DESIGN AND MANUFACTURING OF DUAL MASS FLYWHEEL: A REVIEW

Rohan Zende[1], Mahesh Madane[2], Tushar Thavare[3], Nanaware Rahul[4]

[1,2,3,4] *Research Scholar, Assistant Professor Malave A.C. Mechanical Dept. SBPCOE, INDAPUR, Savitribai Phule Pune University, India.*

Abstract: *The power stroke vibrations are formed due to the minor twist in the crankshaft. The combustion cycles of a 4-stroke engine formed torque fluctuations which excite torsional vibration to be passed down the drive train. Hence it is necessary that the vibrations generated by engine be minimize or isolate, so that the operator or driver was feel lesser fatigue. Dual mass flywheel is a multi-clutch device which is used to dampen. The torsional frequency is defined as the rate at which the torsional vibration produced. When the torsional frequency of the crankshaft is equal to the transaxles torsional frequency an effect known as the torsional resonance occurs. When the operating speed of the engine is minimum, vibration occurs due to the torsional resonance and this can be avoided using dual mass flywheel. The resulting noise and vibration, such as gear rumble, body boom and load change vibration, result in poor noise behavior and driving comfort. The objective while developing this concept was to isolate the drive train from the torsional vibrations. This paper includes the development of inertia expanded mechanism and development of optimized flywheel using this mechanism. The dual mass flywheel comprises primary flywheel and secondary flywheel and two springs.*

Key Words: **Dual Mass Flywheel, Arc Spring, Torsional Resonance and Torsional Frequency**

1.INTRODUCTION

Function of the engine flywheel is to even out the fluctuations in power and thereby make a smooth transmission of power to wheels. All engines have flywheels or weighted crankshafts that balance out compression and power strokes, maintain idle, help starting and reduce component wear. If the flywheel is too light the motorcycle requires more effort to start, idles badly, and is prone to stalling. Weight is not the important factor here, but inertia. Inertia is stored energy, and is not directly proportional to flywheel weight. It is possible to have a light flywheel with much more inertia than a heavier flywheel. In any event, except for when the clutch is slipped all flywheel weight reduces acceleration. There is no engine speed or other condition where an extra flywheel weight helps. Obviously, there's a certain less amount of flywheel inertia that should be present for several reasons such as idle stability, tolerance of high compression, cam overlap, better clutch operation for low speed and traffic operation, fewer load reversals on the driveline during low speed, better traction, etc. Hence it is safe to interpret from above discussion that the flywheel inertia plays a major role in vehicle optimized Performance and by suitable modifying the mass of flywheel can be minimizes by still maintaining the inertia. The arrangement of the dual mass flywheel is a suitable for answer to the above problem statement where in the inertia is increased using two set of masses phased opposite to each other. In our approach we shall focus on modified of new flywheel system using a spring mass system of useful for vibration improve to inertia of flywheel there by achieve higher efficiency using lower mass, lower size flywheel.[3]

2. LITERATURE REVIEW

There has been a great deal of research on gear analysis, and a large body of literature on energy storage system has been published. The origins and use of flywheel technology for mechanical energy storage started several hundred years ago and developed throughout the Industrial Revolution. One of the first modern dissertations on the theoretical stress limitations of rotational disks is the work by Dr. A. Stodola whose first translation to English was made in 1917. Development of advanced flywheel started in the 1970s. [2] Generally various studies have been made on flywheels. According to the periodic combustion cycles of a 4-stroke engine produce torque fluctuations which excite torsional vibration to be passed down the drive train. The resulting noise and vibration, such as gear rattle, body boom and load change vibration, result in poor noise behavior and driving comfort. The basic concept for this paper is taken from United States Patent Document of Lee et al. The main concept of work is started by studying the problems with conventional flywheel. Torque estimation of dual mass flywheel is explained by Ulf Schaper et al which has been useful for this paper. Effect of dual mass flywheel in case of noise in vehicular power train system has been discussed by S Theodossiades et al. According to their research dual mass flywheel has best impact on noise reduction as compare to conventional flywheel. [3]

From the above discussed literatures, it is concluded that most of the work had been done on study the performance of flywheel, dual mass flywheel act as vibration isolators in engine, energy storage of flywheel etc. Now a days the requirement of energy storage of flywheel is more in small size, because of the space constraint in engines. This paper describes the improvement of energy storage capability by using dual mass flywheel with same size as compared to conventional flywheel. [2]

