Fabrication of Salt Spray Humidifier

Akshay Bhaguji Adhav[1] Achyut Sudhakar Akolkar[2] Nitin Anil Gulaskar[3] Akshay Sunildatta Kulkarni[4] Prashant Sarjerao Munfan[5]
[1,2,3,4]Student [5]Assistant Professor
[1,2,3,4,5]Department of Mechanical Engineering
[1,2,3,4,5]G.H.RAISONI C.O.E.& M., Ahmednagar

Abstract— In today's world, corrosion is the most important factor in the automobile sector. Many different methods have been developed to stop such corrosion. These methods differ in their theoretical basis and performance under the change in the various environment conditions. In this paper we review the fabrication of salt spray humidifier. We study here about the salt spray corrosion test, problems, future scope, methodology and objectives of salt spray humidifier etc. in this paper. Thermal corrosion Cycling is an innovative and cost effective process of enhancing the mechanical properties of many materials commonly used in commercial and industrial technologies. By using the salt spray humidifier, we can determine the corrosion rate of the materials or time taken to corrode the various materials. This can be used at various places such as sea water to check the corrosion resistance of the materials which are used their in sea water or in the ocean.

Key words: Salt Spray, Humidifier, Fabrication

I. Introduction

Corrosion is the deterioration of materials by chemical interaction with their environment. Humidity is the amount of water vapors present in the air [1]. Humidity indicates the likely hood of precipitation, dew or fog. Humidifier is a chamber where humidity generates [1]. It is a device for increasing the amount of water vapor in the air of a room or building, consisting of a container for water and vaporizer [1]. Thermal corrosion Cycling is an innovative and cost effective process of enhancing the mechanical properties of many materials commonly used in commercial and industrial technologies [2]. Thermal Cycling has been determined to significantly increase the corrosion properties of many ferrous alloys.

The salt spray test used to check the corrosion resistance which is a standardized test method [2]. Test duration depends on the corrosion resistance of the tested material. Nevertheless, salt spray test is widely used in the industrial sector for the evaluation of corrosion resistance of finished surfaces [3]. Nevertheless, salt spray test is widely used in the industrial sector for the evaluation of corrosion resistance of finished surfaces.

II. Problem Statement

Now-a-days, there are problems of corrosion on the different metal surfaces due to improper selection of materials [4]. Due to such corrosion of metals, machines or parts of it become of no use and because of such a corroded part accidents may occur & life of machines and instruments decreases [4]. To stop happening such cases, it is necessary to check the corrosion resistance of metals.

III. Scope

The machines have been designed to support human beings by helping them to do tedious and back breaking works. However, the industry has made only the limited use of high technology production concept. There is general need to nature the development program in automation and robotics. Machines have been employed in various tasks including material handling various interior and exterior finishing task, including material handling the high expectations of the stemmed from the very serious problems the industry is facing

- Continuous declining productivity
- A high accident rate.
- Low quality
- In sufficient control of construction site
- Vanishing of skilled work force.

In recent years the use of new technologies within the industry has shown great potential although little has been implemented. For example robotic systems and other programmable machines are needed to perform tasks that involve hazardous of rate or in some way physically dangerous to human the development of robotics systems in construction advance very slowly owing to several challenges one of the obstacles in the development of the required software component such development for highly trained programmer and export software engineers.

IV. Objectives

1) To fabricate the salt spray humidifier.
2) To do design of the nozzle.
3) To make analysis of the salt spray humidifier.
4) To take the test on salt spray humidifier.

V. Specifications

Parameters	
Metal sheet	G.I. SWG 18
Glass	Acrylic
Test chamber volume	250 litre
Overall L x W x H in mm (Approx.)	620 x 630 x 1170
Working space in mm (Approx.)	620 x 630 x 700
Control Unit Dimensions in mm	300 x 300
Salt solution tank volume	1 litre
Water supply for humidifier	Distilled water
Air pressure Range	0 to 3 kg/cm^2
Air Pressure least count	0.2 kg/cm^2
Temperature Sensor	J type
Temperature Sensor Range	0 to 750 ^{o}C
Temperature Controller	Thermocouple Type
Temperature Display	4 digit 8 segment LED

