

Designing and building a valve grinding machine
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ABSTRACT

Automobile repair could be a big part of the car business and also bring in a lot of money for the company. These days, combustion engine maintenance is clearly an important part of car maintenance, and the Valve Lapping method that is talked about in this paper is done during IC engine maintenance. Most businesses that do car repair use this method for valve polishing, but it doesn't work and takes a lot of time. "Valve lapping Machine" for combustion Engine could be a machine made to solve these problems by reducing the amount of work that needs to be done by hand. The thesis talks about the history of the machine, the methods that were used, and the outcomes of knowledge analysis that were used to improve the design and planning of the valve grinding machine. Lapping is a way of finishing that involves rubbing two surfaces together with something rough, either by hand or with a machine. This could look two different ways. Lapping, which used to be called grinding, is usually done by rubbing a fragile material like glass against a hard surface like iron or glass (also called the "lap" or grinding tool) while using an abrasive like aluminum oxide, jeweler's rouge, optician's rouge, emery, carbide, diamond, etc. in between them. Stellite has been used as an abrasive in the Stellite honing machine, and it has been found that this method takes less time to get a certain surface than the traditional way. A suction-equipped grinding machine is made. The pressure is linked to the valve manifold, which is in contact with the cylinder seat. The grinding process is carried out by rotating the valve manifold in both clockwise and counterclockwise directions. Cam and Follower are used to make the spinning action possible. To make the needed movements happen at a certain rate, a programming board called Arduino is used. A fair comparison is made with doing things by hand, and it was discovered that the machine starts making money after 48 days of breaking even. Lapping a 3-cylinder head with Stellite as an abrasive takes about 45 minutes, while lapping without Stellite takes about an hour and a half. Ten cylinder heads are lapped in that time. In this way, Stellite's rough property makes work more efficient.

Keywords—Engine parts called valves. Head of cylinder

INTRODUCTION

In a four-stroke combustion engine, a valve job is an operation whose goal is to resurface the conjugation surfaces of the poppet valve valves and their several valve seats. These seats control the intake and exhaust of the air/fuel mixture that moves the pistons during the starting cycle. In the first car engines, the valves had to be taken out and the sealing surfaces had to be smoothed, ground, or filed several times over the course of the engine's life. Valve jobs are

sometimes done on passenger cars for repair reasons these days, but they're still pretty popular on high-end cars. Some of the things that will mean that a modern rider needs a valve job are too many turns per minute, high mileage, heat, material failure, and damage from a foreign object. A valve lapping stick or an impact tool is often used for this type of valve lapping. Because none of these tools work very well, they were replaced by the "Valve Lapping Machine for Combustion Engines," which is meant to simply lap engine valves. Compared to other machines, the valve polishing machine is very efficient because it requires very little participation from humans. When valve lapping is done on an internal combustion engine plate, the goal is to get a good fit between the valve of an engine and the valve seat area of the plate so that compression leaks don't happen through the seating from the combustion chamber and air-fuel mixture doesn't leak into the combustion chamber through the seating. The inside combustion chamber works by getting a precise compression magnitude relation that is different for each engine and burning a mixture of air and fuel that has been squeezed to a precise volume set by the compression magnitude relation. And if the combination of air and fuel leaks through the seats, the amount of the mixture can change, and the combustion process won't be right, which makes the engine less productive. So, it's important to have a completely sealed combustion chamber, and the valve setting is a big part of making sure that the chamber is completely sealed.

