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# Seven Tank Automation System for Chemical and Phosphating Plants

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**ABSTRACT:** In the Automotive industries there are pre-process of chemical phosphating processes which are essential steps for metals. Now a day's, we are observing that, in most of the chemical coating industry, this process is being carried out manually with the help of unskilled laborers. This manual process is very hazardous and having more risk factor for human being. We have studied complete process to get understand where the risk factor is more, the parameters affecting the quality of final product also where to curtail manual work of this process. After study we got an idea about seven tank automation systems for chemical degreasing and phosphating process. After all, we have decided to work on this atomization project. Cleaning and phosphating are essential steps in the overall coating process of metal. If one of the processes is out of control, the completion of the whole system will be concerned. This paper will discuss critical facet of the pre-treatment system with respect to individual wash chemistries, and the control parameter of each step in the process. It will also focus on overview of the manual as well as automatic process control, time consumption, man power reduction, productivity and quality of end product.

**KEYWORDS:** Seven Tank Automation Chemical and Phosphating, Degreasing, Chemical Coating.

## I. INTRODUCTION

Anti-corrosion refers to the protection of metal surfaces from corroding in high-risk (corrosive) environment. When metallic materials are put into corrosive environment, they tend to have chemical reactions with the air or water. The effects of corrosion become evident on the surfaces of this material. For ex. After putting a piece of iron in to a corrosive atmosphere for an extended period, it starts rusting due to oxygen interaction water on the surface of the piece of iron. It is very important process that the metal is avoided from corrosion. The metal loss due to corrosion has become very big problems in industries. The pre-treatment process is carried out from cleaning of the metal equipment. This phosphating process is carried out manually. When the chemical phosphating process carried the harmful gases is generated, this generated gases are dangerous for human being. It is very time consuming process. The automation of seven tank process must be done, so number of metal equipments can be get coated and avoided from corrosion. Metal equipment lacking any preventive (anti-corrosive) measures many become rusted both inside and out, depending upon atmospheric conditions and how much of that equipment is exposed to the air. There are no. of methods for preventing corrosion, especially in marine applications. Anti-corrosion measures are of particular important in environments where high humidity, mist and salt are factors.

## II. WORKING

The whole seven tank automation system for degreasing is depend on the microcontroller. First the material which is going to be pre-treatment put into the movable cage. This movable cage is rest in initial position with the material. Then switch on the power supply, controller will gets starts. When the controller gets starts it sends signal to the motor. The output shaft of the motor is attached to the pulley. Power is transmitted from motor to the movable cage through the rope drive. The movable cage/ basket with the material which is its initial possession will move in vertically upward direction and stop further it moves horizontally on the first tank. Then then it moves vertically downwards and the material gets deeps in the tank material remains deep for 5 to 10 seconds which is set in the controller. After 5 to 10 second again the cage will move vertically in upward direction further same process will happen for the remaining tanks. When the last tank process gets complete, the cage will move vertically in upward direction and move to its initial position and operation get complete.



In our project first upon material (object) put in bucket and press start button manually. Usually it has been use two motors namely M1 and M2. The motor 1 is start the bucket going to upward direction it going to final position the motor M1 is stop and motor M2 will ON, and bucket go to forward direction. the proxy sensor is detect the first tank location. After finding first tank location motor M2 is stop and M1 is start. The bucket going to down and deep in first tank usually its deep for 3 to 5 second. First tank is degrees the material. After 5 second the (M1 start) bucket going on upward direction and stop.

Then again motor M2 is start the bucket goosed to forward direction, again the proxy will detect second tank location. M2 is stop and M1 is start. The bucket going to down and deep in second tank usually its deep for 3 to 5 second. In second tank the material will wash with water. After 5 second the (M1 start ) bucket going on upward direction and stop.

Then again motor M2 is start the bucket goosed to forward direction, again the proxy will detect third tank location. M2 is stop and M1 is start. The bucket going to down and deep in Third tank usually its deep for 5 second. In Third tank the material will wash with Acid. After 5 second the (M1 start) bucket going on upward direction and stop.