Operating Temp. Range	Ambient + 5 to 50 ºC
Temperature Accuracy	±1 ºC
Temperature Readability	1 ºC
Humidity Display	4 digit 8 segment LED
Humidity sensor type	SY HS 220
Humidity sensor Range	0 to 95%
Humidity Least count	1%
Electric supply	230V AC, 50 Hz, Single phase
Electric load	1.5 KW
Weight (Approx.)	20kg
Weight without solution (Approx.)	14kg
Heater	1500 W , Single phase

Table 1: Specifications

VI. EXPERIMENTAL SETUP

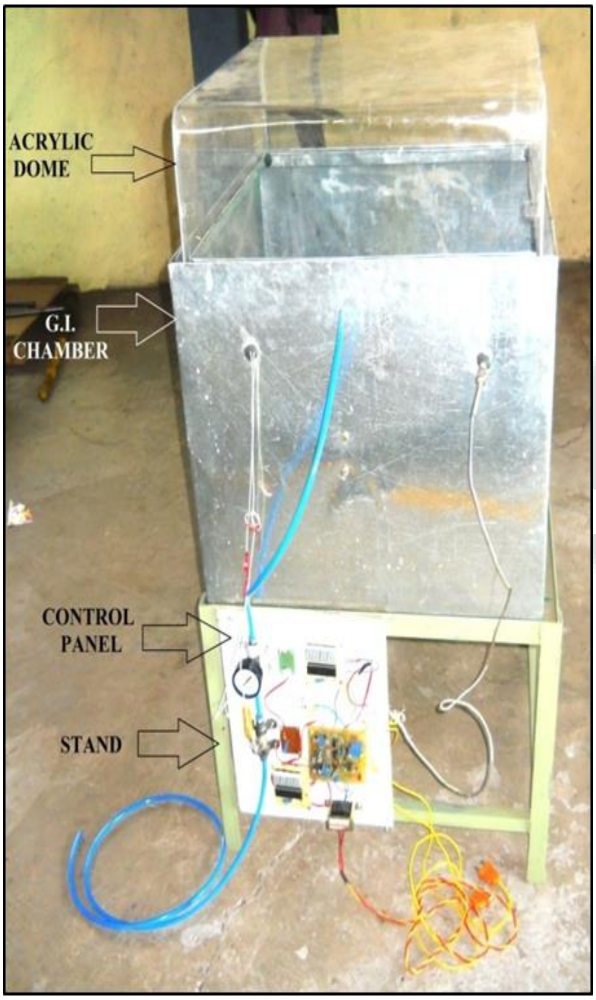

Fig. 1: Experimental Setup

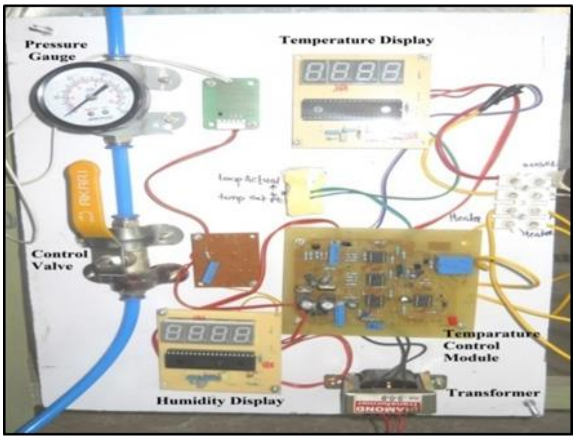

Fig. 2: Control Panel

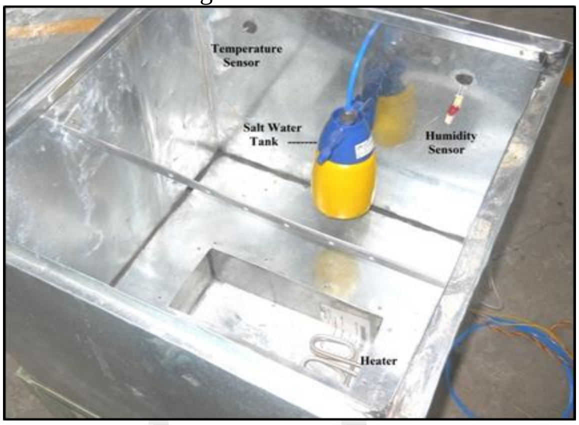

Fig. 3: Internal View of G.I. Chamber

1) Ensure the all electrical supply switched OFF.
2) Prepare the salt water which contains the 5% salt.
3) Fill the salt water in salt water tank.
4) Take the specimen which we have to check and measure their initial weights.
5) Fill the distilled water in heater tank.
6) Hang the specimen to the aluminium strip.
7) Connect all pneumatic connections of nozzle and pressure gauge.
8) Place the acrylic glass dome on the G.I. chamber and pore the water in gap between the Acrylic dome and G.I. chamber for purpose to resist the loss humidity.
9) Now switch ON electrical supply of control panel.
10) Set the required temperature by using controlling knob.
11) When chamber temperature reaches to required, start the supply of compressed air to nozzle.
12) Sprinkle the salt water spray till fog generates.
13) Repeat the sprinkle process after some interval of time.
14) Keep the setup running till desired observations get.

Refill the salt water tank and heater tank if required.

VII. OBSERVATION TABLE

Sr. No.	**Specimen**	**Initial Weight (mg)**	**Final Weight (mg)**	**Weight Loss (mg)**	**Area (cm^2)**	**Density (gm/cm^3)**	**Time (hr)**
1.	Nut	5000	4975	25	1.9721	7.85	240
2.	Bolt	24000	23926	74	21.9877	7.85	240
3.	Wisher	6000	5968	32	3.2673	7.85	240
4.	Nail	34000	33917	83	15.5194	7.85	240
5.	Nut with copper plating	5000	4996	4	1.9721	8.96	240
6.	Bolt With copper plating	24000	23992	8	21.9877	8.96	240
7.	Wisher with copper plating	6000	5995	5	3.2673	8.96	240

Table 1: Observation Table

VIII. FORMULA

