Radiator and Evaporator Leak Testing Machine

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ABSTRACT

This machine is manufactured as per the customer's requirement and specific testing need. As the component is some form of a casting tube like structure which is leak tested. For this specific purpose and requirement of Leak Testing Machine the industry will train in terms of design and manufacturing of whole machine. Testing method was the most important consideration. For which Testing method is selected according to the applications of component. According to the first meeting with the customer the specified the component details that the component is an aluminum casting and should be leak tested. As it is a casting component not a machined component, if a crack is detected on a casting component then it is of no use as casted component cannot be welded or machined to fill the crack. For this purpose, dry leak test method is appropriate. As customer just needs to notify that the component has a crack. So, dry testing method is appropriate. When company needs to detect the location of the leakage of the component then use the wet leakage testing method. Whenever need to check leakage of radiator it's possible to anywhere. When engine is overheated then radiator will be used for cooling the engine but the radiator not ok so its possibility of engine block.

Keywords :– *Casting component, Crack, Dry leak test, Location of leakage, Overheated*

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1. INTRODUCTION

Raw material of radiator (copper and brass stripes) comes in industry which is stored in the warehouse. These materials are kept in a safer place away from other machinery and sharpen material which may damage raw materials. The raw material contains copper and brass stripes, which are mainly used to manufacture radiator because it can be repaired easily.

First of all the radiator core is manufacture in industry which is main part of radiator. The brass stripes from the warehouse is send to Tinning machine which coats them in tin, the tin layer on the strips is around 0.2 to 0.3 micron after the completion of Tinning process. The brass stripes are coated with tin because after the bending of tubes from the brass stripes there remains a gap between metal surfaces which is filled by melting of the tin in furnace. The roll of lead tube is switch over the Single tinning tube mill radiator machine. The machine is programmed to bend the corrugated brass metal stripe in required dimensions as per the requirement of the customer with the help of sensor the tube is cut by machine in equal length as per the size of radiator core. This tube should be accurate so that while in assembly of radiator it can be fitted through the fins of radiator core. Along with the production of tubes the fins of radiator is produced. The fins of the radiator are produced in Standard Flat Fin Machine.

This Machine consists of a cylindrical die which rotates in circular motion with the help of motor. The testing machines differ considerably in procedure, purpose, nature and even terminology in different branches of machine building. Tests are made in factories and while the machines is in operation. The purpose of the trial determines whether acceptance tests, check tests or research tests are made. All branches of machine building test models or full-scale machines of new designs and random samples from assembly lines; they also test machines to continue research. Automobile Radiator are becoming highly power-packed with increasing power to weight or volume ratio. Increased demand on power packed radiators, which can dissipate maximum amount of heat for any given space. For over 70 year now, small change has occurred to the design and manufacturing of automobile radiator.

Radiator is a heat exchanger that removes heat from engine coolant passing through it. Heat is transferred from hot coolant to outside air. Radiator assembly consists of three main parts core, inlet tank and outlet tank. Core has two sets of passage, a set of tubes and a set of fins. Coolant flows through tubes and air flows between fins. The hot coolant sends heat through tubes to fins. Outside air passing between fins pickups and carries away heat. Performance of radiator is influenced by factors like air and coolant mass flow rate, air inlet temperature, coolant fluid, fin type, fin pitch, tube type and tube pitch etc. While designing cooling system three worst conditions considered based on above parameters.

2. CURRENT SCENARIO

In Industries, components and systems are tested to ensure that there are no leakages. As some components are used for high precision application so they must able to sustain their accuracy at that level. This Leak Testing Machine it is specially designed for leak testing of a particular component. The Basic Functions of any Leak Testing Machine are detection of leakage location.

There are certain problems which are associated with the parts of the components ,i.e. crack, dent, and bend instructions. From which some of the components which will work against high pressure must be leak tested first. Leak Testing is a crucial quality assurance process- leaky parts that slip through the cracks lead to problems down the line or warranty claims. But company often lacks the expertise and the tools to ensure a consistently reliable seal between the part and test station. This can show test results, allow faulty parts to pass and fail perfectly well once and erode confidence in the leak test system even if it isn't the source of the problem

3. Methodology

The design of Radiator and Evaporator Leak Testing Machine is carried out in systematic way. The following is a detailed analysis of each step

Step 1: **Input Study**

This is the first step and involves gathering and analyzing the information. It collects all relevant data and assemble it for evaluation and summarizing. The main sources of information are current market and trends. Complete, accurate data allows designers in identifying, finalizing the specifications required of the end product.

Step 2: **Data Analysis**

Analyzing all the data; the collected data was right or wrong. With the help of project guide and teachers and by others experts. Also looking for any problems arising in this process.

Step 3: **Model concept and Project design.**

Understand the data and model with the study of research papers. Consider the small things about project. There are various designing software but we preferred the solid work software and then make design the model in that software.

Step 4: **Design Analysis**

Designing of a model that has a practically implemented design and also satisfying the need of the project was to be made and analyzed if there were any problems in the design. Also if there were any changes that were to be suggested by the guide they were to be done.

