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Design and Analysis of Solar Power Cart for Inhouse Application Through ANSYS

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Abstract -The design and analysis of a solar power cart for in-house applications using ANSYS software is presented in this paper. The solar power cart is a portable, self-contained unit equipped with solar panels, batteries, and power electronics, designed to provide a renewable energy source for various in-house applications. The objective of this study is to analyze the structural integrity and thermal performance of the solar power cart using ANSYS simulation tools. The structural analysis focuses on evaluating the cart's mechanical strength and durability under various loading conditions, including static and dynamic loads. Finite element analysis (FEA) is used to simulate the structural behavior of the cart's components, such as the frame, wheels, and mounting structures, to ensure they can withstand the operational loads. The thermal analysis investigates the heat distribution and dissipation within the cart to prevent overheating of the components and optimize the overall thermal performance. ANSYS Fluent is employed to simulate the airflow and heat transfer mechanisms, enabling the design of effective cooling systems and thermal management strategies. The results of the design and analysis are used to optimize the solar power cart's performance, efficiency, and reliability for in-house applications. The proposed design demonstrates the feasibility of using ANSYS software for the design and analysis of renewable energy systems, providing valuable insights for future research and development in this field..

Key Words:

Hallow shaft, Catia software Ansys19.0

1.INTRODUCTION TO CAD

PC helped design (CAD) is using PC developments (or workstations) to important resource inside the creation, change, appraisal or improvement of a plan. PC helped configuration writing computer programs is used to construct the productivity of the style draftsman, update the most stunning viewpoint setup, improve correspondences through documentation, and to make an informational index for gathering. PC supported plan yield is oftentimes inside the kind of mechanized reports for print, machining, or other creation undertakings. The time span CDAD (for Computer Aided Design and Drafting) is moreover used. Its usage in arranging progressed systems is suggested as electronic strategy robotization, or ERA.

2. DESIGN OF SHAFT SOLAR CART

It is a model of shaft design fig(2.1) & fig(2.2).it as consider 2.1 as shaft diameter and 2.2 shaft length

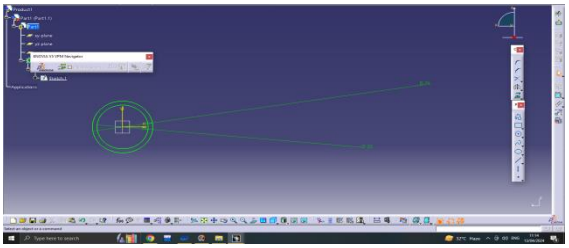


Fig2.1 diameter of hallow shaft

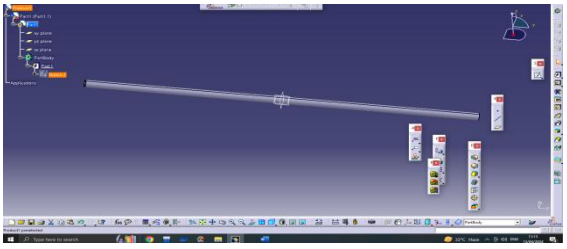


Fig2.2 length of shaft

METHODOLOHY

3.1 METHOD OF DESIGN

It consists of internal framework that supports man-made object. It is the under part of the vehicle which consists of frame and Running gear like motor, transmission system, suspension system etc. The automotive shaft is tasked with keeping all components together while driving and transferring vertical and lateral loads caused by acceleration, on the chassis through suspension and the wheels.

Hollow shaft lends the whole vehicle support and rigidity. shaft usually includes a pair of longitudinally extending channels and multiple transverse cross members that intersect the channels. The transverse members have a reduced cross section in order to allow for a longitudinally extending storage space.

3.2FINITE ELEMENT ANALYSIS (FEA)

It is widely accepted method of accessing product performance without the need for physical building and testing. It also shortens prototype developing cycle times and facilities quicker product launch. FEA consists of a computer modern of a material or design that is loaded analyzed for specific result. It is used in new product design and existing product refinement

