UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN, ANALYSIS AND DEVELOP KR-150 GO-KART

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Design) with Honours.

by

JAMIESHAH BIN JAMIL

FACULTY OF MANUFACTURING ENGINEERING

© Universiti Teknikal Malaysia Melaka

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **Design and Analysis KR-150 Go-Kart**

SESI PENGAJIAN: 2009/10 Semester 2

Saya **JAMIESHAH BIN JAMIL**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (√)

☐	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☒	TIDAK TERHAD	

Disahkan oleh:

Alamat Tetap:

211 BLOK A, MK 12,

SUNGAI NIBONG BESAR

11900, BAYAN LEPAS, PULAU PINANG

Tarikh: 10 MAY 2010

Cop Rasmi:

Ir. SIVARAO, P.Eng
M.I.E.M, S.M.A.M.S, I.A.Eng
Lecturer / Researcher
Faculty of Manufacturing Engineering
Universiti Teknikal Malaysia Melaka (UTeM)
75450, Ayer Keroh, Malacca, Malaysia.

Tarikh: 10/5/2010

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

© Universiti Teknikal Malaysia Melaka

DECLARATION

I hereby, declared this report entitled "Design and Analysis KR-150 Go-kart" is the result of my own research except as cited in references.

Signature : 

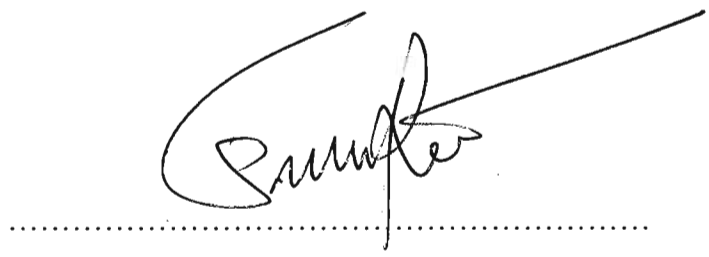
Author's Name : Jamieshah Bin Jamil

Date : 10 May 2010

© Universiti Teknikal Malaysia Melaka

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) with Honours. The member of the supervisory committee is as follow:



.....

Ir. Sivarao a/l Subramonian

Ir. SIVARAO, P.Eng
M.I.E.M, S.M.A.M.S, I.A.Eng
Lecturer / Researcher
Faculty of Manufacturing Engineering
Universiti Teknikal Malaysia Melaka (UTeM)
75450, Ayer Keroh, Malacca, Malaysia.

© Universiti Teknikal Malaysia Melaka

ABSTRACT

The existing design of go-cart is not suitable for road driving. This is because of the height measurement of existing go-cart where it is lower than the daily vehicle while the lack of suspension system in existing go-cart's design will cause the use of existing go-cart on the road is not relevant and has many problems in terms of safety factors. After doing some studies on the measurement and the design of go-cart, the new innovation design is produce which is called GK-150. GK-150 is the suitable design to drive on the road or on the racing circuit. GK-150 is operational with the suspension system and 150cc engine. The height measurement of the go-cart is also capable passing bumpers and can be used as a racing vehicle or daily use.

© Universiti Teknikal Malaysia Melaka

ABSTRAK

Rekabentuk go-kart yang sedia ada adalah tidak sesuai untuk di pandu di jalan raya. Ini kerana ukuran ketinggian bagi Go-kart sedia ada adalah lebih rendah daripada kenderaan seharian manakala ketiadaan sistem perendam di dalam rekabantuk go-kart sedia ada menyebabkan penggunaan go-kart di atas jalan raya adalah tidak relevan serta mempunyai banyak masalah dari segi faktor keselamatan. Setelah membuat kajian ke atas ukuran dan rekabentuk go-kart yang sedia ada, lahirlah rekabentuk inovasi yang dinamakan GK-150. GK-150 adalah rekaan yang sesuai dipandu di jalanraya mahupun di atas litar perlumbaan. GK-150 dilengkapi dengan sistem perendam dan enjin berkuasa 150cc. Ukuran ketinggiannya juga berkeupayaan melepasi bonggol serta boleh dijadikan alat perlumbaan atau kenderaan kegunaan harian.