Then again motor M2 is start the bucket goosed to forward direction, again the proxy will detect fourth tank location. M2 is stop and M1 is start. The bucket going to down and deep in fourth tank usually its deep for 3 second. In fourth tank the material will wash with water. After 3 second the (M1 start) bucket going on upward direction and stop.

Then again motor M2 is start the bucket goosed to forward direction, again the proxy will detect fifth tank location. M2 is stop and M1 is start. The bucket going to down and deep in fifth tank usually its deep for 3 to 5 second. In fifth tank the material will wash with Acid. After 3 to 5 second the (M1 start) bucket going on upward direction and stop.

Then again motor M2 is start the bucket goosed to forward direction, again the proxy will detect sixth tank location. M2 is stop and M1 is start. The bucket going to down and deep in sixth tank usually its deep for 3 to 5 second. In sixth tank the material will wash with water. After 3 to 5 second the (M1 start) bucket going on upward direction and stop.

Then again motor M2 is start the bucket goosed to forward direction, again the proxy will detect seventh tank location. M2 is stop and M1 is start. The bucket going to down and deep in seventh tank usually its deep for 5 second. In seventh tank the material will again degrees. After 5 second the (M1 start) bucket going on upward direction.

Complete this 7 tank process of degreasing bucket is going to up and motor M2 will rotate in anticlockwise direction it is go to reverse direction and he is find to home location, bucket moves to the backward direction After it is touch to limit switch the total movement is stoped and whole movement is get reset and bucket will go to down as a initial condition operation get complete.

