CONCEPTUAL DESIGN AND DEVELOPMENT OF A COMPOSITE DRIVETRAIN DIFFERENTIAL CASING FOR FORMULA STUDENT RACE CAR

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This report is submitted in accordance with the requirements of the Bachelor of Mechanical Engineering (Automotive)

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MAY 2009

I admit that have read this work and in my opinion this work was adequate from scope aspect and quality to award in purpose Degree of Bachelor of Mechanical Engineering (Automotive)

Signature :……

1st Supervisor's name:……

Date :……

DECLARATION

"I hereby, declare this report entitled "Conceptual Design of a Composite Drive Train Differential Casing for Formula Student Race Car" is the results of my own research except as cited in the reference."

Signature : ……

Author's Name : MOHAMAD ARIFF SHAH B MOHAMED NAZMI

Date : 8TH APRIL 2009

DEDICATION

For my beloved father, papa, mom, sisters and brother.

ACKNOWLEDGEMENT

In the name of Allah, the Most Merciful and the Most Beneficent. It is with the deepest senses gratitude of the almighty that gives strength and ability to complete this project and technical report.

First of all, I would like to dedicate my special thanks to my supervisor, En Muhd Ridzuan Bin Mansor and also lecturers at Universiti Teknikal Malaysia Melaka because allowed to take me under his supervision. All of them has given me valuable information and ideas how to perform this project.

I would also to express my thanks to all the faculty lecturers and technicians for their assistance and guidance advice in developing and producing this work and also an effort to guide me through my Projek Sarjana Muda (PSM).

Last, but certainly not least, the continual encouragement and support of my family and not forgotten to all my friends in Universiti Teknikal Malaysia Melaka and the others who somehow that invite whether directly or indirectly in the completion of my project. Without their support, dedication kindness and guides, I can't finish my training and also this report. I hope that this report will be a good reference for other students in the future.

ABSTRACT

The main goal of this project is to design and fabricate a composite drive train differential casing for formula student race car. The main problem of this project is to test whether the Glass Fiber Reinforced Plastic (GFRP) is suitable enough to be used as the material of the product. Aiming to achieve this goal, several techniques were carried out with method. In the first phase, literature review regarding the material has been carried out. Concept design of the differential case, load calculation for the design and composite material were presented in this report. Manufacturing process also will be explained in this report. The conclusion of this project is to have a completed concept design with its final product of the composite drive train differential casing given with its proven load calculation.

ABSTRAK

Objektif utama projek ini ialah untuk merekabentuk pelindung komposit gear kebezaan pada kereta lumba formula pelajar. Masalah utama yang perlu dititkberatkan ialah untuk menguji samada bahan komposit sesuai untuk dijadikan sebagai material binaan untuk pelindung gear kebezaan pada kereta lumba Formula Pelajar. Untuk mencapai matlamat ini, terdapat beberapa teknik yang telah dilakukan. Kajian ilmiah mengenai bahan Komposit polimer gentian kaca telah dilakukan. Beberapa konsep rekabentuk berkenaan rekabentuk juga telah dilakukan. Seterusnya, pengiraan daya terhadap kekuatan dan ketahanan terhadap rekabentuk produk juga dilakukan. Proses pembuatan rekabentuk juga ditunjukkan di dalam projek ini. Secara kesimpulannya,di akhir projek ini akan dikeluarkan rekabentuk serta produk penuh pelindung komposit gear kebezaan pada kereta lumba Formula Pelajar berserta pengiraan daya untuk rekabentuk bahan berkenaan.

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τ = Shear Stress

P = V= Shear Force

A = Area

A_b= Reduced Area

t = Thickness

d = Diameter

P_b = Bearing Force

σ_b = Bearing Stress

M = Moment

Fr = Friction force

r = Radius

E_{11} = Modulus young

G_{12} = Tensile modulus

V_{21} = Poisson ratio

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CHAPTER 1

INTRODUCTION

Formula student race car is using rear wheel drive for its transmission. In formula student race car, drive train differential gear plays an important role in rear drive wheel transmission. The function of the gear differential is to allow the rear wheels rolling with different rate of speed when its moving in straight line and cornering on the road. A casing for the drive train differential casing of the car is needed in case to protect the gear parts and its oil from damage.

1.1 OBJECTIVES

The objectives of the project are:

i. To produce a composite drive train differential casing for Formula Student Race Car
ii. To reduce the component weight on the existing Formula Student race car.