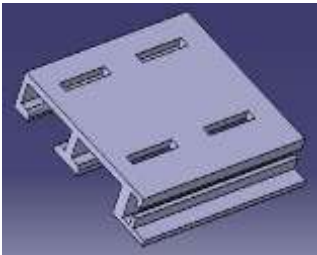
LITERATUREREVIEW

WeiweiLiua et al. looked into how carbon deposits will weaken diesel engines and make them run less efficiently. In the remanufacturing business, chemical cleaning methods are often used to get rid of the deposits, but the leftover liquid is bad for the environment. In this study, the critical greenhouse unit wide was used to get rid of the trash in the remanufacturing industry, but the lost liquid is bad for the environment. In this study, the important carbon emission cleaning technology, which is an eco-friendly method, was used to get rid of these pollutants. The tests showed that almost all organic chemicals were broken down, and the tough contaminants were changed so that they could be removed after just one cleaning with a key greenhouse emission fluid. [1]

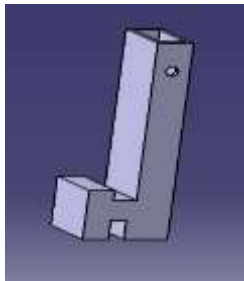
S. M. Fulmali and R. B. Chadge looked into how the lapping method is defined by its slow speed, large air mass, and slow rate of material removal. Small flaws can be fixed with this method, and close specs are kept while finer surfaces and tighter fits are achieved. Lapping is a process where the movement style of the individual grains in the lapping abrasive completely changes how the surface forms and how fast it wears away. To start and stop the flow of fluid, a gate

valve is used. That the wedge and seat ring of a valve are always under pressure from fluid flow, and that these parts wear out because the valve opens and closes. They need to be lapped during repair. This paper can talk about the need, desire, and use of cutting in the process of refurbishing a valve. To get a surface finish on the meeting part that looks like a mirror, lapping may be a small finishing job that needs to be done. Using free gritty grains between two surfaces and moving them relative to each other is what the lapping method does, which ends in a multi-directional lay [2].

The purpose of this study, written by B. SeshagiriRao and D. GopiChandu, is to design a companion valve for a hackney coach gas engine using satellite estimates. The second drawing of the production method is based on the figures and the 3D model. A brief temperature study of the valve should be done both when it is open and closed. In order to make the valve, EN52 steel is used. There are three types of



valves used in IC engines: the poppet valve, the mushroom valve, and the sleeve valve or rotary valve. The poppet valve is the most common of these three kinds. Both the body of water and vent valves are heated to high temperatures (1930° C to 2200° C) during the power stroke, so the materials used to make the valves need to be able to handle these temperatures. Two bodies of water and one exhaust



valve or two bodies of water and two exhaust valves stop pollution and make the engine more powerful. [3]

Y.V.V. Satyanarayana Murthy, the point of this study is to look at the "knock" that happens in diesel engines and makes them work less well. There is a new way to look at the vibration study of diesel engines that is suggested by the methods used in the gift work. A basic link between the pattern of engine shaking and the relative features of the combustion process in various cylinders is what the approach is based on. Knock in a diesel engine can be found by measuring the vibrations that the engine makes. The DC quick Fourier transform analyzer with a measure tool. In a diesel engine, knock is mostly caused by engine miss. If the fuel isn't burning right in one or more engines, the diesel motor will miss. When an engine misses, it burns quickly and under very high pressure, making a rumble or dull, noisy sound. "Knocking or detonation" refers to sounds that are unusually loud and have strong vibrations. [4]

BhargavKhanpara and PankajRathod show that Weld



overlay coating, which is also known as tiresome facing, is a method that includes putting hard, wear-resistant materials on surfaces that need to be resistant to wear and tear. Machine parts' useful life is mostly determined by how much wear they get. Metal parts often don't work the way they're supposed to, not just because they break, but also because they wear out and lose their shape and usefulness. The most common types of wear are Wear and tear, collision, friction and heat between metals, and rust. Research continues to find ways to make things more resistant to damage. Metal tedious facing is the most flexible way to make things last longer after damage [.5].

VARIOUS METHODOLOGYADOPTED FOR IMPROVING SURFACE FINISH OF CYLINDER HEAD ValveLappingStick

Valve lapping stick and hand motion Valve lapping sticks are the tools that we use to lap valves by hand movement. Thevalve is joined to the sucker at the tip of the stick and lapping compound is applied before the operation starts. This process takes approximately half an hour to lap one valve of a 3.0 L engine.