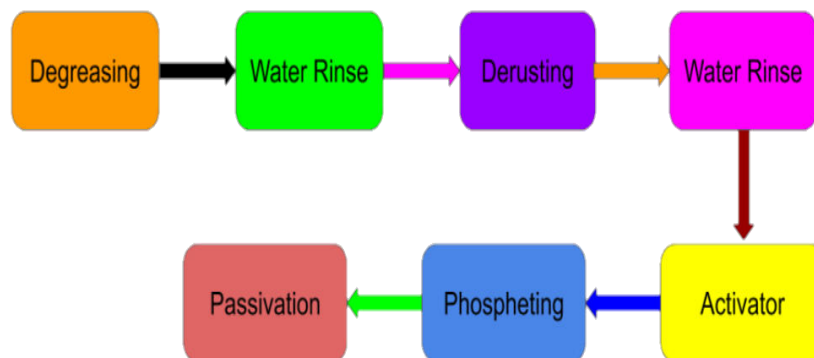


Fig.1: 7 Tanks of Chemical Process



FLOW CHART

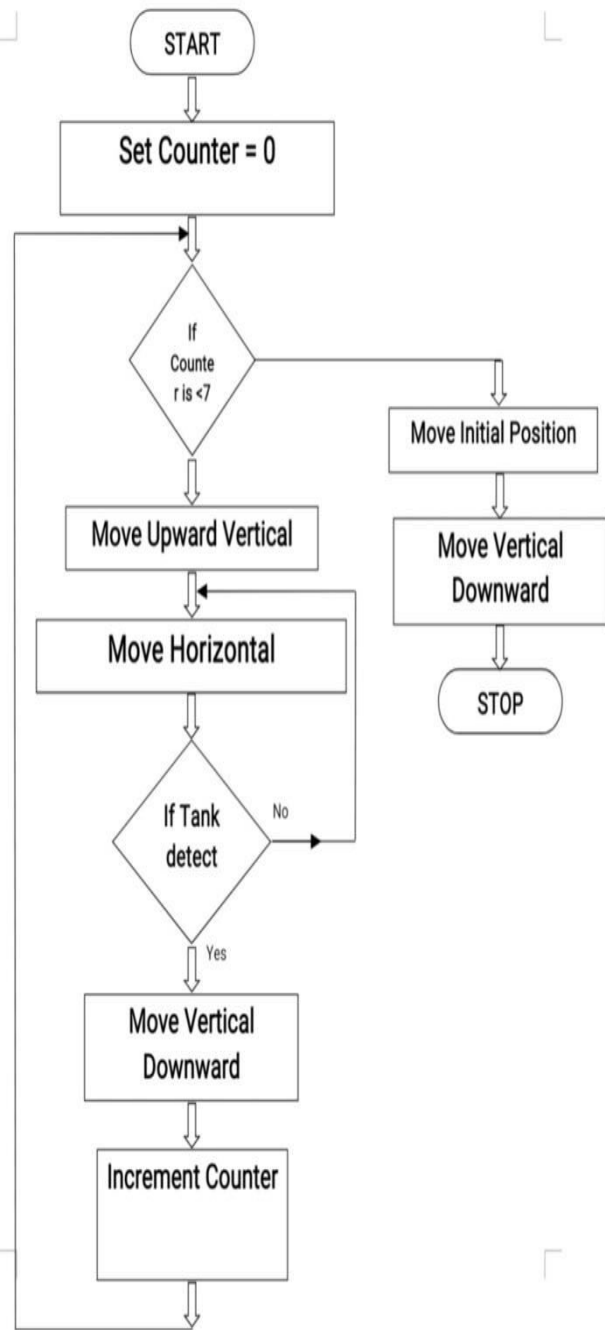


Fig. 2. : Flow chart of Automation Process of Seven Tank Chemical And Phosphating Process.

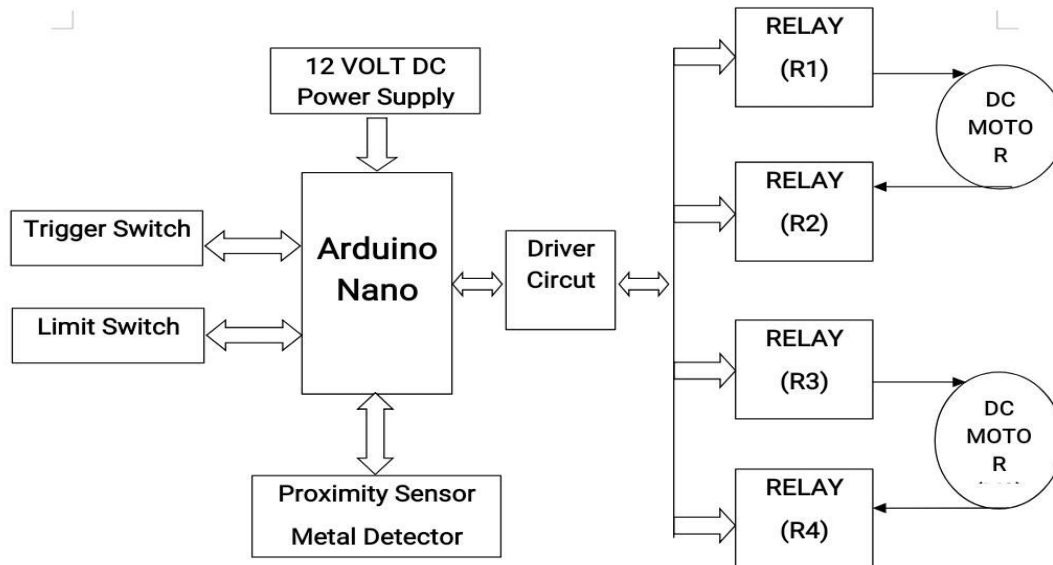


Fig.3. : Block Diagram of Seven tank Automation System

### III. COMPONENT

**Microcontroller :** For the rowing mechanism we use the Arduino nano. Which is the Brain of our Automation system. It is an open source microcontroller board based on the Atmega328. It has 14 pins (of which 6 provide PWM output). There are 8 input pins, input voltage limits is 6 to 20 volt. It has flash memory 32 kb (ATmega328) of which 2kb used by boot loader. Its clock speed has 16 MHz. We are using Arduino nano as microcontroller because its cost is less, less circuit complexity, analog as well as digital program easily to burn in Arduino nano.

