Design And Development Of Throttle valve Endurance Test Machine

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Abstract: A research about design and development of throttle valve endurance test machine, three tests are provided to test the throttle valve endurance. In our country there is big amount of bikes and car are used for traveling. Throttle valve is the part of the air intake system that control the amount of air flowing into the engines combustion chamber, the process effectively control the rate of combustion and ultimate the speed of the vehicle throttle valve maintain the engine idle speed for that purpose throttle valve testing is important, test is done by the testing of spring endurance and life of spring. Basically 3 tests are required for the throttle valve. Tests are designed as per requirement of company. 1] Throttle Valve Endurance Test machine Variable Fast test, 2] Throttle Valve Endurance Test machine spring return test, 3] Throttle Valve Endurance Test machine Variable Slow test. We are Design and development of throttle valve endurance test machine for Variable Fast test and spring return test as per company requirement.

Keywords: **Throttle valve, Endurance, combustion, Variable fast, spring return**

I. INTRODUCTION

A throttle valve is the part of the air intake system in fuel injected automobiles that controls the amount of air flowing into the engine, it is provide air in sufficient quantity to the engine, it is control the air flow in to the system of air injection. Throttle valve is work by Accelerator pedal input. usually located between the air filter box and the intake manifold attached to near the mass airflow sensor. When the driver providing the moment to the accelerator,presses on the accelerator pedal, the throttle plate rotates within the throttle body, opening the throttle passage to allow more air into the intake manifold.

The circular plate is positioned in the center of valve largest piece inside the throttle body, the throttle plate is known by butterfly valve, that regulates the airflow. The plate is attached in the center of valve, butterfly valve connecting by rod and screw, one end of rod is attached with throttle position sensor (TPS) and another end is bracket. Accelerator cable is connected with bracket .A butterfly valve which can be used for isolating or regulating flow. The center plate is always present within the flow, so a pressure drop is always induced in the flow, regardless of valve position.

Throttle bodies work by providing the driver of a vehicle with a way to control the amount of air that is flowing through the intake system at any given time. When accelerator pressurized by driver the throttle valve is work, that actually controls the flow of air into the engine.

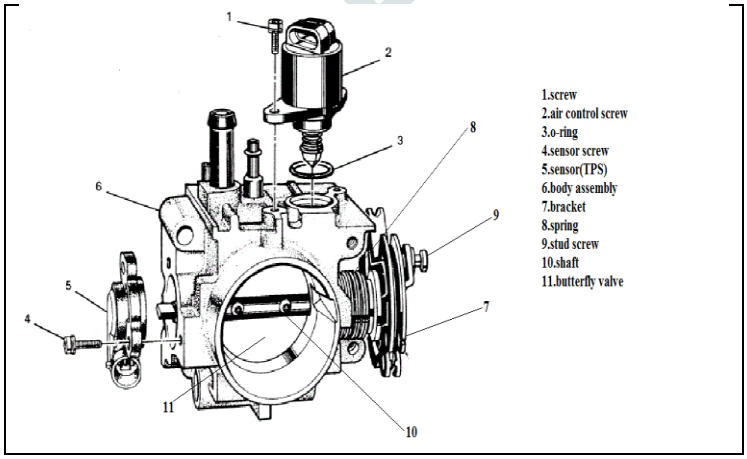

Figure1 Throttle valve

Throttle valve maintain the engine idle speed for that purpose throttle valve testing is important, test is done by the testing of spring endurance and life of spring Basically 2 test are required for the throttle valve. Test are designed as per requirement of company. .

1] Throttle Valve Endurance Test machine Variable Fast test set up is design as per graph show in fig.2. The spring changes the position from idle to WOT position 0.25sec and it returns in 0.25 sec. to idle position. This system is design for 750000 cycles.

