Salt Spray Corrosion Test Chamber

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Abstract **-** The main aim of this project is to design and fabricate low cost salt spray testing machine which is able to identify the corrosion formation in any type of metals; from this testing process we can improvise the life span of the particular metal. A motorbike has a paint coated footrest made of stainless steel, so this part when comes in contact with atmosphere nearly after a year it is corroded so if salt spray testing machine is used at this point can found out that for additional coating of paint, whether it will withstand up to longer duration likewise, this process can be analyzed. This salt spray testing machine is fabricated for low cost and the stainless steel grade 316L is tested and analyzed.

Keyword: *Corrosion Chamber, Coating, Design, Analysis Etc.*

I. INTRODUCTION

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. Thermal Cycling has been determined to significantly increase the corrosion properties of many ferrous alloys. The salt spray test is a standardized test method used to check corrosion resistance. Salt spray testing is an accelerated corrosion test that produces a corrosive attack to the tested samples. The appearance of corrosion products (oxides) is evaluated after a period of time. Test duration depends on the corrosion resistance of the tested material. Salt spray testing is popular because it is well standardized and reasonably repeatable. The correlation between the duration in salt spray test and the expected life of a material is not necessary simple to interpret as corrosion is a very complicated process and can be influenced by many external factors. Nevertheless, salt spray test is widely used in the industrial sector for the evaluation of corrosion resistance of finished surfaces.

A. Objective

1) Make chamber in compact size.
2) Reduce the cost of machine.
3) Make effectively and easy handling.
4) Perform in more realistic way.

B. Problem Statement

1) Cost of testing chamber is very high and it require highly trained operator.
2) In size it is very bulky. Also it takes high maintenance and that's why its affect on working of chamber.
3) It not provides conformity with natural outdoor corrosion conditions.

C. Future Scope

Above system will use for simulating atoms passerine condition switch will be required for taking life tests for spares used in any mechanical or automobile industry. From this corrosion mechanism the opted out the materials which can also are used in automotive, marine, even in day to day life. It always never deals with the automotive parts or marine parts but also the materials that are in regular use such as knife, building construction tools, pipes etc. So from this mechanism we can just extend the life of the materials or specimen or automotive parts.

II. CORROSION TESTING

The corrosion testing is intended to be a more realistic way to perform salt spray tests than traditional, steady state exposures. Because actual atmospheric exposures usually include both wet and dry conditions, it makes sense to pattern accelerated laboratory tests after se natural conditions. Research indicates that, with corrosion tests, relative corrosion rates, structure and morphology are more similar to those seen outdoors. Consequently, tests usually give better correlation to outdoors than conventional salt spray tests. They are effective for evaluating a variety of corrosion mechanisms, including general, galvanic, and crevice corrosion. Corrosion testing is intended to produce failures representative of type found in outdoor corrosive environments. CCT tests expose specimens to a series of different environments in a repetitive cycle. Simple exposures like prehension may consist of cycling between salt fog and dry conditions. More sophisticated automotive methods call for multistep cycles that may incorporate immersion, humidity, condensation, along with salt fog and dry-off. Originally, se automotive test procedures were designed to be performed by hand. Laboratory personnel manually moved samples from salt spray chambers to humidity chambers to drying racks, etc. More recently, microprocessor controlled chambers have been used to automate se exposures and reduce variability.

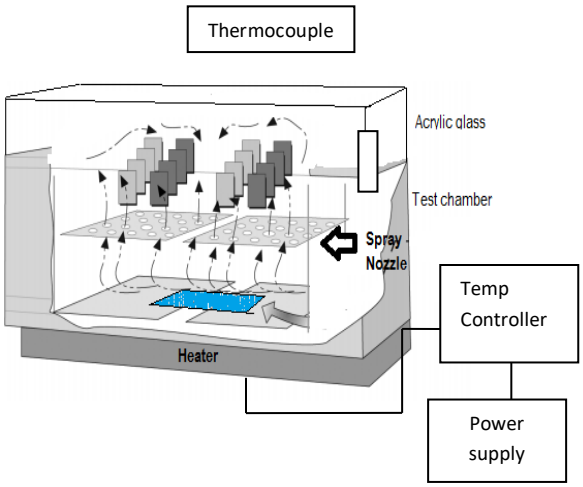

Fig. 1 Block Diagram of corrosion chamber

III. TECHNICAL DATA

A. Approximate done should be if unit

1) Width =200mm
2) Height=300mm
3) Depth=450mm

B. Main supply -230v AC at 50 hz

C. Important factors

1) *Compressor air*: 4.6 bar above atmospheric pressure.
2) *Water supply connection*: 1-3 bars above atmospheric pressure
3) *Specimen holder tray*: Specimen holder to is located inside corrosion chamber in such a way i.e. it will be a net which will be suitable to provide moisture to tally
4) *Material of chamber*: Used for chamber will be properly painted or powder coated so as to avoid corrosion effect salt
5) *About spray nozzle*: Spray nozzle is key point of system. It is used for spraying moisture in test chamber.

