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DESIGN AND MANUFACTURING OF VALVE CLEANING MACHINE

R.Y.Daspute
HOD Department of mechanical Engineering,
Dr. D.Y. Patil COE Innovation, Varale, Pune, India
hod_mechanical@dypatilef.com

Krishna P. Patil
Department of mechanical Engineering,
Dr. D. Y. Patil College of Engineering & Innovation, Varale, Talegaon, Pune

Rahul A. Gaikwad
Department of mechanical Engineering,
Dr. D. Y. Patil College of Engineering & Innovation, Varale, Talegaon, Pune

Amardip M. Patil
Department of mechanical Engineering,
Dr. D. Y. Patil College of Engineering & Innovation, Varale, Talegaon, Pune

Gaurav A. Thakare
Department of mechanical Engineering,
Dr. D. Y. Patil College of Engineering & Innovation, Varale, Talegaon, Pune

***ABSTRACT*—The proposed concept in this project is to reduce the time for conventional valve lapping process and manual work in manually valves cleaning process by semi-automated system. Traditional method of valve cleaning is by brush and Kerosene or by stick and power tool to remove the carbon deposited on valve and valve seat surfaces. Whereas this method is not correctly suitable to remove all the deposit material to ensure the contact between the valve seat and valve. To overcome the problem and to save the time for lapping, "Design &Manufacturing of Valve Lapping machine" is needed. Our proposed project uses a special abrasive tool for cleaning the carbon deposition on valve, valve seat and cylinder head, D.C motor (high torque less rpm), D.C motor (less torque high rpm), tension spring, Helical spring, C channel and base plate and mounting fasteners .**

Keywords - Valve Lapping machine, Welding Spot remover.

I. INTRODUCTION

Valve Lapping is basically the sanding down process for the surface of the valves, valve seat and cylinder heads (which allows fuel and air mixture to flow in and exhaust gas to flow out). In the current four stroke engines, the valves are to be removed and the sealing surfaces sanded ground and lapped multiple times during the life of engine. After the decades passed, on one hand the engines ran cleaner at other hand the addition of tetraethyl lead in gasoline meant that such maintenance became more frequent, to overcomes the difficulty in lapping process this lapping machine is essential to use. In the current era there have been adequate application of the valve lapping power tool used which is much more efficient than the valve lapping by hand movement. It will take approximately 15 minutes to lap a valve using this power tool. But still the power tool is hold in position for lapping process, which is somewhat hard for the labor to undergo the lapping process. Power tools can be worked on using an electric motor or pneumatically by using the compressed air. Our proposed system is using a cam and follower system in the lapping machine with the power of DC motor and spring force the stacked carbon contamination is removed.

II. PROBLEM STATEMENT

In today's era the automation plays a very important role in all the industrial applications for proper functioning and accurate results. Traditional power tools are more time consuming and incorrect angle of lapping may result in scrap the cylinder head and valve and valve seat, to overcome this problem we implemented a design which provides a better maintenance service.

III. LITERATURE REVIEW

The current working condition of the lapping process in valve industry, it elaborates the effect of abrasive particles, working speed, surface roughness and other related parameters, the difficulties facing during lapping is discussed. The changes required in the current set up required are suggested in this model with the proposed model [1].

The detailed study done on main criteria to determine the characteristics of super-finishing machines i.e. Energy consumption criteria-Higher properties of abrasive

material lower the consumed energy, Technological criteria, Dynamic Criteria [2].

The investigation conducted to determine the effect of the various input controlled parameters i.e. abrasive concentration and time of lapping etc. on the material removal rate and the type of surface generated using lapping process [3].

To present the advanced researches approaches, i.e. some special materials in conditions of minimum cost/ maximum quality, with modern technology and the elaboration of the models for the wear of the lapping disc engrained with the abrasive powder [4].

The fundamental mechanism of material removal in this lapping process and explores the key areas where the detailed study and work is required. i.e. surface finish, sub surface damage and part shape and lapping / polishing processes are affected by number of variables. [5]

An experimental investigation done to observe the effect of exhaust gas recirculation on the exhaust gas temperatures and exhaust capacity. The setup for the experiments developed on a two-cylinder, DI air-cooled CI engine. The effect of different quantities of EGR on exhaust gas temperatures and opacity are observed on matrix of experiments [6].

