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Implementation Towards Radiator & Evaporator Leak Testing Machine

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ABSTRACT: Radiator is equipment which helps engine to cool down by heat transfer of engine heat to coolant & from coolant to the atmosphere. Radiators are used to cool large size engines. A water jacket is provided around which the coolant is provided so due to heat realized from the engine the coolant gets heated up & is cooled down by the radiator. The problems occurring during the assembly or during the manufacturing process. In this project we design a pneumatic circuit for the leakage testing machine. For the designing of the pneumatic circuit, we used the various components like pneumatic compressor unit, toggle operated 5/2 Direction Control Valve, hose, fittings and Double acting cylinder. In this project, we have finalized the design for cylinder. The piston is used for generating the up and down movement of the platform which will bear the loads of the various radiators, which are selected for leakage testing. The piston movement is controlled with the help of the pneumatic circuit. The designs for the tank and platform have been finalized. The theory regarding it has been finalized and the design will be confirmed as the final part of this procedure. The main objective of the project was to design and manufacture special purpose leak testing machine.

KEYWORDS: Text detection, Inpainting, Morphological operations, Connected component labelling.

I. 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. There are many different types of machinery and process use to manufacture a copper and brass radiator. 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. According to the design and type of tubes used in radiator, the pattern on the fins is decided. The die for the fin machine is created according to the required pattern on the fins. one end of machine the copper strip roll is set and the strip goes from different rolling dies and comes out with pattern printed on it and with the help of sensor it is cut into required length. Now the two header plates will be produced in a hydraulic press. The header plate consist of a pattern same to the pattern on the fins. The pattern on fins and header plate is made to pass the tubes through them.

The ram of the press consist of a punch and a die is kept below the punch, when the ram comes down the metal plate between the punch and the die gets pattern of punch on it. The metal used is thick because header plate is used to hold the radiator core firmly and fixed on one place. Now when tubes, fins and header plates are produced they are to be assembled on a jig to form a radiator core. The fins are kept on the jig and it is checked that each and every hole of the



tube is aligned or not because if one of the fin is not in alignment while poring the tubes through them the whole core becomes a piece of waste. After pouring all the tubes through the fins it is ready to send to the baking department of the industry. The baking department consists of a shouldering tub and a low capacity furnace. First the radiator core is dipped into the shouldering tub; it contains shouldering iron which helps to fill the tiny holes or cavity in the core. Now after shouldering the core it is put in the furnace, the temperature in the furnace is about 350°C; the shouldering metal melts and fills the tiny holes of the cavities in the core. After taking the core out of the furnace, it is sent to the testing department, hears it is filled with pressurized air and kept in water for few minutes. If air bubbles come out the leak is repaired and then tested again. The cores passed from the testing department are now fitted with the header plates, top tank and bottom tank. Now the radiator is ready to be used for cooling the large capacity engines and the manufacturer gives a one-year warranty to the customer. 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 years now, small change has occurred to the design and manufacturing of automobile radiator. However, cheaper and better advanced designs of radiators are available to industries. etc.

Paper is organized as follows. Section II describes automatic text detection using morphological operations, connected component analysis and set of selection or rejection criteria. The flow diagram represents the step of the algorithm. After detection of text, how text region is filled using an Inpainting technique that is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

II. RELATED WORK

Prof. Prashant Vavhal, has work on, Design and Assembly of Special Purpose Leak Testing Machine, according to his work, As title suggests it is Special Purpose Machine (SPM). 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 to be precisely leak tested. For this specific purpose and requirement of Special Purpose Leak Testing Machine the industry will train us 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 their 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. He is not interested where the crack is. So, dry testing method is appropriate. The main objective of the project was to design and manufacture special purpose leak testing machine [1].

Prof. Jalpesh Solanki, Prof. Hardik Acharya & Prof. Ajay Bhimani, has work on, Optimization of Defects Encountered in Manufacturing of Radiator, according to his work, 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. The studies of all process for manufacturing of a radiator are studied. The problems in their manufacturing process are shown and improving some parameters such as furnace temperature, assembly jig, internal deposits and cracks in plastic tank the cost of manufacturing as well as the manufacturing efficiency of radiator can be increased[2]M.Aliff Ashraf, has work on,Design and Development of the Radiator Test Rig, according to his work, A radiator test rig could serve for the further analysis depends on the type of appositeness needed. In conclusion, all the objectives set in this radiator test rig development have been achieved. By imitating this automobile radiator system, a radiator test rig could serve for the further analysis depends on the type of applications needed. The fan speed would obviously alter the cooling effectiveness of the system.[3] A. N. Gowardipe, Ajay Deshmukh, Prashant Dimble, Akash Deshmukh, NandkishorGarje, has work on, Leakage Testing Machine, according to his work, As title suggests it is Leak Test Machine.This project has described methods for the finding the leaks and their location in the part and helps in the field of automation and also to improve quality.[4]

DarshanDabholkar, Dipak Shenvi, NitinkumarAnekar& Onkar Joshi, has work on, Design of Wet Leak Test Machine for Radiators: A Study, according to his work, This paper gives study of design of a wet leak test machine, used for the

detection of leakages in radiators. The piston is used for generating the up and down movement of the platform which will bear the loads of the various radiators, which are selected for leakage testing. The piston movement is controlled with the help of the pneumatic timer circuit, which we have designed by using the SMC software. The designs for the tank and platform have been finalized.[5]