**Transistor BC548 :** In our project, we are using transistor BC548. It is a general-purpose NPN Bipolar Junction Transistor commonly used in electronic equipment. It is low in cost and widely available. It is used for amplifying and switching purposes in electrical circuits. BC547 and BC548 are essentially the same but BC547 has higher breakdown voltage whereas BC548 has low noise. These are the most general purpose NPN silicon Transistors and changing one with the other does not noticeably (or otherwise) affect the circuit.

**DC Motor :** In this project, we are using 60W DC Motor. FHP PMDC Motor or Fractional Horse Power Permanent Magnet Direct Current Motor is an armature wound carbon brush motor in which the DC current flowing through the commutator in the armature winding produces magnetic poles on the armature. Output powers are 20-watt, 25 watt, 60 watt, 120 watt, 180 watt.

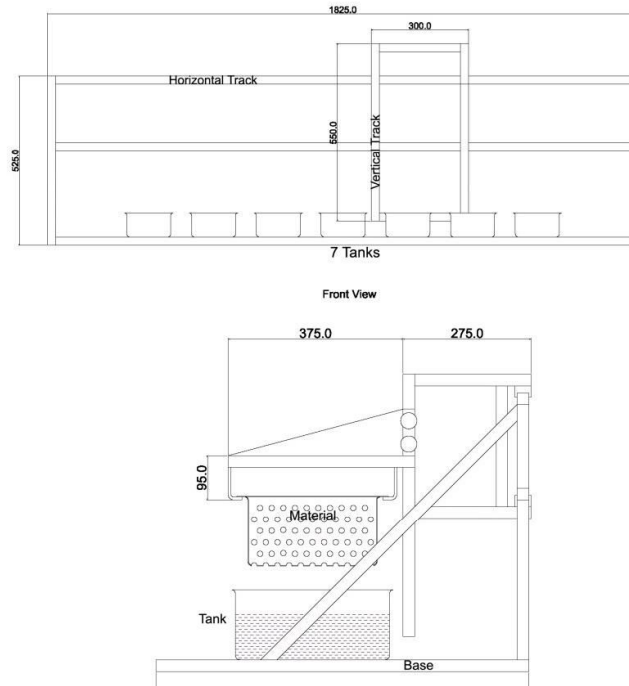
These motors are designed and manufactured by our adroit professionals using superior grade raw material and latest technology in adherence to industry standards. Furthermore, we offer these DC motors in different specifications at market-leading price to the clients. DC motors have the advantage of higher starting torque, quick starting and stopping, reversing, variable speeds with voltage input and they are easier and cheaper to control than AC-AC motor advantages include: lower power demand on start and minimal.

**Sensor :** In this project we are using PNP Proximity sensor for metal detector. This 8mm proximity sensor can detect a variety of metals, shielded type installation, anti-interference ability, 1mm detection distance, used for precise positioning of molds, precision machine tools and robots. In this project this proximity sensor is used as a metal detector. When the motor goes to horizontal direction the metal is fixed in some distance as tank position, at that time the metal detector (sensor) detects this metal and stops this horizontally movable motor and commands to the microcontroller for the next process.



**Limit Switch:** In this project the Limit switch is used for stop and reset the motor movement and gives reverse information to the Arduino then the motor will goosed to initial condition.

**Relay :** In this project the relay used as switch, it is used for motor control. One relay for forward and one is reverse horizontal movement control. In another two relays one is for up and one is down vertically movement control.