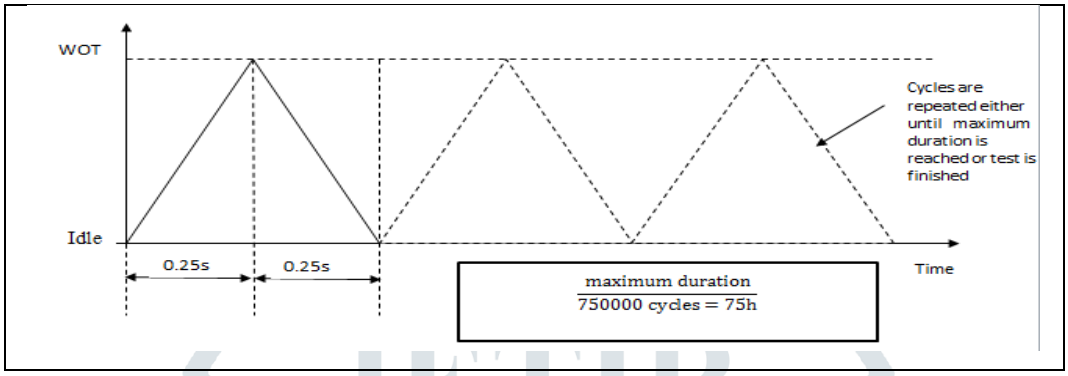

Figure2. Variable Fast test graph

2]Throttle Valve Endurance Test machine spring return test set up is design as per graph requirement is show in fig 3.This test spring changes the position from idle to WOT in 0.5sec and its return to idle position in 0.02 sec. The spring is in steady condition to 0.5-0.02= 0.48 sec. again start the cycle this test set up is design for 50000 cycle.

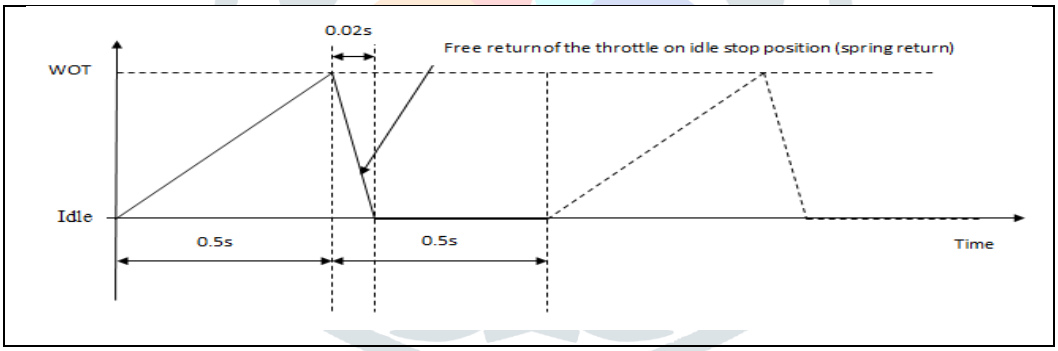

Figure 3 spring return graph

II. Design and Development Throttle Valve Endurance Test machine Variable Fast

The complete setup is assembled on a fabricated frame structure made of 40mm square tubes and setup is designed as per the company requirement Overall size: 1860mm X 650mm

To open the valve completely the spring need to moves 80 to 90 deg.

Open the valve 20N force is applied. To fulfill the requirement cam and roller follower are designed to pull 20N load by wire at 120 rpm. Design the system for 750000 cycle by using mechanism of cam and roller Follower mechanism 20N force required to open valve. Its takes 120 rpm in 0.25 sec and its return in 0.25 sec.

Design the cam which rotates 180 degree in 0.25 sec for 120 rpm and its return in 180 degree in 0.25 sec to its original position for this requirement roller its above on cam . Cam is designed with 25mm base circle ,180 degree forward stroke and 180 degree returns stroke for that time duration 0.25 sec roller follower which transmit the vertical up and down movement to the system the rod is attached between roller joint assembly and C-clamp assembly; C-clamp is designed for hold the wire. Wire is connected between throttle valve bracket and C-clamp, when the wire pull by clamp bracket is move with spring movement 80 to 90 deg.

For wide open throttle valve. Easy movement of rod, 400mm plate are joint. Mechanism are consist with 40mm square tube having 400×400mm size and plate. Center of plate bearing are located for avoid the fluctuation of rod and control the moment of rod. When cam rotes 180 degree the roller movies vertical up and down, the rod is pull the wire with c clamp and mechanism is work. The 2D drawing OF mechanism is show in bellow fig.

Electrical control panel comprises of-

a) Electrical panel made out of M.S sheets duly powder coated.
b) Programmable logic controller with HMI for setting angle of rotation and open/close timings. Facility of plotting graph of angle v/s time is provided.
c) Other electrical accessories such as contactor, push button, MCB, indicator lamps etc.