IV. DESIGN AND MANUFACTURING

A. Operations Involved

1) Turning
2) Facing (flat surface)
3) Drilling
4) Gas cutting
5) Shaping
6) Welding
7) Tapping
8) Thread cutting

B. List of parts which affects on Testing

1) *Process* Transducer: Transducer converts one form of energy into another form. In our case the physical energy is to be converted into an electrical signal.
2) *Analog Signal Conditioning*:In analog signal conditioning operational amplifiers are used. The electrically received from the transducer is converted to a proper range.
3) *Spray Nozzle*: A spray nozzle is a precision device that facilitates dispersion of liquid into a spray.
4) Relay: A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch
5) *Pressure Regulator*: Pressure regulating components are formed by various components, each of which has its own pneumatic symbol
6) *Power Supply*: Power supply is the first and the most important part of our project. For chamber we require +5v regulated power supply with maximum current rating 500 mA
7) *Rectifier Unit*: Rectifier unit is a circuit. Which converts A.C. into pulsating D.C

V. TESTING AND TROUBLESHOOTING

1) Check that component agree with the parts list (value and power of resistors, value and voltage rating of capacitor, etc.) if in any doubt double check the polarized components (diodes, capacitor, rectifiers etc).
2) Check the continuity of the tracks on the PCB (and through plated holes with double sided boards) with a resistance meter or continuity tester.
3) Make a wiring diagram if the layout involves lots of wires spread out in all directions.
4) Do not reuse wire unless it is of good quality. Cut off the ends and strip it a new.
5) Inspect all soldered joints by eye or using a magnifying glass and check them with a continuity tester. Make sure there are no dry joints and no tracks are short circuited by poor soldering Check all ICs in their sockets (see that there are no pins bent under any ICs, no near ICs are interchanged etc.)
6) Check all the polarized components (diodes, capacitor etc) are fitted correctly.
7) Check that the connections to the earth are there and that they are of good contact.
8) Recheck everything suggested so far.
9) Re-read the article carefully and carefully anything about which you are doubtful.
10) Check currents (generally they are stated on the circuit diagram or in the text). Don't be too quick to suspect the ICs of overheating.
11) And don't forget to switch the power on and check the fuses

VI. METHODOLOGY

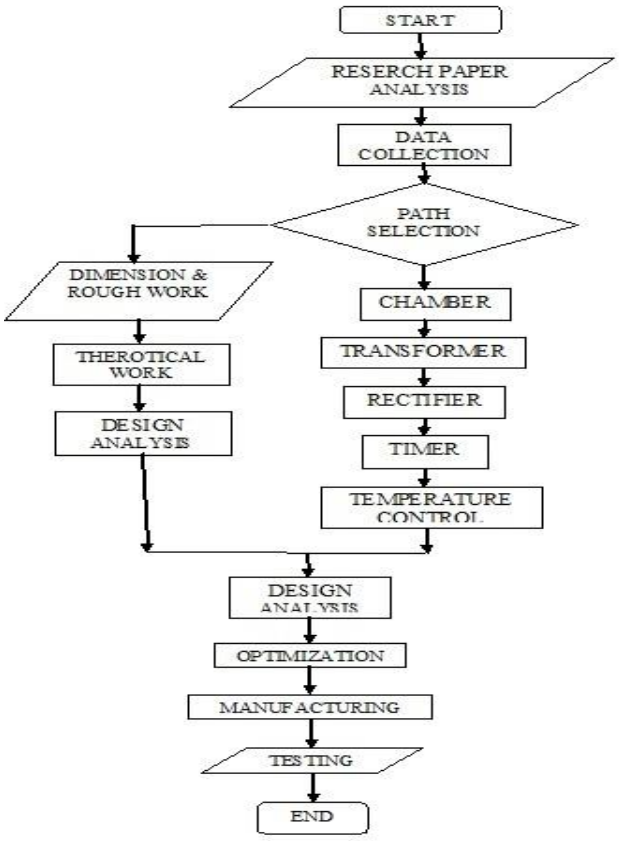

Fig. 2 Flowchart of Methodology

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REFERENCES

[1] SathishKumar.M , "Fabrication of Low cost Salt spray Chamber For Testing Corrosion Resistance of Materials ", Mechanical Department, SNS College of Engineering, Coimbatore, Tamil Nadu, India IJRSI Volume V, Issue IV, ISSN 2321–2705, April 2018 1-3

[2] Lei Pan , "Galvanic corrosion protection and durability of polyaniline-reinforced epoxy adhesive for bond-riveted joints in AA5083/Cf/Epoxy laminates ", College of Material Science and Technology, Nanjing University of Aeronautics and Astronautics, 210016 Nanjing, China, Materials and Design 160 2018 1106–1116

[3]Frederico Augusto PiresFernandes, "Corrosion Behavior of Plasma Nitrided and NitrocarburisedSupermartensitic Stainless Steel", Department of Mechanical and Materials Engineering, Portland State University, Portland, Materials Research. 2018; 1-9

[4] C. A. Loto "Electrochemical corrosion resistance and susceptibility of 12Cr martensitic stainless steel in H2SO4 1Department of Mechanical Engineering, Covenant University, Canaan Land, Ota, NigeriaJournal of Chemical and Pharmaceutical Research, 2015 39-48

[5] Ankit Bhatia et.al "Effect of Salt Spray Testing on En19 & En8d Alloy Steel",PG Student, Green Hills Engineering College Solan, Himachal Pradesh, India International Journal of Engineering Research-Online Vol.3., Issue.5., 2015 165-169