine are used with force to dry the washed car. We can also use Heat to get a dry car fast.

2.2.4 Submersible Water Pump:

Pump is a machine or mechanic equipment which is required to lift liquid from low level to high level or to flow liquid from low pressure area to high pressure area .Low pressure is at suction side of pump and a high pressure carried out at discharge side of pump.

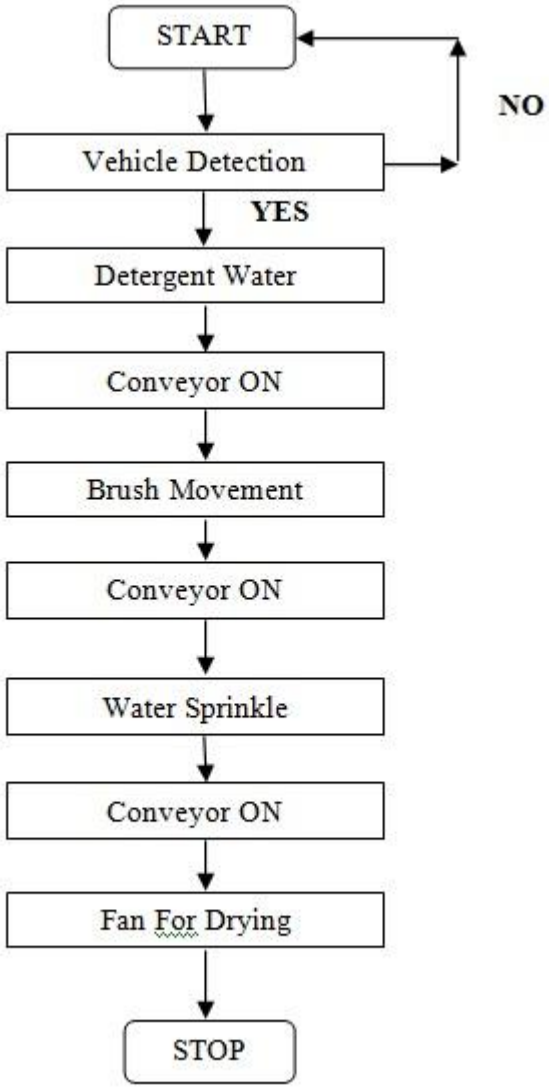
A submersible pump is a pump that is able to be placed inside the water. An electric submersible pump (ESP) is a device generally called as Submersible pump which has a hermetically sealed motor close-coupled to the pump body.

2.2.4 Conveyor:

A 24 volt Brushless DC geared motor that requires less space and has higher operating efficiency as compared to traditional conventional conveyor belt drive systems. Micro-Motor unit i.e. MMU with DC (driver card) for motor control provides very safe and maintenance-free operation in either continuous or high-indexing applications.

The right angle drive design combines a powerful Brushless DC motor with a proprietary small gearbox tool. This unit transfers around 99% of motor output power to the belt drive pulley.

III. FLOW CHART

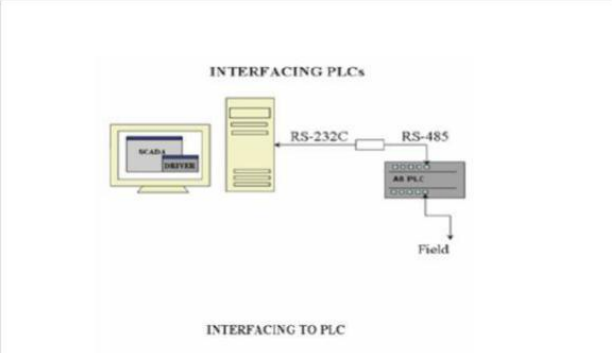


IV. METHODOLOGY

In the project, programmable logic controller (PLC), using which we have controlled all the parameters of this project. Software & Automated tools (equipments) used in current project do washing car automatically using conveyor assembly in it. The conveyor assembly that we have used is for moving the car. In this process the car is on conveyor belt of developed system, when conveyor assembly starts the car moves. There is the IR sensor is placed from this sensor the car is get sensed all process is ready for further use. Sensing the availability of car, first process is to detergent water applies. The belt i.e. conveyor assembly stops so as to the car get full shampooing effectively. When it's done of this process conveyor moves and halts at next step for cleaning purpose which is done by brushes carried forward by sprinkling clean water. Conveyor again at drying section where car is dried using exhaust fan. This is how process gets completed and car is get fully washed properly.

V. INTERFACING

The following figure gives the interfacing technique of PLC using RS232 and RS485 which is required for project purpose.



VI. SOFTWARE DEVELOPMENT

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Overview of Software:

What is RSLogix 500? RSLogix 500 software is a 32-bit Windows ladder logic programming package for the SLC 500 and MicroLogix processors. RSLogix 500 is compatible with SLC 500 and MicroLogix programs created with any of Rockwell Software's programming packages.

RSLogix 500 software includes:-

1. FFL: - A free-form ladder is kind of editor which requires only application logic not syntax of your program.
2. PPV - A powerful project verifier is to create list of errors to make corrections.
3. D&D :- Drag-&-drop editing can move data table elements from one data file to another, and can run from distributed places.
4. AW :- An address wizard for making addresses entering task easier and reduces keying errors.
5. S&R: For quick change occurrences of a particular address or symbol we must search it then replace accordingly.
6. A custom data monitor to observe interactions and view separate data elements together
7. SLC libraries: - there are so many ladder logics used. So as to get correct portions of ladder logic for utilizing across any of Rockwell Software's SLC programming software products

VII. RESULT

By using all above components, we implemented a reliable and efficient project. With the help of PLC ladder we can even change time for washing, which gives very effective trouble free result and efficient washing. The final desired result of project is we can do car washing automatically and in bad environment condition

VIII. CONCLUSION

The concept has been successfully implemented on PLC and presented in this paper. Considering the cost effect, Low cost is achieved through this project.

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