3.SPECIFICATIONS

Bore diameter: 35 mm
Stroke: 35 mm
Capacity: 34 cc Power output : 1.2 BHP at 5500 rpm
Torque: 1.36 N-m @ 5000 rpm
Dry weight: 4.3 kg
Ignition: Magneto ignition
Direction of rotation: Clockwise .looking from driving end
Carburettor: "B" type
Cooling: Air Cooled engine[2]

4.EXPERIMENTAL SETUP OF DUAL MASS FLYWHEEL

The experimental test rig consist of two stroke petrol engine is paired with the planetary dual mass flywheel mounted on flywheel of the shaft, by love joy coupling. The flywheel shaft is mounted on base plate with the help of deep groove ball bearing. The torsional vibration damper is incorporated into the flywheel as a two arc spring as well as two masses on the conventional flywheel. For this reason the flywheel is divided into a primary and a secondary mass hence the name exists "dual mass flywheel". The unidirectional ball bearing called as unidirectional clutch is mounted on flywheel shaft with bearing mounting to avoid opposite side rotation of dyno brake pulley. The dyno brake pulley is paired with unidirectional clutch. The rope is rapped on dyno brake pulley with one end is tie on base plate, and another end is tie on weighing pan.

Fig.1.Experimental setup of dual mass flywheel

5. PROCEDURE

1) Start engine by turning

2) Let mechanism run & stabilize at certain speed (say 1300 rpm)

3) Place the pulley cord on dynamo brake pulley and add 500 gm weight into, the pan, note down the output speed for this load by means of tachometer.

4) Add another 500 gm cut & note down the output speed for this load by means of tachometer.

5) Take data of speed up to adding 5 kg weight.

6) Repeat above process with removing weight.

7) Tabulate the readings in the observation table

for conventional and dual mass flywheel system.

8) Plot torque Vs speed, Efficiency Vs speed & Power Vs speed characteristics.[2]

5. CONCLUSION

Since we have concluded that modern automobile industry expect better performance of engine and transmission system, our project spring mass flywheel tries its best to fit their requirements.

The main advantages of Dual mass flywheel improves flywheel effectiveness and it has turn improves Engine performance characteristics such as speed, torque, power and efficiency. With refers of the research papers we have concluded that power output of engine is increased by implementing the dual mass flywheel system. We also come to know that torsional vibrations are minimized. Hence preventing gear box components knocking. Moreover the fuel consumption can also be reduced. Also the power output increases.

6. REFERENCES

[1]Design Development and Comparative Analysis of Spring Mass Flywheel vs Conventional Flywheel for Two-stroke Engine, by Tejashri KhochareAugust 2015, ISSN: 2319-4413 (Volume 4).

[2] A Review paper on Dual Mass Flywheel system,

by Prof. R.S.Shelke, D.G.Dighole.January 2016, Volume 5, Issue 1.

[3] Design and Development of Dual Mass Flywheel System, March 2015, Vol.4, Issue 3.

[4] Dr. Albert Albers, "Advanced Development of Dual Mass Flywheel (DMFW) Design - Noise Control for Today's Automobiles".

[5] Ulf Schaper, Oliver Sawodny, Tobias Mahl and Uti Blessing "Modeling and torque estimation of an automotive Dual Mass Flywheel" American control conference, 2009.

[6] Govinda, Dr.Annamalai, "Design and Analysis of Arc Springs used in Dual Mass Flywheel", International journal of

engineering and technology research. Volume 2, issue 1.pp 35-41, 2014.

[7] S Theodossiades1, M Gnanakumarr, H Rahnejat, and P Kelly, "Effect of Dual Mass Flywheel on the Impact Induced-Noise in Vehicular Powertrain systems",part D, Journal of automotive Engineering 220-(6), pp.747-761.

BIOGRAPHIES

Student of Mechanical Engineering, SBPCOE, INDAPUR, Savitribai Phule Pune University, India
Zende Rohan D. appearing BE Mechanical Engineering SBPCOE, INDAPUR, Savitribai Phule Pune University, India.

Student of Mechanical Engineering, SBPCOE, INDAPUR, Savitribai Phule Pune University, India
Madane Mahesh B. appearing BE Mechanical Engineering SBPCOE, INDAPUR, Savitribai Phule Pune University, India.

Student of Mechanical Engineering, SBPCOE, INDAPUR, Savitribai Phule Pune University, India
Thavare Tushar M. appearing BE Mechanical Engineering SBPCOE, INDAPUR, Savitribai Phule Pune University, India.

Student of Mechanical Engineering, SBPCOE, INDAPUR, Savitribai Phule Pune University, India
Nanaware Rahul P. appearing BE Mechanical Engineering SBPCOE, INDAPUR, Savitribai Phule Pune University, India.