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ANALYSIS OF VARIABLE DISPLACEMENT ENGINE BY INTRODUCTION OF HYDRAULIC CRANKSHAFT

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Abstract - *Conventional Internal combustion engine which have their displacement fixed due to which the engine maximum power at specific RPM is fixed the task is to make an engine which can have a variable capacity due to which power can be optimized as required. The main idea behind this is to save fuel without compromising the power. Previously attempts has been made to implement the concept like this, the military vehicles which had v8 engines were provided with a mechanism that the supply of fuel was cut off from some cylinder which ultimately reduces power and hence save fuel but in order to increase the capacity of engine we can only increase stroke length by increasing the crank radius this is different method of changing capacity as the old method was not so effective as losses of friction were there even after cutting of fuel supply.*

Key Words: *Variable Displacement engine, Variable Compression Ratio, Hydraulic Crankshaft*

1. INTRODUCTION

Variable displacement engine which is topic of our study which increases efficiency without compromising the power the basic idea behind this is to deliver power only when necessary. The Variable Displacement Engine concept is used before but it was not as it says the displacement is not changed instead the fuel supply is cut-off. Variable compression ratio this concept is used widely now a days as it saves fuel and also emission are reduced greatly. There are several methods of changing compression ratio and some of them are now used in commercial vehicle also.

Generally all the engines of a car like v8 or v12 engines are under loaded but this is the reason why they drain so much fuel. Or let's take an example a truck fully loaded gives a mileage of 4kmpl and when it is empty it gives a mileage of 5kmpl now we can understand the concept of overloaded and under loaded. The conventional engines are of fixed capacity and produces fix amount of power at specific RPM so what we can do is change the displacement so that the power can be varied as per requirement. Suppose when we are cruising we don't require much power at that time we can operate our engine at low capacity and when we need to accelerate at that time we can operate at its full capacity.

There are currently two main types of cylinder deactivation used today, depending on the type of engine. The first is for the pushrod design which uses solenoids to alter the oil pressure delivered to the lifters. In their collapsed state, the lifters are unable to elevate their companion pushrods under the valve rocker arms, resulting in valves that cannot be actuated and remain closed. The second is used for overhead cam engines, and uses a pair of locked-together rocker arms that are employed for each valve. One rocker follows the cam profile, while the other actuates the valve. When a cylinder is deactivated, solenoid-controlled oil pressure releases a locking pin between the two rocker arms. While one arm still follows the camshaft, the unlocked arm remains motionless and unable to activate the valve after the price of oil surged in 2008, consumers were looking for a more fuel efficient car without sacrificing peak power. This has led many

manufacturers to put variable-displacement controls into their cars, especially those with V8s installed.

2. OBJECTIVE

1. Study the mechanism and calculating variation in capacity.
2. Study variation in compression ratio by changing stroke length.
3. Observing benefits of new mechanism by graphical method.

3. METHODOLOGY

For changing the displacement of engine, stroke length must be varied it is done by the new designed crankshaft which can vary its crank radius. The model of this is simulated in algoodo education 2.0.1 And a 3d model is created in solid edge st5

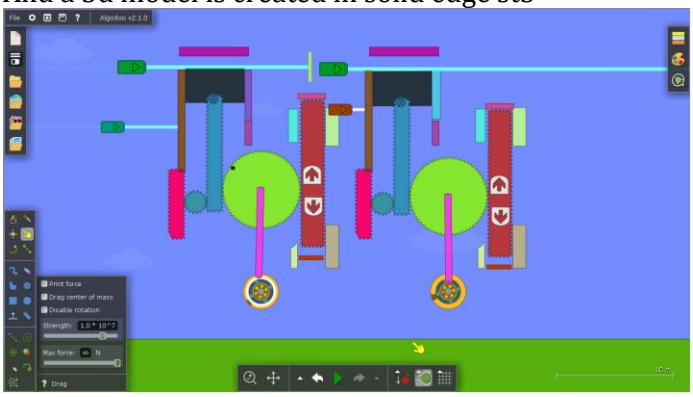

FIG 1

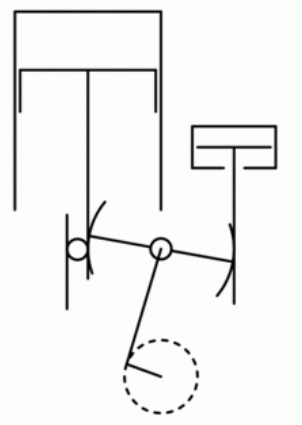

FIG 2

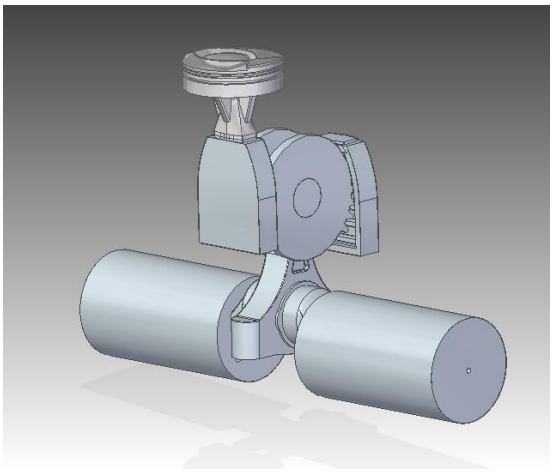

FIG 3

For changing the compression ratio MCE-5 engine mechanism which uses electrical actuator.