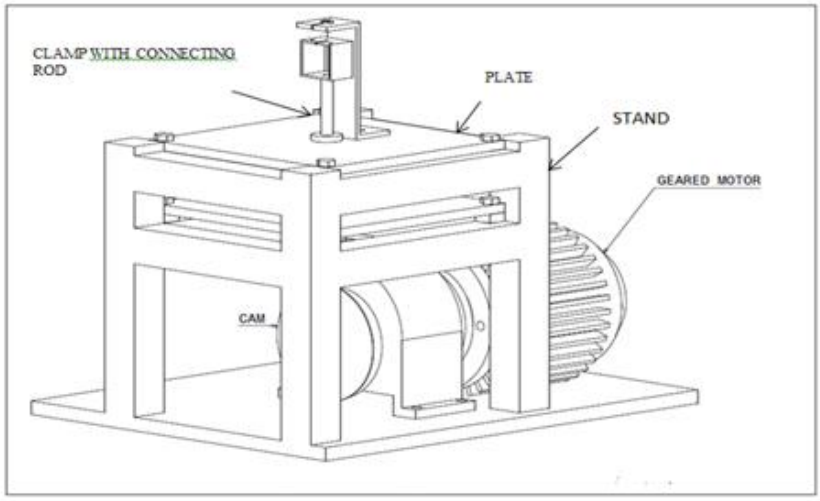

Figure 4. Isometric view of mechanism

III. Design and Development Throttle Valve Endurance Test machine Spring Return Test

The throttle valve spring return testing set up is as similar as throttle valve endurance test machine variable fast only the mechanism is change.

The complete setup is fixed on a fabricated frame structure made of 40mm square tubes and setup set up is design as per the company requirement Overall size: 1860mm X 650mm

Open the valve 20N force is applied. To fulfill the requirement cam and roller follower are designed to pull 20N load by wire at 60 rpm. Design the system by using mechanism of cam and roller Follower mechanism 20N force required to open valve. Its takes 60rpm in 0.5 sec and its return in 0.02 sec. the cycle is rest for 0.5 sec. Design the cam which rotates 180 degree in 60cycle for 60 rpm and its return in 180 degree in 0.02sec to its original position rest of cam for 0.5 sec for this requirement roller is set 22 mm offset from center bellow on cam . Cam is designed with diameter 70mm base circle and roller offset from 22 mm of cam. 180 degree forward stroke and 180 degree returns stroke for that time duration. roller attached Aluminium strip with 1mm thickness and 295 mm long strip locate with center or cam . to transmit the vertical up and down movement to the system the rod is connected between strip with roller joint and C-clamp ; C-clamp is designed to hold the wire.

Wire is connected between throttle valve bracket and C-clamp, when the wire pulled by clamp, bracket moved with spring movement 80 to 90 deg. For open throttle valve. Mechanism consist with 40mm square tube and having 320mm×320mm size and plate. Center of plate bearing is located to avoid the fluctuation of rod and control the moment of rod. When cam rotes 180 degree the roller moves vertical down, cam push the roller and hence it return back the rod is pull the wire with c clamp and mechanism works. . The 2D drawing OF mechanism is show in bellow fig.

Electrical control panel comprises of-

a) Electrical panel made out of M.S sheets duly powder coated.

b) Programmable logic controller with HMI for setting angle of rotation and open/close timings. Facility of plotting graph of angle v/s time is provided.

c) Other electrical accessories such as contactor, push button, MCB, indicator lamps etc.

Construction and machine set up is same as testing machine variable fast. Only the mechanism is changed, Half cam is design for mechanism having 70mm base circle, 22mm offset from centee, 8mm thick. Center hole is of 25mm. Aluminum strip is used of length 295 and 3mm thick, width 25mm the roller is attached with strip. And it is fixed at the center of the cam .For roller bearing are used.