Step 5: **Costing of the project and selection of proper material.**

After the finalization of the design we needed to look for the suitable material which would be satisfactory for the project and also which was cost effective and could be available in less amount of time in local area

Step 6: **Manufacturing of the Project**

Once the project material is finalized and available we start with the manufacturing phase of the project. All the worl is divide among the group members and the manufacturing part is started accordingly.

Step 7: **Testing**

After the manufacturing part is done then the project is ready to be tested for the actual condition of the customer requirement. It is important that the project satisfies the objectives of the project. The major is customer satisfaction and solving of problem after utilization of the project.

Step 8: **Documentation**

After all the manufacturing part and testing part we move to the documentation part such as the reports for the project.

4. Testes options to check leaks.

- **Air or Dry Testing-** This method is most used for the testing any enclosed component. In this method, the component to be tested is first fully enclosed and pressurized air is passed through it, the pressurized air in the component is checked through the 'COSMO LSR 700'. It is noted that if the pressure increases uniformly in the enclosed component, that means the component is okay. But if the pressure suddenly drops that means the component has a crack, then the component is rejected
- **Water or Wet Testing-** This method is used as is a secondary method of testing any enclosed component. In this method the component to be tested is first fully closed and a pressurized air is passed through it as like dry testing the pressurized air in the component. After that component deep in water tank which is held below the working table. It is noted that if the pressure increases uniformly in the enclosed component, that means the component is okay. But if the pressure suddenly drops and bubbles occur that means the component has a crack, then the component is rejected.

5. Construction.

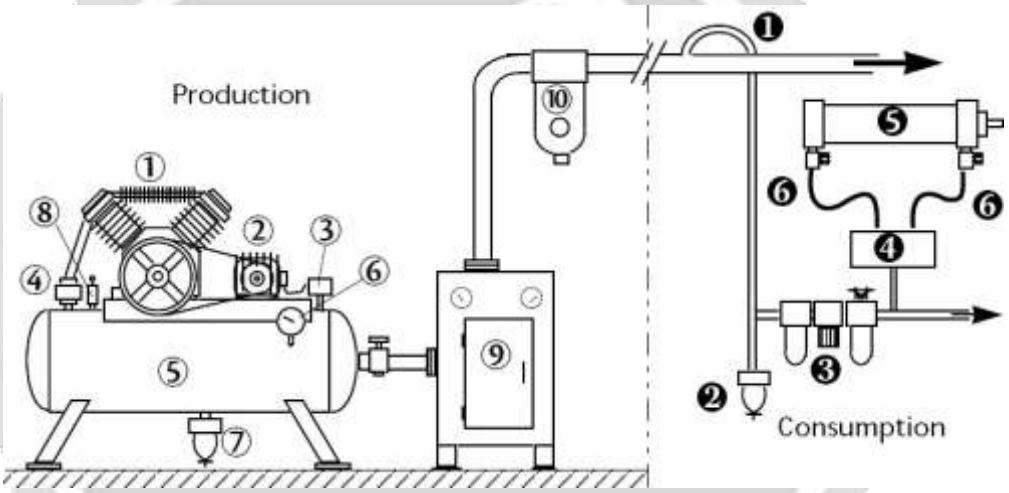


Fig. 4.1 Basic Pneumatic System.

The component parts and their main functions are:

a) **Compressor:** Air taken in at atmospheric pressure is compressed and delivered at a higher pressure to the pneumatic system. It thus transforms mechanical energy into pneumatic energy.

b) **Electric Motor:** Supplies the mechanical power to the compressor. It transforms electrical energy into mechanical energy.

c) **Pressure Switch:** Controls the electric motor by sensing the pressure in the tank. It is set to a maximum pressure at which it stops the motor, and a minimum pressure at which it restarts it.

d) **Check Valve:** Lets the compressed air from the compressor into the tank andprevents it leaking back when the compressor is stopped.

e) **Tank:** Stores the compressed air. Its size is defined by the capacity of the compressor. The larger the volume, the longer the intervals between compressor runs.

f) **Pressure Gauge:** Indicates the Tank Pressure.

g) **Auto Drain:** Drains all the water condensing in the tank without supervision.

h) **Safety Valve:** Blows compressed air off if the pressure in the tank should rise above the allowed pressure.

i) **Refrigerated Air Dryer:** Cools the compressed air to a few degrees above freezing point and condenses most of the air humidity. This avoids having water in the downstream system.

j) **Line Filter:** Being in the main pipe, this filter must have a minimal pressuredrop and the capability of oil mist removal. It helps to keep the line free fromdust, water and oil.

We used pneumatic system, as it has some advantages over the hydraulic system. There is no need for fluid replenishment. Light tubing/piping is sufficient. There is no fire hazard. But in our pneumatic system, we have used air as a working fluid. Because air has the some advantages over the other gases. Properties of air are verysuitable for pneumatic system.

