

Design and Fabrication of Automatic Seven Tank Process of Pre-Treatment Before Powder Coating

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Abstract: Powder coating is a finishing process in which dry, free flowing, thermoplastic or thermoset powder material is applied to a surface, melted, and hardened into an even coating. Pretreatment means surface preparation. Here by pretreatment, we mean metal pretreatment as the powder coating is predominantly applied to metals. Surface preparation includes: Cleaning – mechanical or chemical Mechanical cleaning includes methods like scratch brushing and sand blasting. The process of pretreatment of a material is currently totally dependent upon manual labour and thus increases the cost of the project. By making the process automatic, the cost of the project can be substantially reduced. The conventional 7 tank process contains Degreasing, Derusting, Phosphating, Passivation and three water baths. The same process will be adopted in our process but instead PLC will be used to control and automate the entire project. The setup charges are considerable but it will be one time investment to the client.

Keywords: Powder coating, seven tank process.

1. Introduction

In the conventional system of Pre-Treatment of Powder Coating, the Metal Job is loaded and unloaded into 7 tanks manually.

Hence, the time, efforts, recurring cost of Labours is on higher side if we compare it to one-time investment of the setup. By using a PLC based fully Automatic 7 Tank Process

System, we can achieve the following benefits,

- Reduces the possibility of human error
- Higher productivity
- Higher product quality
- Cost reduction
- Saves time
- High performance

Hence, taking a Realtime problem from current scenario and converting it into fully smart & autonomous process to achieve the benefits mentioned above, is the main focus of selecting this topic for project.

2. Literature Review and Objective

A kind of durable powder coating without any solvent is a powder coating. It is commonly used in the metal industry because of its excellent application performance and ecofriendly usage. The use of powder coatings has been

introduced very rapidly in recent years, and the criteria for practical powder coatings have also been continuously improved. Pre-treatment prepares a component before powder coating is added to improve adhesion and corrosion resistance. Phosphating is a method of surface treatment by which the surface of virgin steel is converted into metallic phosphate and is commonly used before painting. Post treatment increases resistance to corrosion and humidity about two to tenfold when compared to conversion coatings without final rinses. Post-treatments are usually chromic acid-based.

Advantages of control panel that is based on a PLC controller can be presented in few basic points: Compared to conventional process control system, number of wires needed for connections is reduced. Consumption is greatly reduced because a PLC consumes less than a bunch of relays. Diagnostic functions of a PLC controller allow for fast and easy error detection. Change in operating sequence or application of a PLC controller to a different operating process can easily be accomplished by replacing a program through a console or using a PC software (not requiring changes in wiring, unless addition of some input or output device is required). It is cheaper compared to a conventional system, especially in cases where a large number of I/O instruments are needed and when operational functions are complex Reliability of a PLC is greater than that of an electromechanical relay or a timer.

3. Materials And Methods

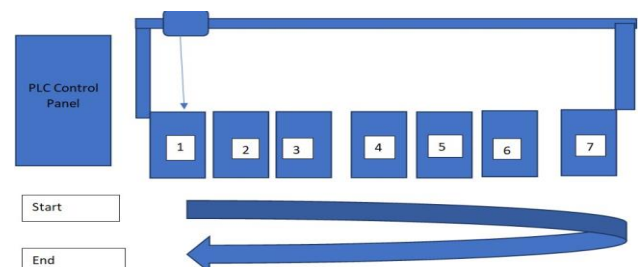


Fig. 1. Block diagram of the set-up

There will be a Gantry system (Vertical and Horizontal Motorized Slider) that will dip the loaded object to every Tank for predefined time.

The process of Dipping will be Serial & Time required for

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every Tank will be different. i.e., first the Object is loaded in Tank 1, the motor will slide to Tank 2, Then it will slide to Tank 3 and so on.

The Gantry will be having a Motorized Gripper for Holding the object properly.

The Tanks are as follows

Tank 1- Degreasing

Tank 2 - Water Bath

Tank 3- Derusting

Tank 4- Water Bath

Tank 5- Phosphating

Tank 6- Water Bath

Tank 7- Passivation

A. Operations via PLC

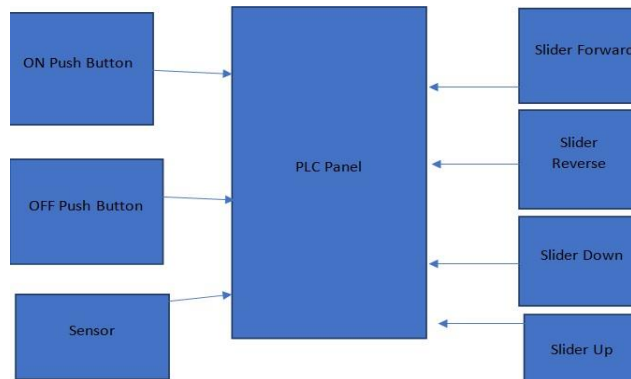


Fig. 2. Operations via PLC panel

The Programmable Logic Controller (PLC) will be programmed in such a way that it carries the entire process automatically. Just by the usage of two buttons (ON and OFF) the process can be initiated and ended. Apart from these there will be other buttons with functions as follows-

- Sensor- To sense the presence of Slider to return it back
- Slider Up- To move Up vertically

- Slider Down- To Move Slider downwards
- Slider left- Slider move left
- Slider Right- Slider move Right

4. Conclusion

Thus, we searched for a Real time Problem in the Industrial Manufacturing Process. We checked the Feasibility of the Project along with the Components lists and technical stuff.

We also implemented Mechatronics including Hardware & Software Programming which is in demand in current Industry. So, the system is completely built by using mechatronics and industrial technology that can automatically load and unload the industrial fabricated products in 7 tanks and get the Pretreatment process of Powder coating done thereby reducing the labour costs.

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