ANALYSIS OF HOLLOW SHAFT

STATIC ANALYSIS

MATERIAL CARBON STEEL

LOAD 150 Kgs

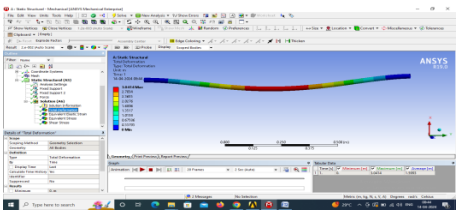


Fig3.1 Total deformation

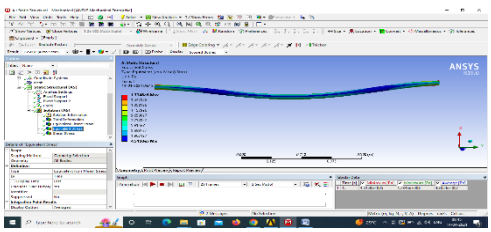


Fig3.2 strain

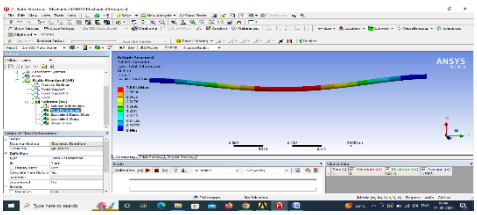


Fig3.3 stress

LOAD AT 200 Kgs

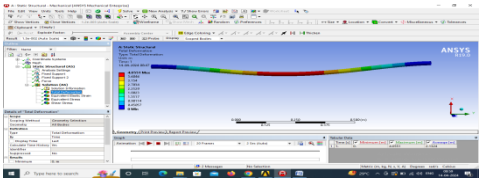


Fig 3.4 total deformation

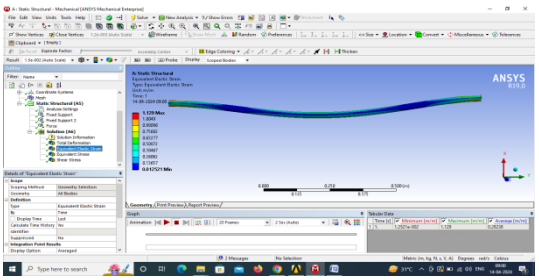


Fig3.5 strain

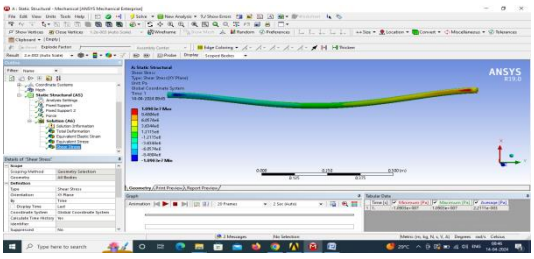


Fig 3.6 stress

LOAD AT 250 Kgs

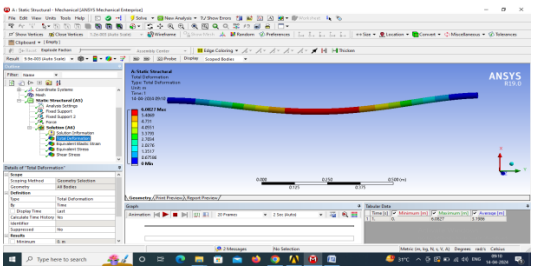


Fig3.7 total deformation

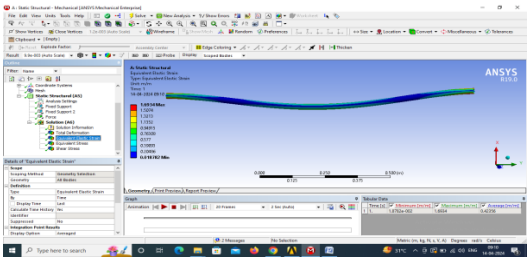


Fig 3.8 strain

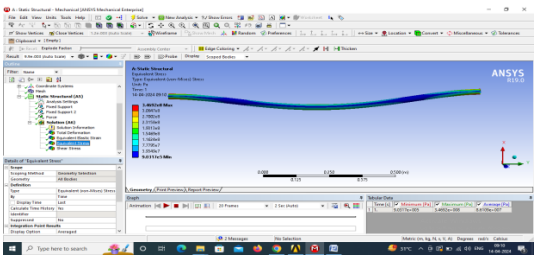


Fig3.9 stress

Let us consider the different types of loads carrying the capacity on hollow shaft to find the deformation, stress and strain. the mention above loads 150 kgs, 200kgs,250kgs in the Ansys 19.0 software

RESULT TABLES STATIC ANALYSIS RESULTS

Mode Is	Material	Load (Kgs)	Deformation	Stress	Strain
Hallow	Carbon Steel	150	3.0414	1.734E8	0.846
Hallow	Carbon Steel	200	4.0551	2.321E8	1.129
Hallow	Carbon Steel	250	5.0689	2.891E8	1.412

Flow chart for structural (static) analysis procedure's

PRE-PROCESSING	• Definition of type of analysis • Material properties • Elements type used Description of the geometry or model in order to generate mesh (number of nodes or elements edge length) • Loads and boundary conditions
SOLUTION	• Run analysis to obtain solution (stresses and displacements)
POST-PROCESSING	• Graphical display of the stresses and displacement for quick and easy interpretation of results.