Corrosion Rate$\left(\frac{mm}{year}\right)$ = 87.6 x $\left(\frac{W}{DAT}\right)$

Where, W = weight loss in mg,
D = Metal density in gm/cm^3,
A = Area of sample in cm^2,
T = Time of exposure of metal sample in hrs.

IX. SAMPLE CALCULATIONS

A. *Corrosion Rate for Nut*

Corrosion Rate ($\frac{mm}{year}$) = 87.6 x ($\frac{25}{7.85 \text{ X } 1.9721 \text{ X } 240}$)

$= \frac{87.6 \text{ X } 25}{3715.4364}$

Corrosion Rate = 0.5894 mm/year

B. *Corrosion Rate for Bolt*

Corrosion Rate ($\frac{mm}{year}$) = 87.6 x ($\frac{74}{7.85 \text{ X } 21.9877 \text{ X } 240}$)

$= \frac{87.6 \text{ X } 74}{41410.32}$

Corrosion Rate = 0.1565 mm/year

X. ADVANTAGES

- Operating cost is low
- Maintenance is low
- We can find the corrosion resistance of various materials, alloys and coatings
- Easy to operate
- We can calculate corrosion rate.

XI. DISADVANTAGES

- More time required to perform.

XII. APPLICATIONS

Typical coatings that can be evaluated with this method are:

- Phosphated (pre-treated) Surfaces
- Zinc and zinc alloy plating
- Electroplated chromium, nickel, copper, tin
- Coatings not applied electrolytically, such as zinc flake coatings according to ISO 10683
- Organic coatings, such as rust preventives
- Paint Coating

XIII. RESULTS

(a) Before Test (b) After Test

Table 2: Results

XIV. RESULT TABLE

Sr. No.	Specimen	Weight Loss (mg)	Corrosion Rate (mm/year)
1.	Nut	25	0.5894
2.	Bolt	74	0.1565
3.	Wisher	32	0.4554
4.	Nail	83	0.2486
5.	Nut with copper plating	4	0.0826
6.	Bolt With copper plating	8	0.0148
7.	Wisher with copper plating	5	0.0623

Table 3: Result Table

XV. CONCLUSION

From this project we conclude that we can find out the corrosion rate of various materials. We can make some prevention to stop corrosion of such materials. We can test various coating of metals on part which will corrode. Because of such test, we can able to decide which coating is best for corrosion resistance. And we can stop that material to be corroded. We can stop accidents which are happening because of corrosion. This is really good method to find out corrosion resistance.

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