Grinding Machine

By holding valve against the grinding wheel lapping can be done manually. However, the operator has to work continuously. It will take less than 25 minutes to lap a valve using the power tool. Power tool works using electric motor or pneumatically using compressed air.

DrillingMachine

A rubber bush is installed at a drill-bit and operation is performed. However, the operator has to work continuously.

DESIGNOFMACHINECOMPONENT MachineBed

The entire assembly is assembled on machine bed and cylinder head rests on it.

Material:MildSteel

Dimension:460x380x88(inmm)

Fig.1:Machine Bed

CantileverBeam

Itisverticalcolumnwhichhasadjustableverticalheighton which the mechanism of valve specimen is assembled.

Material:MildSteel Force Acting: 5N

Fig.2:Cantilever Beam

Camand Follower

Cam and follower mechanism isused inthe machine to convert the rotational motion ofthe motorinto reciprocating motion for the valve specimen.

DCmotors

Two dc motors are used in valve lapping machine,one as thedrive for cam system and one as the motor for valve lapping.

LowTorque:Volts12V, RPM-300

Reason: High initial speed is required to run the cam follower arrangement.

HighTorque:Volts-12V,RPM-30

Reason:HighTorqueisrequiredduetooppositionduring Lapping of Cylindrical Head

Spring

The function of the spring is to adjust the displacement that occurs during operation.

Fig.3: Spring
Valve Specimen

It is the device that enters the cylinder head and initiates the cleaning.



Fig. 4: Valve Specimen
Stellite

Stellite is a wide range of cobalt-Chromium alloy Design for wear resistance. Stellite is family of completely non-magnetic and corrosion resistance cobalt alloy of various composition that have been optimised for different use. It has good wear resistance ability and can work under high temperature range and resist hardening and annealing. The alloy may also content Tungsten and small but important amount of carbon. They are adaptable and can be refined due to its hard material property Stellite alloys are inherently difficult to machining. Type used is Stellite 6.

Mechanical Properties

Hardness: 373 BHN

Tensile Strength: 896 MPa

Yield Strength: 541 MPa

Density: 8.9 gm/cm³

Temperature Range: (1285-1395)⁰C

Composition

Stellite alloys are mixture of cobalt (43%), Chromium (29%), Carbon (1.2%), Iron (3%), Nickel (3%), Silicon (1%), Manganese (1%), and Tungsten (4.5%)

SUMMARY

Making a good fit between the engine valves and the valve seat area in the IC engine head is a job that needs to be done very carefully. To get a good seat, the air-fuel mixture (petrol engine) or air (diesel engine) must not flow into the combustion chamber until the right time. This is similar to how exhaust gas is stopped from running into the exhaust pipe until the right time. If you get a good seat, you can also stop compression leaks. In any of the above situations, the engine's performance will drop by a huge amount. So, it becomes an important part of maintaining an IC engine. Most of the time, a valve honing stick or a hand tool is used for the process. But neither of these tools works very well. A valve polishing machine, on the other hand, will give you much better results. The machine's mechanical system makes the two movements in two directions, which used to be done by hand or with a power tool. Also, the machine only allows a very small amount of human interaction.

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[3] B. Seshagiri Rao¹ and D. Gopi Chandu, Design, Analysis, and Manufacturing Processes of Petrol Engine Exhaust Valve, Int. J. Mech. Eng. and Rob. Res., 2014, pp. 395–401.

This article by Y. V. V. Satyanarayana Murthy is about how to use vibration analysis to study combustion and find knocks in a single-cylinder DI-diesel engine. It was published in the International Journal of Engineering Science and Technology (IJEST) in Visakhapatnam in 2011 and has pages 10–16.

An article by Bhargav Khanpara and Pankaj Rathod called "A Review on Hard Surface Coatings Applied Using Stellite Hard Facing Techniques" was published in the International Journal of Engineering Technology, Management and Applied Sciences, India, in 2017 and can be found on pages 132–139.