To detect the "knock" in Diesel engines which deteriorate the engine performance adversely. The methodology provided in the present work gives newly developed approach towards the vibration analysis of diesel engines. Knock in diesel engine is identified by measuring the vibrations by the engine using the DC-11 FFT analyzer with accelerometer [7].

An experimental design based on Taguchi's "L' 16" orthogonal table, and the engine is tested at different engine RPMs, throttling opening in % and water temperatures, using different fuels. The data analyzed using S/N (signal to noise ratio) to obtain the results that the optimum operating conditions for minimum BSFC (brake specific fuel consumption) are achieved [8].

To design an exhaust valve for a four wheeler Otto cycle engine by theoretical calculations. 2D drawings are drafted from the calculations then the 3D model and transient thermal analysis is to be done on the exhaust valve when valve is open and closed this analysis is done in ANSYS. At the time when the study state condition is attained at 5000 cycles at the time of when valve is closed is 127.651 sec valve is opened 127.659 sec [9].

The effect of intake port design on swirl generations, flow patterns and streamlines hence it is analyzed with CFD tool. The results of the CFD simulation improves the understanding of the intake system of IC engine and the performance evaluation of intake ports and simulation results can be verified by prototype testing on swirl test rig [10].

IV. COMPONENTS SPECIFICATION

DC Motor- 1.Low torque mini 12V DC gear motor, 0.8W (60mA no load), RPM- 200rpm, Reversibility- reversible, Gear ratio- 1:20, length of motor -54mm, Diameter of motor- 25mm, length of spindle- 8mm

DC Motor- 2.High torque, heavy duty 12V dc gear motor RPM -20, no load current -120mA, load torque - 10-19 Kg.cm, load current -400mA, Length of motor - 29mm, Diameter of motor - 33mm, Spindle length -15.5mm

Square and grounded spring- Solid length- 48mm, Free length 80mm, Pitch -8mm. This spring is connected to Abrasive tool.

Tension Spring- This spring is mounted over the high torque DC motor and cam operated low torque DC motor.

Welded C channel section- It carries the DC motor and abrasive tool on it and attached to the base of the machine.

Valve holding piece- Body is made of natural rubber and head by mild steel. The head and body is merged together by industrial grade adhesive.

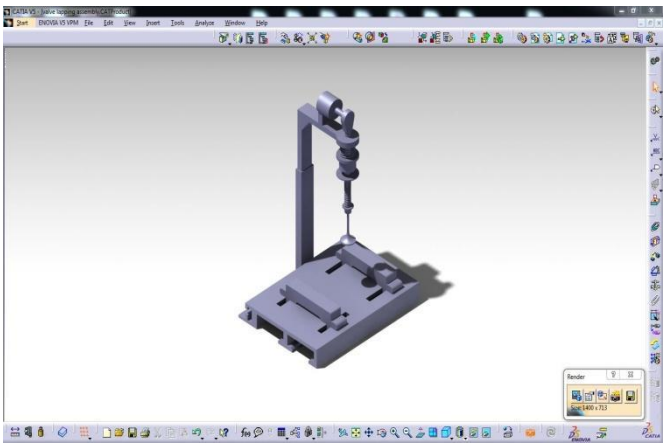

Figure 1.Valve Cleaning Machine 3D model

Cam- The cam is coupled to the low torque DC motor shaft and transmits the vertical motion to the abrasive tool. It has 20mm pitch radius and 30mm rise.

Spring loaded follower- It is attached to the abrasive tool via high torque DC motor. It has inner rad 20mm, cam rad 5mm, and rotation with and without DWELL 120/120mm

V. WORKING

An ON / OFF switch is used to operate the DC motor. AS the Switch is ON the Low torque DC motor rotates the cam. The Cam transmits the motion in the form of reciprocation of the abrasive tool. The Abrasive tool rotates by the high torque DC motor against the cylinder head / valve seats and hence the lapping is done.

VI. Conclusion

The above research and proposed physical model can provide benefit in the lapping of valve, valve seat and cylinder head like components. This model will provide the portability and reduced time for lapping in some extent. The paper provides and importance of the proposed lapping machine operations in valve job maintenance. It will be an economical model and only one labor of semi-skilled can be operate this model.

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