INFLUENCE OF VARIATION OF GEAR RATIO ON TRANSMISSION SYSTEM OF ECO-FRIENDLY KART

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Abstract : Each and every day the prices of petrol and diesel keep on fluctuating. Increase by day to day. Then to save a fuel for future used. So basically it is important to design such vehicle that could work on electric energy rather than fuels, as electrical energy is available in large amount compared to fuels.
This paper aims to design analysis of gear ratio and influence of its variation on the transmission system. And design a drive shaft to achieve a suitable diameters. The main intension to achieve optimum speed of ecofriendly kart.

Keyword: Electric motor, Design of shaft, variation of gear ratio, Transmission system.

I. INTRODUCTION

E-kart is four wheeled, mini racing used mainly in United States. Transmission systems are of various type that is Belt Drive, Chain Drive, Gear Drive. As ecofriendly kart run on battery [3]. Chain drive selected for transmission. Gear ratio means number of teeth on larger gear to number of teeth of smaller gear. Hence by varying gear ratio different speed occurred. Analysis of traction force and motor efficiency through the torque distribution between the motor and gear ratio, the necessity of optimizing these factors was confirmed to improve the dynamic performance and energy efficiency [1]. Roller chain drive are applied for power transmission in any mechanical system due to high energy efficiency, large power capacity, timing capability, flexibility in choosing shaft centre distance, and ease of installation and maintenance [2].

II. TRANSMISSION SYSTEM

The function of drivetrain is to couple the engine that produces the power to the driving wheels that put this power down to the road surface. This connection involves physically linking the two components. They are done to meet the rule specification. power is transmitted from the engine to the rear axle by the means of the chain and sprocket.

Motor Specification	Values
Motor	48V BLDC @3000rpm
Power	2000W
Rated Torque	7.6 N-m
Motor Weight	5.9 kg
Battery & Battery wt.	Lithium ion phosphate (90Ah, 48V) 31 kg

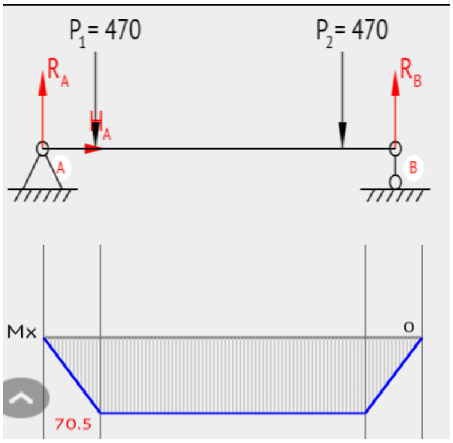
Table no 1: Motor Specification

III. CALCULATION

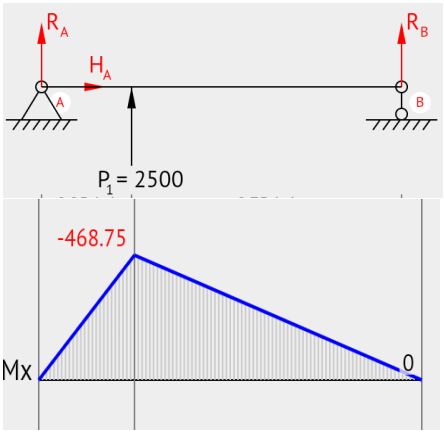
❑ Speed = tyre radius*rotational velocity/(168*gear ratio)
= 6.5*3000/168*2.4
=48 mph
Speed in kmph will be:
Kmph= mph*1.609344
= 77.24 kmph

❑ Efficiency = Ideal RPM of shaft under loaded / calculated RPM on shaft * 100
= 1192/1250 * 100
= 95%
❑ Gear Reduction = No. Of teeth on sprocket / No. Of teeth on pinion
= 24 / 10
= 2.4
❑ Battery discharge = 5 hours on load condition.

IV. DIAMETER OF REAR AXLE



Horizontal BMD of rear axle



Vertical BMD of rear axle

Max torque at axle	138.6187204Nm
vertical load at axle	940N
rear axle length	40 in
disc position from left wheel	0.08 m
sprocket position from left wheel	0.31 m
sprocket pad	87.5mm
max bending moment in shaft	531Nm
Equivalent twisting moment	548.7951801Nm
Equivalent bending moment	539.89759Nm
Factor of safety	2.15
ultimate shear stress	300 MPa
Ultimate tensile strength	440 MPa
Allowable shear stress	139.5348837MPa
Allowable bending stress	204.6511628MPa
Safe Diameter based on twisting moment	27.16267951MPa
Safe diameter based on bending moment	29.95751836mm
diameter of rear axle	30mm

Table no 2: Shaft Design

CONCLUSION:

In this paper we have studied about Influence of variation of gear ratio on Transmission system to achieve optimum speed for eco-friendly Kart.

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