4. CONCLUSION

Using crank angle and piston position equation and differentiating it new equation is derived

Position

$$x = r\cos A + \sqrt{l^2 - r^2\sin^2 A}$$

Velocity

$$\begin{aligned} x' &= \frac{dx}{dA} \\ &= -r\sin A + \frac{(\frac{1}{2}).(-2).r^2\sin A\cos A}{\sqrt{l^2-r^2\sin^2 A}} \\ &= -r\sin A - \frac{r^2\sin A\cos A}{\sqrt{l^2-r^2\sin^2 A}} \end{aligned}$$

Acceleration

$$= -r\cos A - \frac{r^2(\cos^2 A-\sin^2 A)}{\sqrt{l^2-r^2\sin^2 A}} - \frac{r^4\sin^2 A\cos^2 A}{\left(\sqrt{l^2-r^2\sin^2 A}\right)^3}$$

By using this equation and putting data in it we get the graphs which are as follows

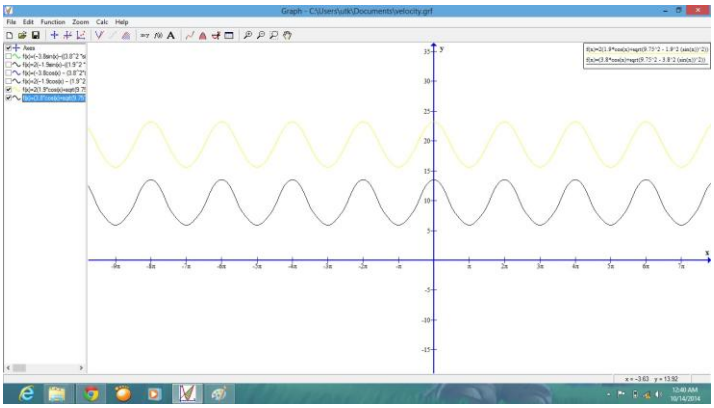

FIG 4
(DISPLACEMET VS CRANK ANGLE)

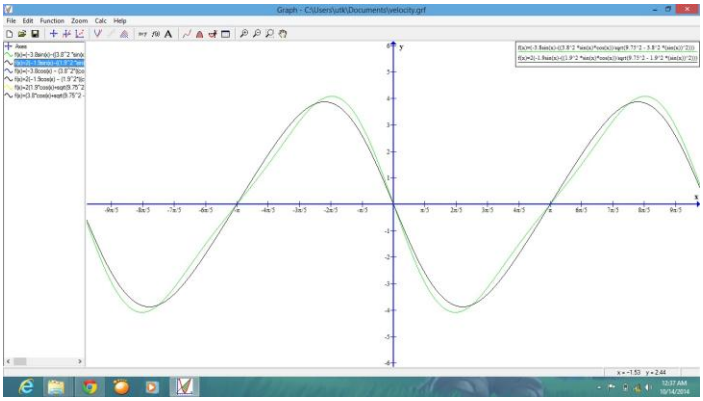

FIG 5
(VELOCITY VS CRANK ANGLE)

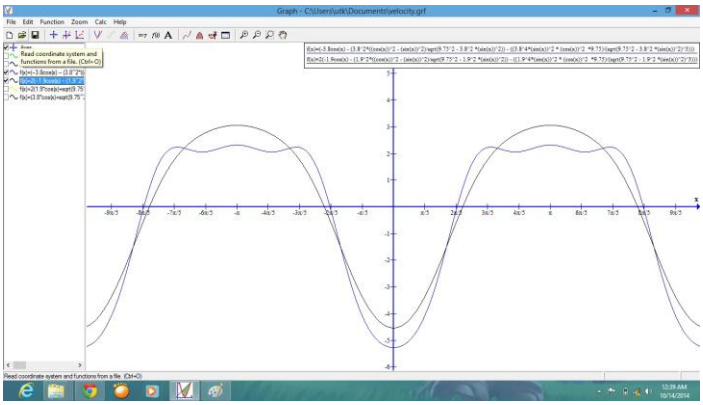

FIG 7
(ACCELERATION VS CRANK ANGLE)

1. From fig.4 we can conclude that displacement remain same

2. From fig.5 it is observed that no significant change is visible

3. Fig.6 shows that there is change in aceeleration.

With this data we can conclude that new mechansim has less vibration,longer life,less noise,smoother acceleration and with the apllication of variable compression assembly it will be emitting less pollutants.

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