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DESIGN & DEVELOPMENT OF VALVE LAPPING MACHINE

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Abstract — *Vehicle preservation is a high area inside the enterprise of car and additionally a number one profits to the business enterprise. In gift, internal Combustion engine protection can be stated as a totally essential segment in automobile protection and the valve lapping technique this is subjected on this thesis is achieved all through IC engine protection. The contemporary techniques utilized in maximum car preservation corporations for valve lapping method are not effective and devour masses of operating hours. 'Valve lapping device for inner Combustion Engines' is a machine designed to overcome these problems by means of minimizing the human involvement within the process. The thesis includes the history in designing the system, methodologies used, consequences received via information evaluation in an effort to optimize the layout and layout of the valve lapping system. Lapping is a machining approach wherein surfaces are rubbed collectively with an abrasive amongst them, through hand movement or the use of a tool. This may take forms. The first form of lapping (traditionally known as grinding), includes rubbing a brittle material which consist of glass in competition to a floor including iron or glass itself (moreover called the "lap" or grinding tool) with an abrasive which consist of aluminum oxide, jeweler's rouge, optician's rouge, emery, silicon carbide, diamond, and so on., amongst them.*

Keywords- *Internal combustion engine, lapping, abrasive, rubbing &brittle material.*

I. INTRODUCTION

Valve lapping or the procedure of creating a very good seat among engine valves and the corresponding valve seat area inside the IC (internal combustion) engine head (cylinder head) is a undertaking which must be completed very correctly. The significance of obtaining a superb sea is that the air/gasoline combination (in petrol engines) or air (in diesel engines) is averted from flowing in to the combustion chamber, same because the exhaust gasoline is averted from flowing to the exhaust manifold from the combustion chamber until the proper time. And additionally, a terrific seat prevents compression leaks. The engine will lose its efficiency via massive possibilities if any of the situations defined above happens. In order that is a very important mission in IC engine renovation, extra interest is given to this unique project with the resource of technicians. This approach of valve lapping is typically finished using a valve lapping stick or a strength device. As each of this device are not very effective, these tools may be changed via the usage of the ' Valve Lapping device for inner Combustion Engines', particularly designed for the technique of engine valve lapping. The tool employs a fully mechanical system which performs specific motions in suggestions previously performed with the aid of hand whilst the use of valve lapping stick and power tool. Especially the valve lapping device may be very effective because the human involvement may be very confined within the process.

II. PROBLEM STATEMENT

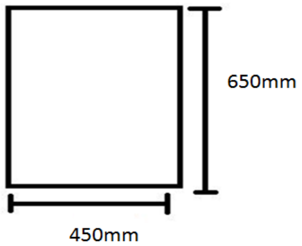
The main purpose of the project is to minimize the human effort with excellent machines with precision although the time required for the process is the same for manual as well as the machine but, if we use a machine instead of the person the person can do another job by this time. Also, the efforts which are given by employee will be reduced.

III. OBJECTIVES

The principle goal of this assignment is to design a machine each green and powerful than previously used techniques for valve lapping and to reduce the exertions price with the aid of reducing the human involvement within the process. The targets that had to be accomplished so as to reap the main intention have been designing the simple model of the system(structure), designing the valve lapping mechanism, meeting of the complete device through designing the components wished, calculating and designing the cam wished, analyzing facts and categorizing them for you to layout five valve preserving pieces, reading records to attain the specifications of the machine, acquiring two high torque dc automobiles that has particular RPM(revolutions in line with minute) values and deciding what materials need to be used in order for the design to be durable and cost-efficient.

IV. CALCULATION'S

Design of Frame:



Frame design for safety FOR 25*25*3 L angle mild steel channel
b = 25 mm, d= 25 mm, t = 3 mm.
Consider the maximum load on the frame to be 30 kg.
Max. Bending moment = force*perpendicular distance
= 30*9.81*225
M = 66217.5 Nmm
We know,
M / I = σb / y
M = Bending moment
I = Moment of Inertia about axis of bending that is; Ixx
y = Distance of the layer at which the bending stress is consider
(We take always the maximum value of y, that is, distance of extreme fiber from N.A.)
E = Modulus of elasticity of beam material.
I = bd3 /12
= 25*25^3 / 12
I = 32552.08 mm4
σb = My / I
= 66217.5 *12.5 / 32552.08
σb = 25.42 N /mm2
The allowable shear stress for material is σallow = Syt / fos
Where Syt = yield stress = 210 MPa = 210 N/mm2
And fos is factor of safety = 2
So σallow= 210/2 = 105 MPa = 105 N/mm2
Comparing above we get,
σb < σallow i.e
25.42 < 105 N/mm 2
So, design is safe

