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Design of Electric- Go Kart

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Abstract: The aim of our project is the development of an electric GO kart vehicle to reduce emission of hazardous pollutant gases and to design and develop a vehicle which works efficiently on electric power.
E-Kart is a racing vehicle having very low ground clearance and can be worked on only flat racing circuits.This paper concentrates on explaining the engineering behind the design of a safe, rigid and torsional free frame, well-mounted power train along with the braking and steering system. We approached our design by considering all possible alternatives for a system and modelling them in SOLIDWORKS.

I. INTRODUCTION

Electric Vehicle comprise of various models, which are interconnected for working of the vehicle. Initially while designing an electric vehicle, one has to fix certain parameters like, radius of tyres, type of motor, type of battery and the dimension of the vehicle.

These factors are used in calculation of various factors like-Resistance offered, Torque provided by tires ,charge and Discharge rate of Battery.

The design of the vehicle plays an important role in the efficiency of the vehicle . If the vehicle is better aerodynamically designed ,then it would have to overcome less resistance while running , thereby load on motor would be reduced and it would work efficiently and offer large range .The environment and terrain in which we will use Electric Vehicle in a very crucial factor ,as different terrains provide different environmental conditions and the Electric Vehicle should be designed in a particular fashion ,so it adapts to the particular terrain ,for enhancing the working of the vehicle. The main component of Electric Vehicle are the Motor and the Battery.

II. MATERIAL USED

The material used in designing and development of this project is AISI 4130. This steel provides necessary strength. This metal combines both iron and carbon elements along with manganese, sulphur chromium and silicon. Due to its versatile properties it is dominating in the current market. It is so useful that the American iron & steel industry and Society of Automotive Engineers (SAE) outlined numerous grades of steels which are made for specific purposes and denoted by 3 to 5-digit identifiers. 4130 is commonly used alloy steel.

A. Physical Properties of AISI 4130

4130 steel gets its name from specific rules outlined by SAE & AISI. The first digit i.e. 4 of 4130 alloy indicates the class of steel. The second digit i.e. 1 represents the relative percentage of this alloying element and other important secondary elements present in the material and the remaining last two digits which is 30 represents the carbon concentration. By knowing these rules of 4130 steel, 4XXX & 41XX series (chromium -molybdenum steels) with around 1% molybdenum/chromium by mass with an included 0.30% carbon.

The chemical breakdown for AISI 4130 steel is given below:

1) 0.28 - 0.33% Carbon
2) 0.7 - 0.9% Manganese
3) 0.8 - 1.1% Chromium
4) 0.15 - 0.25% Molybdenum
5) ≤ 0.04% Sulphur
6) 0.15 - 0.35% Silicon
7) ≤ 0.035% Phosphorus

B. Mechanical Properties of 4130 Steel

Mechanical properties	Metric
Modulus of Elasticity	205 MPa
Ultimate tensile strength	670 MPa
Tensile yield strength	435 MPa
Rockwell B Hardness	92
Elongation of Break	25.5%

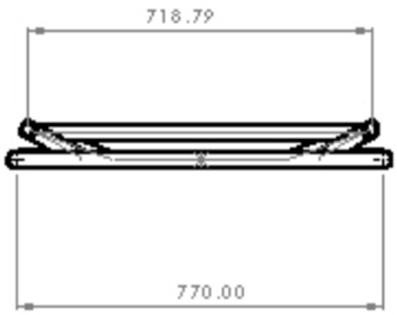
The elastic modulus is a measure of a material's elasticity, it is common mechanical which is used to show material stiffness. 4130 steel has high modulus of elasticity of 205 MPa which is higher than some strength steels such a 4018 steel. This shows that 4130 steel has high rigidity and does not bend easily and can withstand large stresses and still returns to its original position.
Hardness is the ability of material that describes the response of material to local surface deformation. There are many hardness test scales that depend on standard hardness testing machines. The most common alloy Rockwell indenter machine is used & 4130 steel has a hardness of 92 which is high for steel and shows why 4130 steel is so tough. Mainly hardness indicates increase in stiffness.

C. Application of 4130 Steel

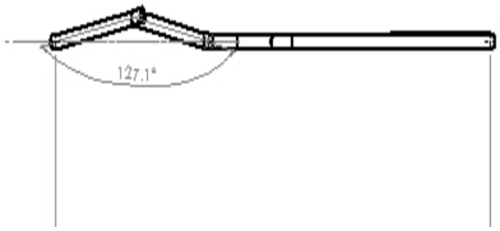
4130 alloy steel is an exceptionally tough material vital to welding, manufacturing, cutting, grinding and other high stress applications in industry. 4130 steel's great heat treatment characteristics impart a high toughness and, combined with its great machinability, workability and therefore this steel is widely useful.