III. METHODOLOGY

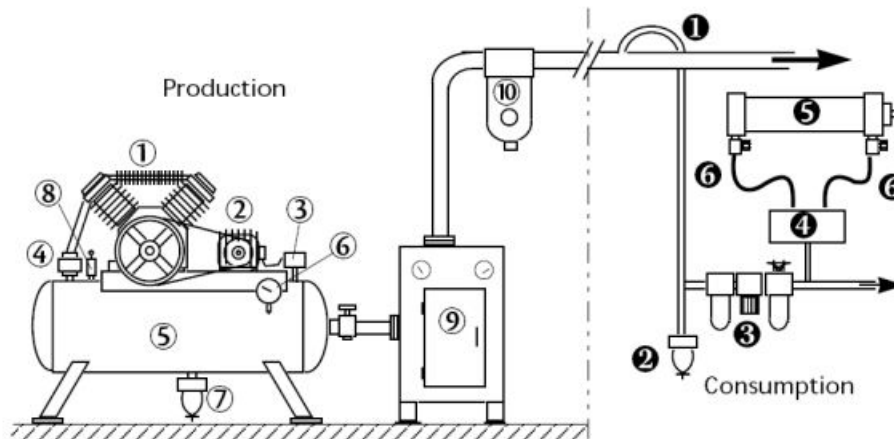


Fig: Basic Pneumatic Design

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 and prevents 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 pressure drop and the capability of oil mist removal. It helps to keep the line free from dust, 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.

IV. EXPERIMENTAL RESULTS

In every radiator and evaporator manufacturing industry the main problem is leakage found in the casting, forged & welded component. Due to this various leakages problem are occurs after the components are assembled in actual working condition. Due to this faulty component break down in machine or equipment is occurred. In our machine we detect the various leakages formed in the casting component, forged component, welded component etc. In this machine we use the wet testing for the detection of leakages in the component or equipment. The air is blown in casting component for the checking the leakage of component with the help of compressed air. This compressed air is supplied by the pneumatic compressor. For this we use the pneumatic circuit by using various pneumatic valves and hoses. Then

we dip the radiator and evaporator component in clean water tank for the detecting the location of leakage then we mark the location with help of marker. For these we used the pneumatic circuit. For checking the loss of air in the component we use visual testing, which observe passing air through the part of leak component. After that we can tell component is ok or faulty.

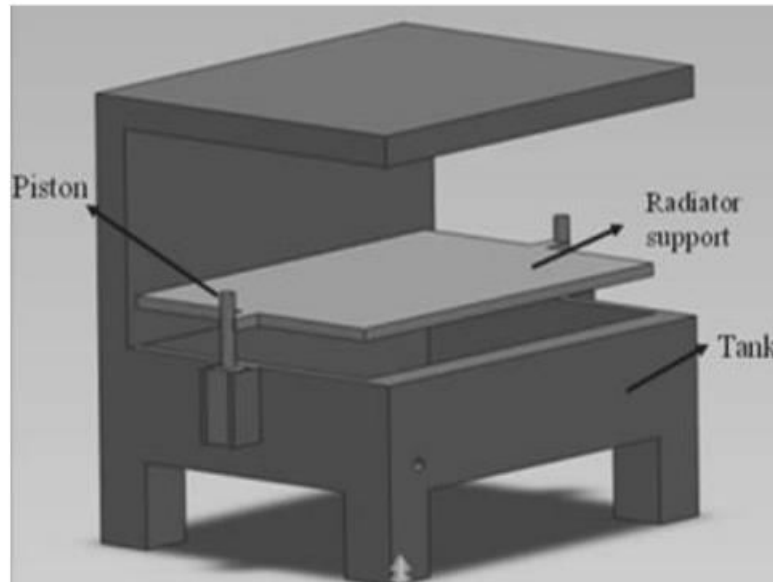


Fig: .Concept of Radiator & Evaporator leak testing machine

Design of Pneumatic Cylinder: Clavarino's equation for closed end cylinder at both ends.
For ductile material use to determine the thickness of cylinder.
Let, Material of the cylinder is Aluminum.

V. CONCLUSION

In this project, we have finalized the design for cylinder. The piston is used for generating the up and down movement of the platform which will bear the loads of the various radiators, which are selected for leakage testing. The piston movement is controlled with the help of the pneumatic circuit. The designs for the tank and platform have been finalized. The theory regarding it has been finalized and the design will be confirmed as the final part of this procedure. The main objective of the project was to design and manufacture special purpose leak testing machine. Manufacturing of this machine is done after the studies of all process for manufacturing of a radiator. The problems in their manufacturing process are shown and improving some parameters of radiator. In the first part component is studied in details for the forces and the calculations. The conceptual model of the fixture is drawn for simplification and understanding of the rough picture of fixture. The cylinders of the fixtures are selected according to the forces on the radiator fixture. The mounting of the cylinders is also important in the machine. The mounting is selected as front mounting for all cylinders. Manufacturing is done of radiator fixture first and then it is attached to the main part of the machine. Which is a stable part base frame. While concluding this report, 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 criteria 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.



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