Cam & follower:

A cam-follower mechanism has a two degree of freedom cam joint that connects the input and output links. The relative shape of the cam and follower define the displacement function of the mechanism. Displacement functions for radial cams are periodic functions consisting of sequences of dwell, rise and return segments. The geometry of the follower is usually simplified to a point, line or circle, and combines with the displacement function to define the cam profile.

The displacement diagram for simple harmonic motion can be obtained as shown in fig. The line representing angle ɵ is divided into a convenient number of equal lengths. A semicircle diameter L is drawn as shown & divided into same number of circular arcs of equal length. Horizontal lines are drawn from the points so obtained on the semicircle, to meet the corresponding vertical lines through the points on the length ɵ. For SHM we always have finite velocity, acceleration, jerk and higher order derivatives of displacements.

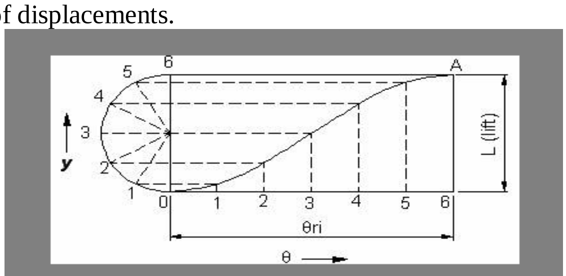


Fig. Displacement diagram for SHM

Consider, Base Radius of Cam = R_b = 21.5 mm
Nose Radius of Cam = R_n = 17mm

Radius of Roller = R_r = 12mm
Distance from Base to Top = R = 53mm
Speed = N = 60RPM
Angular Speed = w = $\frac{2*\pi*N}{60}$ = 6.28rad/sec

Distance Between the Centres of Base and nose = r = R - (R_b +R_n)
r = 53 – (21.5+17) = 14.5mm

Total Lift = L = r + R_n - R_b
L = 14.5 + 17 – 21.5 = 10mm

R_b = r *Cosα + R_n
21.5 = 14.5*Cosα + 17
α = 71.9
Angle of Ascent = α =71.9

Φ = Angle Turned by the cam from the beginning of the roller displacement to end of straight flank
Tan φ = $\frac{r*Sin\alpha}{Rb+Rr}$
= $\frac{14.5*Sin\ 71.9}{21.5+12}$
Φ = 22.36

Acceleration of the follower at the beginning of the lift when Θ = 0
F_{min} = w^2 (R_b + R_r)
= 6.28^2 (21.5+12)
= 1321.19 mm/sec^2

Acceleration of follower where straight flanks merges into a circular nose i.e. when Θ = φ
F_{max} = w^2 (Rb + Rr) *($\frac{2-Cos2\varphi}{Cos3\varphi}$)
= 6.28^2 *33.5*($\frac{2-Cos44.72}{Cos322.36}$)
F_{max} = 1912.02 mm/Sec^2

V. CATIA

Computer-aided design (CAD) is the use of computer systems (or workstations) to aid in the creation, modification, analysis, or optimization of a design. CAD software is used to increase the productivity of the designer, improve the quality of design, improve communications through documentation, and to create a database for manufacturing. CAD output is often in the form of electronic files for print, machining, or other manufacturing operations. The term CADD (for Computer Aided Design and Drafting) is also used.

