

AUTOMATIC SPRAY PAINTING MACHINE USING PLC OPERATED PNEUMATIC SPRAY GUN

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Abstract— This paper debriefs about the design of the paint machine involves the initial stages of concept design and their purposes. Different concepts of spray painting mechanisms, use of sensors and microcontroller which is PLC were decided and finally a specific one was chosen after evaluating them on the basis of complexity, ease of fabrication and simplicity. Then, a detailed design of the same was presented which includes individual features, specifications and CAD model presentation. With the advance in IT technology sensors and processing power exist to achieve fully automated programming in industrial tasks. This paper

Reports on the EU-project Fix Paint, which devised a methodology to automatically generate programs for spray painting of unknown parts. The Designed System is totally operated on PLC so there is No collision of Coding because PLC Execute the Code in Ladder. Demonstrations at industrial platform is as shown Fig1.

Key Words- Spray gun, Magnetic sensor, Compressor, Pneumatic system, Control strategy, PLC

1. INTRODUCTION

Spray painting machine is a kind of important and advanced spray equipment. It is widely used in automotive manufacturing. The Design of a Machine and the tool parameters can efficiently influence the quality of painting. In order to achieve the new spraying operation standards,

For painting ROBO and tool, Flow of Process is an active research for some years.

Automated tool path is the key technology in which robotic operation is done. At present, generating

In this system we have paint regular surface and uneven surface efficiently, achieved better results using this methodology, Also this project give replacement for traditional painting methods, reduce the tool cost, and optimize the human efforts. Due to the complex geometry of free-form surfaces, it is still a challenge to generate optimization trajectories of spray gun that satisfies paint uniformity requirements.

In existing system painting process is done by conveyor assembly, this system require man power to complete the process .Our system gives replacement for man power because in this system painting process is completely

automated, Hence it requires less man power, but disadvantage of this system is the required

2. HARDWARE DESIGN

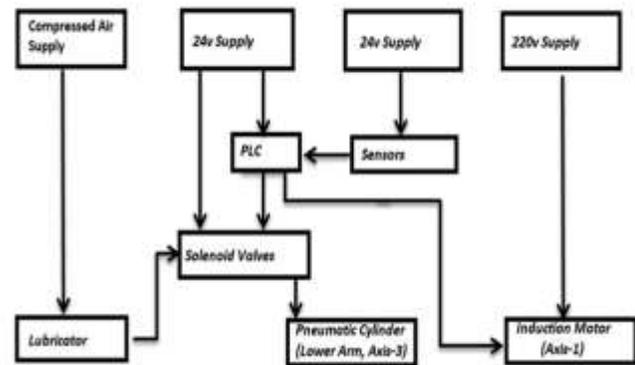


Fig.1: Block diagram for representation of system.

Due to this research this system attracts and gather industry as well as academic sector. Some researchers developed modelling methods to model the material deposition for the spraying processes, such as parabolic, Gaussian, Cauchy, and Beta models. Automated spray painting process is much more easier than traditional method which does not follow previous hierarchy but it gives better results as compared to traditional method in this system painting process is done by programmable logic control(PLC) and sensors, As Fig 2 indicates flow process as well as actual implementation of the system.

