Automatic Spray Painting Machine

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*Abstract***:** *The intention of the automatic spray painting system is to solve the problem of automatic painting in small scale industries, and it is to avoid the lack of skilled labours in small scale industries. Here we provide automatic spray painting machine to solve the problem in small scale industries. In this project we have fabricated the automatic paint spraying equipment with conveyer for moving the work pieces. This system uses compressed air to spray the paint. It's a technology to paint the specimen using compressed air with paint, ink and varnish through air on to the surface. The paint particles are directed by the compressed air in the air compressor. The size of the spray particles are determined the airbrushes sizes and it also distinguishes the pattern of the sprayer. When we need to change the spray painter brushes and the pattern, it will be used for various applications like fine arts, painting nails and photo retouching. This system helps to increase production rate at a very low cost as it does not require any skilled labours.*

*Index Terms***:** *Belt conveyor, Sprayer, Dryer, Flow regulator, Sensor*

I. INTRODUCTION

In this paper deals with the automation of spray painting the objects passed on a conveyor thereby minimizing the human intervention and speeding up the process. The spray paint is the type of painting, using in automobile works like body building and other material handling industries. In the automobile works the spray painting mostly used in automobile fields, mainly in the parts of the automobiles and in the assembly lines. The painting on the parts will help to protect the parts from rust and it also help to give a color finish to the automobiles. By hand spraying, robot end effectors are replaced with multiple nozzles assembly system and it removes the initial costs. To increase the production in the assembly line, we need usual changes in the parts color. The spraying process is based on the structure and architecture of the automobile parts and it helps to the assembly line. When we do the spray painting, mostly the particles are misses the targets, and it creates pollutions in the atmosphere. The pollutions in the atmosphere make changes in the environment. The pollution from the engine will affect the life time of the automobiles also. When we doing the painting process, to make the reflectivity of the automobile parts we need to use orange peel, blistering etc. The body parts to be parallel to the body surface and it make the reflectivity increases.

The overall quality of the paint on the vehicle can play a major role in selection of a car for purchase. The automobile industry needs a solution to the spray painting problem. All the industries are invested huge amount to the machines for painting and the amounts are wasted. The main aim of the industries is to reduce the percentage of spray off. To increase the efficiency of the spray painting, we need to control the drop size and trajectories. For that we need to add instrumentation and computing technologies to the process. This advanced spray painting technologies increases the efficiency of the process and reduces the pollutions also. Use of this advanced spray technology would provide very large financial benefits to the automobile industry.

II. EXISTING SYSTEM

The main drawback of the existing system is to reduce or to convert the semi automatic system to automatic system. We make use of pick controller which controls the painting operation. The belt conveyor contains roller and belt. The one roller of the belt conveyor is connected to the motor. Another motor is attached above center of the conveyor. The motor shaft is coupled with a sprayer arrangement. The motor shaft rotates then the sprayer also rotates, using this rotation we can easily paint the specimen in all outer side. The end of the conveyor contains the dryer. The dryer is used to dry the painted spray paint in this equipment. The sensor is fixed center of the conveyor. The motor, sensor and dryer are linked to the control unit. The control unit has already programmed micro controller, the micro controller in the control unit controls the whole parts of this equipment. We place the specimen one side of the conveyor, and then the conveyor is switched on by the control unit. The specimen moves on the belt conveyor, the sensor sense the specimen and stop the conveyor then the spray painting arrangement rotates to paint the specimen. After finishing the painting operation the conveyor switched on and moves to the dryer area. The dryer area the specimen stopper few minutes then finished specimen moves out this conveyor. Using this equipment we can easily made the painting on the specimens.

III. WORKING MODEL

The 3D Model of the automatic spray machine as in the figure 1. In this, the technology for controlling the machine is electromagnetism. When the current passing through the device, the current carrying conductor generates a magnetic field and based on the polarity the motor is rotating and controlling the machine.

The motor is designed based on the harness of the magnetic interaction between a current carrying conductor and the external magnetic field. As the polarity changes, changes the directions of motor and it works.
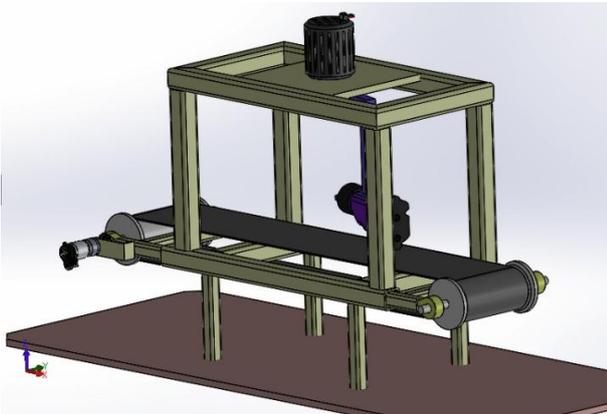

Fig. 1 Working Model (3D Model) of Automatic Spray Painter

IV. PROPOSED METHODOLOGY

The working principles of the automatic spray painter is as follows, the object sensor is used to identify the position of the object or the specimen we wants to spray. After identify the position, conveyor belt stop and the controller identify solenoid valve to adjust the position of the valve of the sprayer. After identify the solenoid valve position the controller control the DC Motor and the motor helps to spray the specimen.