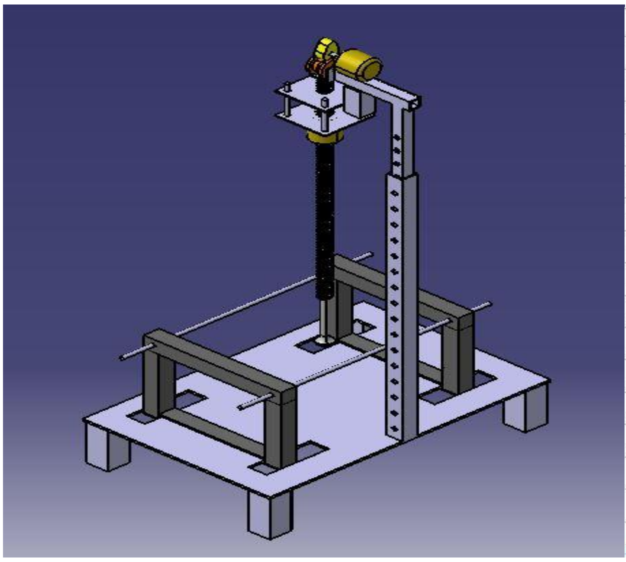


Fig. 17 Valve Lapping CATIA

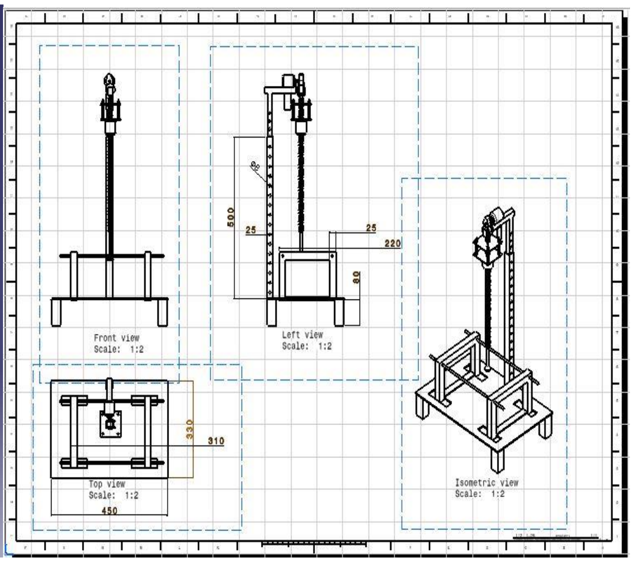
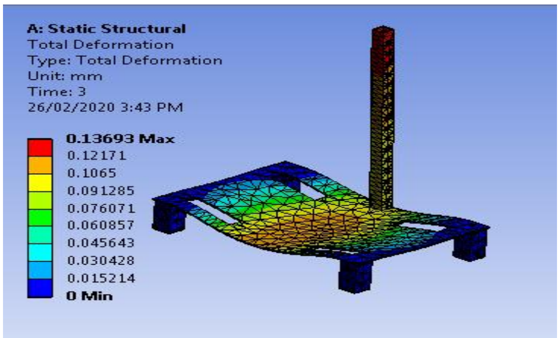


Fig.18 Drafting of model

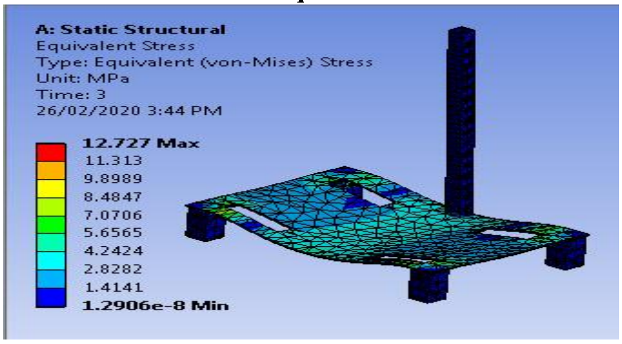
VI. ANALYSIS

Frame & Spring

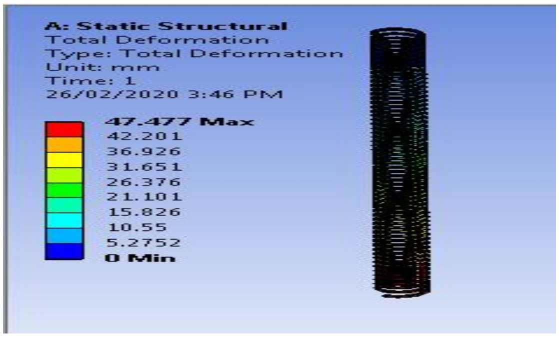
Total deformation



Von-mises equivalent stress



Total deformation



Von-mises equivalent stress

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