III. CHASSIS & DESIGN

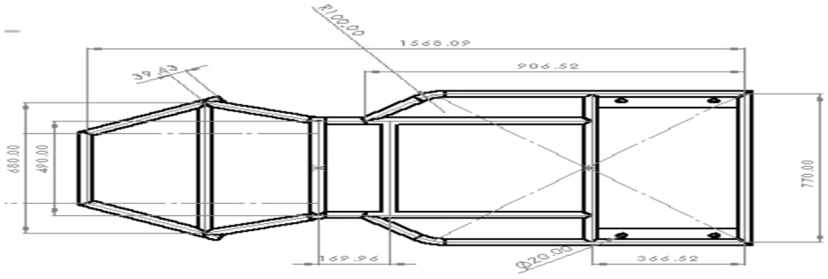
Front View



Side View



Top View



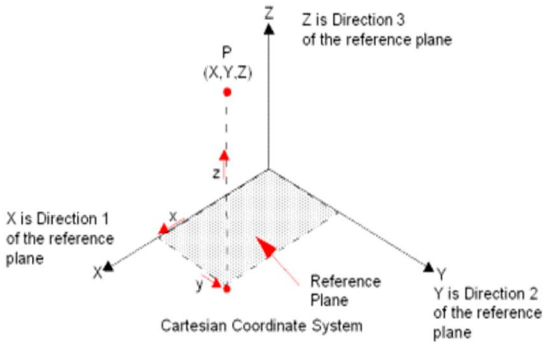
The material used to make the chassis is AISI 4130 steel. Which has good weldability, ductility, and hardness. While making this chassis we used arc welding. Chassis is the main component in kart which holds all the weight and provides suspension so it should have good hardness and should not be compromised with flexibility. The design of the chassis is done by Solid-works software as shown in fig. The weight of the chassis is 18kg

A. Solidworks Fundamentals

The SolidWorks application is mechanical design automation software that takes advantage of the familiar Microsoft Windows graphical user interface.

This easy-to-learn tool makes it possible for mechanical designers to quickly sketch ideas, experiment with features and dimensions, and produce models and detailed drawings.

B. Directional Loads And Boundary Condition



Loads and boundary conditions are necessary to define the service environment of the model. The results of analysis directly depend on the specified loads and restraints.

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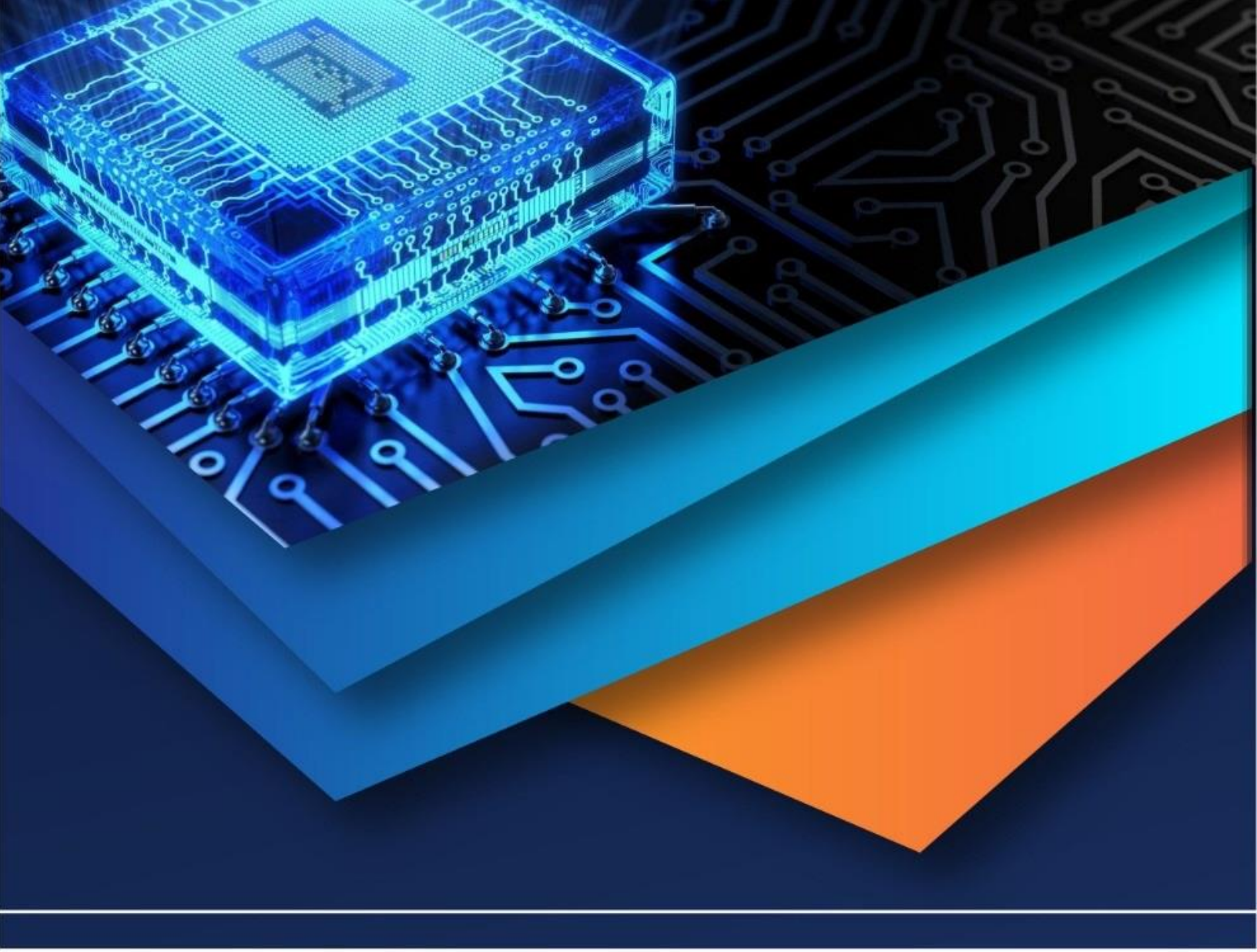

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