6. Bubble test & establishing operative conditions for bubble and foam testing.

The bubble emission method requires a gas pressure differential to be established across the pressure boundary to be tested. A test liquid is placed in contact with the lower pressure side of the pressure boundary. Gas leakage through the pressure boundary can then be detected by observation of bubbles formed in the detection liquid or liquid film at the exit points of leakage through the pressure boundary. This method provides immediate indications of the existence and location of large leaks (10-2 to 10-4 mbar-L/s). Longer inspection times may be needed for the detection of small leaks (10-4 to 10-5 mbar-L /s). In bubble testing, the probing medium is the gas that flows through the leak due to the pressure differential. The test indication is the formation of visible bubbles at the exit point of the leak. Rate of bubble formation, size of bubbles formed, and rate of growth in size of individual bubbles provide the means for estimating the size of leak. Bubble tests are often classified according to the test liquid and means of application. In the liquid immersion ("dunking") technique, the pressurized test system is submerged in the test medium. In the liquid film application method, a thin layer of the test medium is flowed over the lowpressure surface of the object. For large leaks, a foam blanket is established by the applied liquid; the rapid escape of gas through this blanket blow through the blanket and reveals the location of the leak

- **Typical applications of Bubble testing:**

Bubble testing for leak location is one of the most widely used non-destructive tests because its simplicity permits its use by workers with minimal training. On an elementary scale, bubble tests can be used for testing connections on domestic propane systems, or for testing tire inner tubes in a soapy bath. For small vessels, it is appropriate to pressurize the entire vessel, and coat all welds with a detecting medium. For larger vessels, and for welds in piping, it is possible to coat the inspected area with bubble solution, and then use a vacuum box to create the pressure differential. Active pressurized piping joints and connections in the vessel can be examined by coating individual or suspect welds when the vessel is operating at a pressure greater than the external pressure. Heavier structures, such as those used in hydro power installations, can be examined using this method. In this case, a vacuum box is needed to create the pressure differential and the welds are examined in short sections, section length being related to the size of the vacuum box.

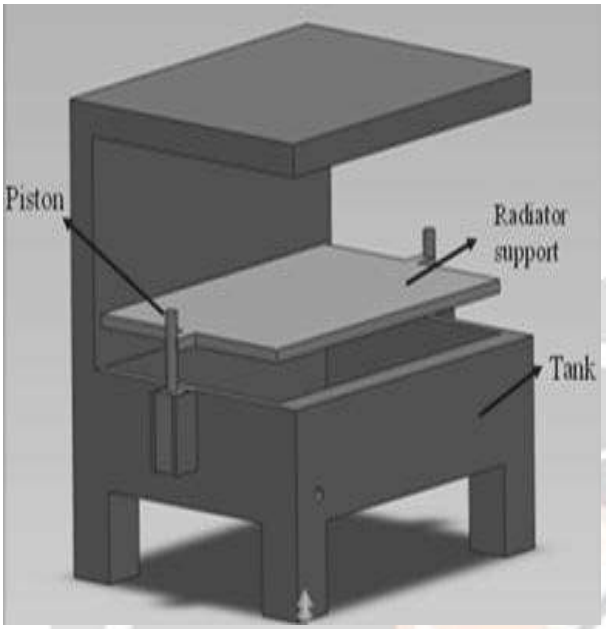
- **Advantages of Bubble testing:**

The advantages of bubble leak testing relate to its simplicity, rapidity and economy. It is a fairly sensitive leak detection technique and enables the inspector to locate the exit points of leaks very accurately. Another advantage is that it readily detects very large leaks, yet provides rapid responses for small leaks. It is not necessary to move a probe or sniffer over the surface being inspected. Often it permits the examination of the entire pressurized component to be inspected simultaneously. Immersion testing permits independent location of individual leaks. Leaks detected by this technique are real leaks, as opposed to the virtual leaks found in acoustic tests.

- **Limitations of Bubble testing:**

Conditions that interfere with bubble testing are contamination of the test specimen surfaces, improper temperatures of test specimens, contaminated or foaming test liquids, improper viscosities of test liquids, excessive vacuum over surface of test liquid, and low surface tension of the test liquid which leads to clogging of leaks. Prior bubble testing in general can clog leaks or lower the sensitivity of subsequent leak testing by more sensitive methods. For the immersion or dunk testing technique, the handling of the test item is important. Small components can be easily submerged, and very little pressure difference is sufficient, however larger heavy objects cannot be practically tested by this method.

7. Pictorial Representation.



Concept of Radiator and Evaporator leak testing machine. Radiator deep in water

8. CONCLUSION

In this project, we feel quite fulfill in having completed the project assignment well on time, we had enormous practical experience on fulfillment of the manufacturing schedules of the working project model. We are therefore, happy to state that the in calculation of mechanical aptitude proved to be a very useful purpose. Although the design criterions imposed challenging problems which, however were overcome by us due to availability of good reference books. The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of problem. Needless to emphasis here that we had lift no stone unturned in our potential efforts during machining, fabrication and assembly work of the fixture project model to our entire satisfaction.

9. REFERENCE PAPERS

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