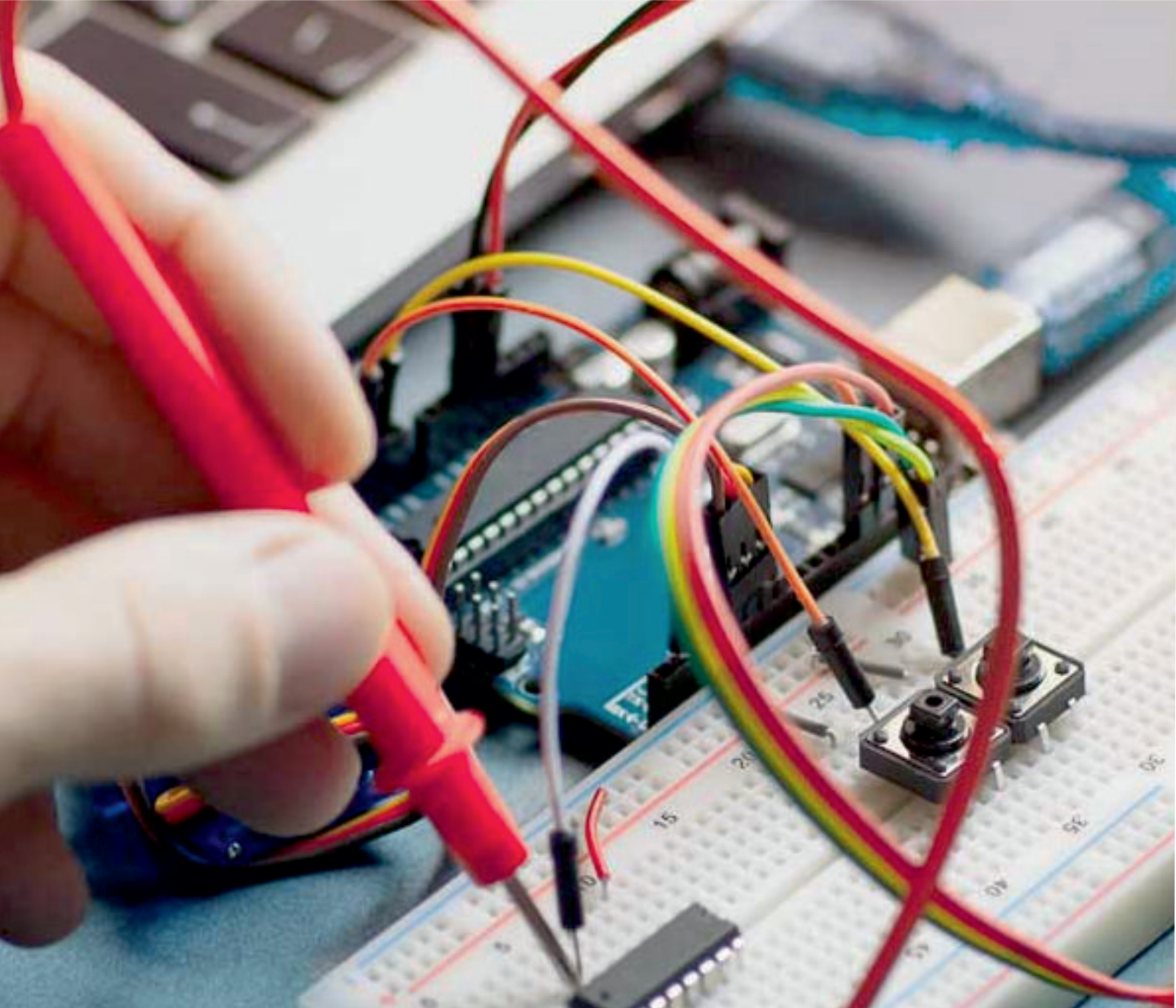
**Fig.4. : Front View And Side View Mechanical Structure Of Seven Tank Automation System**

#### IV. FUTURE SCOPE

- Automation has a major role in the automotive industries in India and many applications like painting, welding, machine tending and gluing are automated.
- Industrial automations involves the use of various control devices such as PLC, SCADA, PCs. These devices can be integrated with the existing systems without substantially disturbing others applications. These devices provide automatic control performance without human interventions.

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