SELECTION OF MATERIALS

4.1PROPERTIES OFCARBONSTEEL

PROPERTIES	VALUE
Density	7850
Poisson's ratio	0.3
Shear modulus	7.9615E+10
Bulk modulus	1.725E+11
Tensile yield strength	2.5E+08
Tensile ultimate strength	2.5E+08

4.2 Application of structural steel

- Construction industries
- Transport industries
- Mining sector
- Ship Building
- Energy sector
- Packaging industries

5. SPECIFICATIONS:

5.1SPECIFICATIONS OFMOTOR:

Motor type = BLDC Motor.

Speed = 2000-6000rpm.

No. of Poles = 8.

Voltage = 48V

Power = 1250Watts

Power source = 1.6H. P

5.2SPECIFICATIONS OF BATTERY:

Model = 3-1

Nominal Voltage = 48V

Capacity = 30Ahm

Core material = Lithium iron phosphate

Max .Cont. Discharge current = 60A

Max. Chargingcurrent = 15A

cycle life = >3000

Applicable products = Tricycle Electric Vehicle

5.3 SPECIFICATIONS OF CHASSIS:

Material used = AISI1018 carbon steel

Pipe Diameter = 26mm

5.4SPECIFICATIONS OFBRAKE:

Position = Single rear.

Type = Drum Brake.

5.5 SPECIFICATIONS OFSPROCKET:

Type of Material = MS.

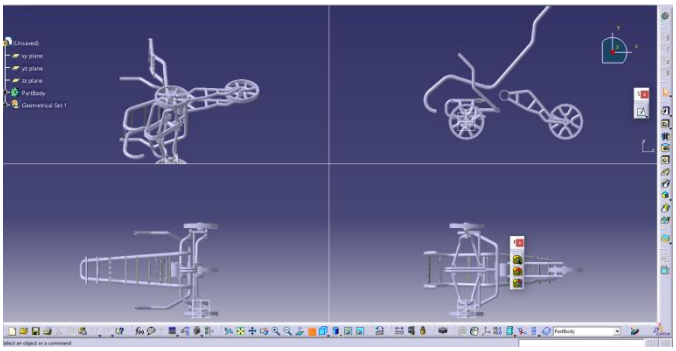
Outer Radius of sprocket;

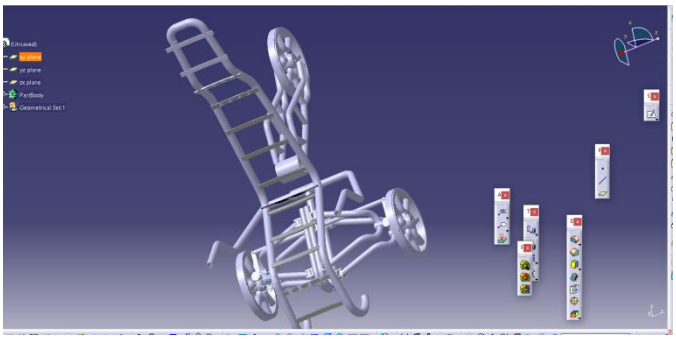
No of Teeth = 22.

5.6SPECIFICATIONS OF STEERINGSPINDLE:

Material = STEEL

Diameter = 1.5 inches





CONCULSION

“The Design and Fabrication of Hybrid Vehicle” of self-designed and self-assembled has been carried out by our team with diligent and continuous effort. The design of the chassis and relevant components are designed by using the Fusion 360 software by one of the project teams of our college. Then the fabrication process is started by applying the methods like Pipe bending, Pipe cutting, beveling, welding, reaming and grinding processes. Followed by the completion of fabricating the components of the vehicle the power transmission system is placed my means of motor to the rear wheel through chain mechanism. The connections for the motor and solar panel are given from the battery through the controller. The power generation by the solar

equipment is sufficient to supply the power to lights and horn. For protecting the kart from atmospheric corrosion paints are applied. The project hassucceed to run the vehicle by means of both battery and solar panel.

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