Design Analysis Of Composite Flywheel Made Of Carbonfiber Using Finite Element Analysis: A Review

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***Abstract*—In present examination, to counter the prerequisite of smoothing out the extensive motions in speed amid a cycle of an I.C. Motor, a flywheel is planned, and broke down. By using Finite Element method is used to calculate the stresses inside the flywheel, we able to compare the Design and analysis result with existing flywheel. The finite element method of this model was then produced using the tetrahedron solid element. The analysis was performed in a static condition. We find out the total deformation, normal stress and equivalent stress by using FEA software. In this paper by observing the results of static analysis obtained carbon fiber is suggested as better material for designing of wheel as it has lower weight. This study of the enhancement of high-speed flywheel energy storage is to investigate composite materials that are suitable for high-speed, high-energy density for energy storage and/or energy recovery. The main motivation of the study is to explore the application of the flywheel in automobile car industry.**

Keywords— composite, flywheel, finite element analysis, ansys

I. INTRODUCTION

A flywheel utilized in machines fills in as a repository, which stores vitality amid the period when the supply of vitality is more than the prerequisite, and discharges it in the middle of the period when the necessity of vitality is more than the supply. Flywheels fill in as dynamic vitality stockpiling and recovery gadgets with the capacity to convey high yield control at high rotational speeds as being one of the rising vitality stockpiling innovations accessible today in different phases of improvement, particularly in cutting edge mechanical regions, i.e., rockets. Today, a large portion of the examination endeavours are being spent on improving vitality stockpiling ability of flywheels to convey high power at exchange times, enduring longer than customary battery fuelled advances. For the most part, the execution of a flywheel can be credited to three components, i.e., material quality, geometry (cross-segment) and rotational speed. While material quality legitimately decides motor vitality level that could be created securely joined (coupled) with rotor speed, this examination exclusively centres around investigating the impacts of flywheel geometry on its vitality stockpiling/convey ability per unit mass, further characterized as Specific Energy. Proposed PC helped examination and improvement method results demonstrate that plan of flywheel geometry could both significantly affect the Specific Energy execution and diminish the operational burdens applied on the pole/heading because of decreased mass at high rotational velocities

II. LITRATURE REVIEW

Composite materials have both high strength and low density and are ideal for flywheel rotors used for energy storage. A composite material allows a higher rotational speed and this result in flywheel rotors with high specific energy. Composite materials are therefore a better choice than metals when designing flywheel rotors. The theoretical specific energy of composite rotors is around five times higher than metallic ones. The high-speed flywheel concept originated in the early 1970s. A researcher at Lawrence Livermore National Laboratory presented an article in Scientific American proposing a new approach to rotor design, recommending the use of composite materials instead of metal. Composite materials also have safety advantage over metallic material.

Akshay P. Punde [1] built up the strategy to countering the necessity of smoothing out the expansive motions in speed amid a cycle of an I.C. Motor, a flywheel is planned, and analysed and finished up Based on the above work of flywheel and its improvement techniques the accompanying end can be drawn. Unmistakably, cast iron flywheels are having higher Stress and disfigurement. Palak J. Patak [2] has done research on Reduction and Optimization of weight of vehicle flywheel and finished up Gray cast iron flywheel is exposed to increasingly add up to disfigurement contrasted with 5059 Al. Test completed by Sushama G Bawane [3] on Optimization system different parameter like material, cost for flywheel can be upgraded, 1kg weight 20% material can be expelled from the fringe of the flywheel. A technique was depicted by Sudipta Saha [4] Exploring the impacts of flywheel geometry on its vitality stockpiling/convey capacity per unit mass and reasoned that In this plan of flywheels, there is still space for research, particularly when the execution is the essential goal. Prof. GayatriS.Patil [5] has done Evaluation of non-straight worries in the flywheel for various material, and discover The direct investigation was done on Aluminium composite, Cast Iron, Titanium and E-glass materials that is demonstrates the less pressure. Exploratory completed by F. Monfort Windels [6] and has utilized strategy for Currently, in air ship, composite structures that are strengthened with these materials are utilized in all the essential parts, including the wings and fuselage which finished up Carbon fiber composites have an incredible future in front of them, regardless of whether a few vulnerabilities make it difficult to precisely predict how the market will create. Xiao tune Huang [7] the point of this examination Carbon fiber is characterized as a fibre containing no less than 92 wt. % carbon, while the fibre containing no less than 99 wt. % carbon is typically called a graphite fiber and finished up Polyacrylamide (PAN) and mesosphere pitch (MP) are the two most imperative carbon fibre precursors. KishorD.Farde [8]said in his paper Flywheels fill in as active vitality stockpiling and recovery gadgets with the capacity to convey high yield control at high rotational speeds as being one of the developing vitality stockpiling and closed A composite material permits a higher rotational speed and this outcome in flywheel rotors with high explicit vitality and light in weight. Archana A Pihulkar [9] has utilized technique for A flywheel is a turning mechanical gadget that is utilized to store rotational vitality. Flywheels have an inactivity called the snapshot of dormancy and along these lines oppose changes in rotational speed and closed Project depends on structure, advancement and enhancement of flywheel utilizing composite material. K. Hayat[10] has done research in A vitality stockpiling framework (ESS) is indispensable to utilize vitality proficiently by putting away the surplus vitality from sustainable assets. A flywheel vitality stockpiling framework and finished up A half and half composite arch sort centre and rotor have been planned, manufactured and tried to fabricate a cross breed. JASON LEE[11] done experimentation on Modern innovation has empowered another application for the well established flywheel in cutting edge flywheel vitality stockpiling frameworks and finished up It is normal that for all cases an adequate change in estimations for position or current will happen for rates over 40,000 Rpm. R.E. Hebner [12] has utilized strategy for Composite flywheels are planned, built, and utilized for vitality stockpiling applications, especially those in which vitality thickness is a critical factor and closed Composite flywheel configuration has achieved a dimension of development adequate to guarantee that hearty frameworks with a wide range. X. Charles [13] appeared in is paper that A car framework utilizing a rapid, moderate mass controller fit for putting away and space Dissipating huge gives of mechanical vitality not to mention a transmission uniquely crafted and inferred that The above discovered outcomes speaks to the von misses stresses disfigurement and normal recurrence from the table, it is seen that the von misses stresses 152.818 Mpa.

III. GAP ANALYSIS

There are lots of materials which are used in fabrication of flywheel but most of them are metals like steel, cast iron etc. which are heavy metals and costly. So there is scope of work left in the field of steel & carbon fibre flywheel as composite material.

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