The controller in the device is Microcontroller. Microcontroller is used for the overall controlling action of the automatic spray painting machine. The solenoid valve is used to change the position of the state of the valve that is used in the control flow of gas in the sprayer.

After the spraying operation, the dryer get a signal from control unit to dry the specimen. After the drying operation, the belt conveyor rotates and next specimen reaches the position. The process continues when we switch off the relay circuits. Based on the speed of the operation, the process to be continued and the based on the number of specimens the process stops the operations.
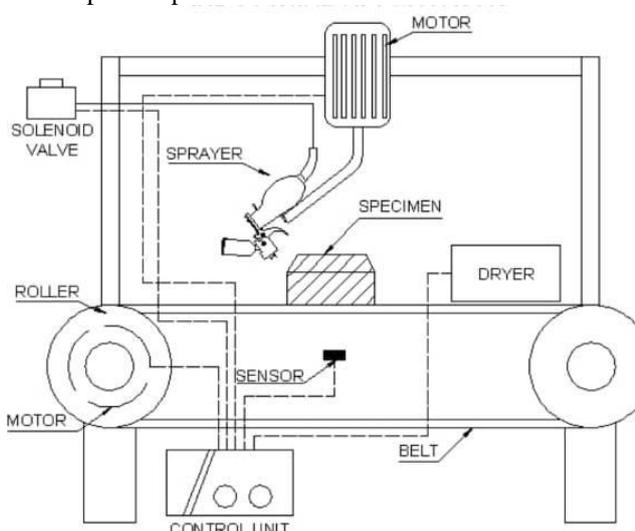

Fig 2.Components of Automatic Spray Painter

V. CONTROL SYSTEMS

A. Sensor control

- Photo electric proximity sensor is used to detect the object or specimen. It's consisted of a transmitter and a receiver, when the transmitter emits the lights and when the object is identify, it cut the receiver light. The output of the receiver is given to the controller unit.
- It's a 4-wire complementary sensor of NO and NC.

B. Control Unit

- The microcontroller is control the overall function of the automatic spray machine. The programming part of the machine is controlled and edited using embedded C programming.

C. Solenoid Valve Control

- Solenoid valve is an electromechanical valve which is helped to control the liquid or gas by running or stopping an electrical current through a solenoid. The solenoid valve consists of the coil of wire which helps to change the state the valve.
- The solenoid and the valve in the spray painter help to control the gas flow for the painter.
- It uses metal or rubber seals for easily control the opening and closing of the valve.

D. DC Motor Control

- The Motor used in the machine is to control the spraying operation of the sprayer and other motor in the conveyor is to help the controlling action of the conveyor. It helps the conveyor to run when the specimen gets painted.
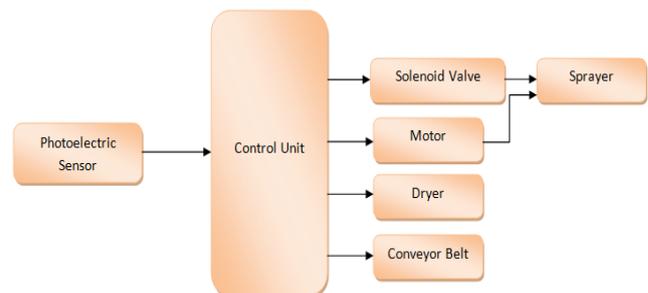

Fig 3.Block Representation of Automatic Spray Painter

VI. MODEL CALCULATIONS

i. *DC Motor Calculation:*

Speed N = 10 RPM

Voltage V = 12 VOLT

Watts P = 0.72 WATT = 0.000965 HP

ii. *Electrical Power Equation:*

Power $P = I \times V$

Where,

V = 12

P = 0.72watt

I=0.72/12

Current   I = 0.06 A

iii.   *Torque of the Motor:*

Torque = (P X 60) / (2 X 3.14 X N)

Torque = (0.72 X 60) / (2 X 3.14 X 10)

Torque = 0.6875 Nm

iv.   *Diameter of motor shaft:*

The shaft is made of mild steel and its allowable shear stress =42MPa

Torque = 3.14 x f_s x d^3 / 16

$6.875 \times 10^2 = 3.14 \times 42 \times d^3 / 16$

D = 4.368mm

The Nearest Standard Size (D) =5mm

VII.   RESULT AND DISCUSSION

The automatic spray painting machine will help in the industries to do spray painting very easily and it will be very useful for the industrial technological up gradation. We come to conclude that, automatic spray painting techniques to be reduces the overall cost of the spray painting system.

VIII.   CONCLUSION

The work carried out by us made an impressing mark in the field of painting department in manufacturing industries. It is very useful for the workers working in the painting department. This automatic spray painting system reduces the overall cost of the spray painting systems and it will help to perform the specific work with a short period of time.

ACKNOWLEDGMENT

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