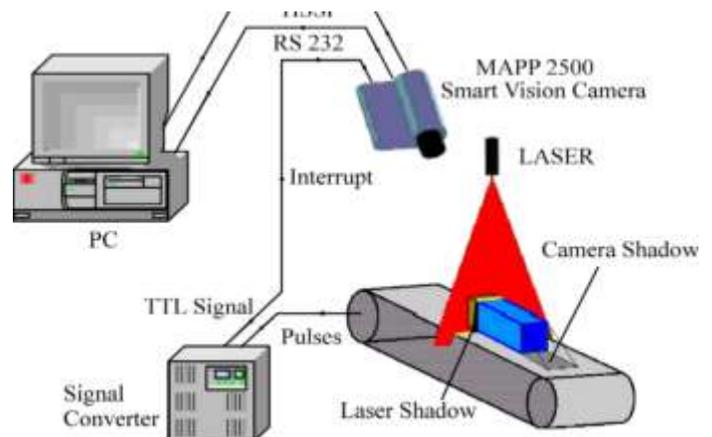




Fig.2 Developed System

. However, due to that the process is complex and very time consuming, their algorithms could not resolve robot trajectory optimization problem. The paint thickness function for free-form surfaces is not considered and the optimal time is not satisfying. In this development we have developed the system in which the painting is done in even quote if surface is uneven or rusted then also this system paint in even form and give the satisfactory output due to this rejection is reduced up to 0 % in minimal time it gives maximum production that means maximum number of painted products are done. This process completely follow the algorithm which is embedded in the code and shows the feedback on SCADA due to this we can track the current status of the system. Today conventional paint in processes are getting out of the scenario. Conventional spray processes are getting automated by use of PLC i.e. Programmable Logic Controller. CNC machines, Pneumatic spray machines, etc. are used for painting processes. In this Pneumatic spray machines using PLC is widely used because of their flexible nature. For transportation of one material from one location to other location conveyors are used. They can carry heavy weights from light weight to tones of material. For reducing human efforts convey are automated helping to create more efficient system. Due to conveyor belt the production increases and human efforts reduces that means it is inversely proportional to each other. In large scale industry there are number of conveyor belt which are continuously operated 24 hrs. For increased productivity. Manually it will take long time and thus increases the production cost.

3. CONDITIONS IMPOSED:

The paint tank needs to be filled completely before start of the cycle. For this purpose, a pre-defined time of 5 sec is set for filling up of tank. When paint tank achieves minimum level it gives a signal for operator it indicates that paint in the container is at its minimum level and needs to be refilled. In other words, the operator should immediately stop the operation and start filling the paint tank.

4. TECHNICAL DETAILS:

A PLC (Programmable Logic Controllers) is an industrial machine used to observe inputs and based on its logic or program, to control its outputs to automate a device or a process. In this system we are using PLC , SCADA and sensor and interfacing is done at controlling unit as well as programing is done in ladder network according to algorithm the system follows ladder network in programing timing and counting through digital or analog input/output module are done.



Fig 3: Developed System Connection

Name	Spray machine HCFME40
Dimensions	6.4*2*1.8m
Weight	1.5T
Max processing length	420mm
Max processing width	10-400mm
Max processing thickness	5-80mm
Feeding speed	5-25m/min
Feeding power	1.1kw
Fan power	1.5kw
Water pump power	0.5kw
Spray gun caliber	1.3mm
Air pressure	0.6mpa
Paint dosage	60-200g/m2
Air flow	2400L/min
Type of paint	UV,NC and water paint
The amount of paint used	60~200g/m2
Power supply	380v 50HZ

Table I Technical Details

5. Features:

- Automatic identification infrared sensor is provided to test the product's length and width. PLC adjusts spray gun's position automatically when the product's dimension are changeable.
- The automatic spray gun is imported from Japan originally-Iwata or Meiji spray gun. The spray gun's paint quantity and angles can be adjusted in advance. Each spray gun is control separately.
- Waste gas purification system is provided to release the waste gas created during the painting, which can protect the environment from pollution in a large extent.
- Stable paint supply is offered by a set high- capacity diaphragm pump and stabilizer to make the painting work more stable and paint change more convenience.
- The conveyor's speed can be frequency controlled to meet different painting requirements.
- The paint recovery device can recycle 70%-80% wasted painting in order to improve the paint's use ratio.

6. CONCLUSION

Recently there has been a huge growth in IT sectors and industry due to which electronic appliances are needed to be monitored for a long time, which were being controlled by computers. Being an easily understood programming language, most equipment's use PLC (Programmable logic controller) to connect with computers to monitor such consuming devices. A programmable logic controller (PLC) is an electronic device used in many sectors to monitor and control building systems and production processes. Unlike PCs and smartphones, which are designed to perform any number of roles, a PLC is designed to perform a single set of tasks. Industry today use PLC automation in an effort to reduce human effort and increase productivity and ultimately reduce the cost of the system, with the help of industrial dip painting system using **spray** gun and conveyor belt has helped to achieve an easy to use and effective system for automatic spray machines.

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