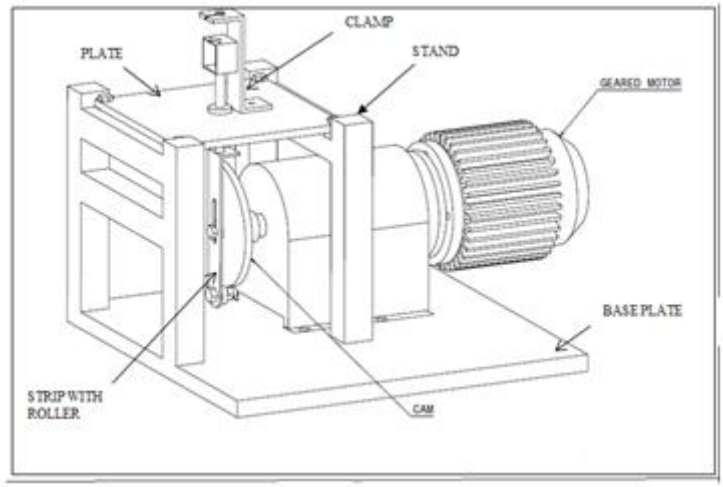

Figure 5 Isometric view of mechanism

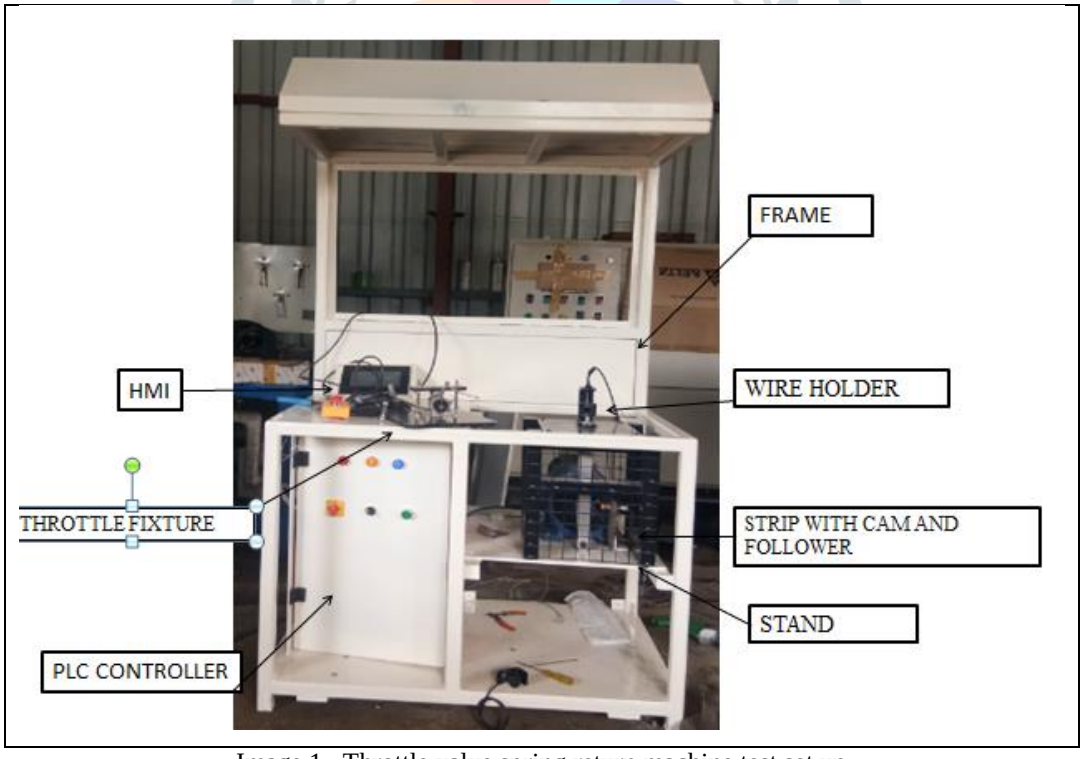

Image 1. Throttle valve spring return machine test set up

IV. Test And Result

We have completed fabrication of our Research project as per the above Company requirement, After completion of fabrication and all assembly, we had tested it as per providing graph and requirement, specific load and time duration. These tests are as follows

Sr no.	Throttle Valve Endurance machine	Load	Cycles	Hours	Remark
1	Throttle Valve Endurance Test machine Variable Fast test	2N	7,50,000	75h	Still working
2	Throttle Valve Endurance Test machine spring return test	2N	50,000	13.88h	Still working

Table 1. Test And Result

Our Research project is still working in good condition after required hours

V. SUMMERY

This paper review about design and Development Of Throttle Valve Endurance Test Machine categorizing their advantage and disadvantages, this testing has more become more crucial and demanding. Factor such as affective and safety should be used in analyzing the best testing method to be used. furthermore the testing machine chosen should minimize the incurred in the testing. Basically these test are design to maintain the ideal speed of engine and testing of throttle valve endurance and life of valve, Furthermore this test can be carried out in few minutes and are cost effective. Throttle valve endurance test machine is effective quality control which can be used for testing of various throttle valve have in different size and different shape.

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