© Universiti Teknikal Malaysia Melaka

DEDICATION

"Special dedicated to my parents, Mr. Jamil Bin Hj. Ngajis and Mrs. Hjh. Mazlina Binti Hj Yusop and family for their understanding and support to finish this thesis. Special thanks to my supervisor, Mr.Ir.Sivarau A/L Subramonian for his encouragements, advices, and motivational supports for me to finish this thesis. Thanks a lot to my colleagues for giving supports and their keenness helping me during my thesis.

"May Allah be with us"

© Universiti Teknikal Malaysia Melaka

TABLE OF CONTENT

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

LIST OF FIGURES

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

LIST OF TABLES

© Universiti Teknikal Malaysia Melaka

CHAPTER 1
INTRODUCTION

1.0 Introduction

Go-kart or karting was born from United States in 1950s, where the engine mainly from discarded lawn engine. Go-kart is a driving and racing miniature, skeleton frame, and rear engine automobiles called karts (DiNozzi, 1999). Go-kart is a non popular sport previously, but today it has become one of the most popular sports by multiple group of age. Now days, racing go-karts are considered as one of the most economic activity where a large number of people can participate.

1.1 Background

In the new millennium, we regularly heart about motorsport racing such as formula one, NASCAR, rally art and many more, which are used popular in the western countries but nowadays it has been wide separate in the developing countries. Those motorsports activity is mainly popular for the rich people because of restrict by the regulations and further more high cost. In contrast, go-kart motorsport gives chances to low income people to get involved in legal racing with less restricted by regulation and low budget needed. Seven times formula one World champion, Michael Schumacher started his involvement in motorsports with karting. He joined go-kart motor sports at his hometown, Germany and won his first go-kart championship at the age 19 years old (McAuley. J, 2008). All go-karts look alike, but the fact is that go-karts have its own classes such as sprint kart, road racing kart, indoor karting and speedway karting. In addition, with small engine and skeleton frame go-karts speed can speed up to 100 miles per hours with a weight up to 210 pounds.

© Universiti Teknikal Malaysia Melaka

The development in karting has expanded rapidly together with advanced technology. As this motorsport become popular among citizens, those go-karts manufactures started to do more research and development to improve the go-kart in terms of the chassis design, speed, braking system and transmission system. Today's, go-kart frames are made from lighter iron, chromoly and others which is more durable and it can absorb more vibration even if it has no suspension. Designers, engineers and others have involved directly towards new achievement in improving all aspects in the go-kart. The usage of advanced technology in manufacturing is widely utilized to invent a better go-kart.

1.2 History of Go-kart

In 1958, go-kart was already a popular racing motor sports especially among locals around USA. The history took placed at Rose Bowl in Pasadena, California. One of the significant names of this sport was Don Boberick. He started his participation in karting when he was still working at Art angels. Art Angels, Duff Livingstone and plenty of individuals was the participant of motor racing type of events at rose bowl parking lot (DiNozz, 1999). Roy Desbrow had constructed a kart named the "Drone" and he was also a business partner of Duffy Livingstone. The kart was powered by 250cc engine originally used in a U.S Army radio controlled drone air plane (DiNozzi, 1999). Don Boberick was the driver to the kart at the rose bowl kart competition. At the same time Don was also contacted by Jim Rathman to drive the latest kart design at GKCA (Go-kart Club of America) Nationals called FIRST Rathman Xterminator prototype kart in 1959 (Figure 1.1).

© Universiti Teknikal Malaysia Melaka

Figure 1.1: Don Boberick driving the "Drone" (www.vintagekarts.com, 1999)

In 1959, the world of go-kart revaluated to be more organized event as Don Boberick, Duffy Livingstone, Marvin Patchen the advertising manager of Peterson Publishing Cooperation and few members agreed to form an organized pattern called Go-kart Club of America (GKCA) to manage and organized motor racing at an inexpensive level (DiNozzi, 1999). The role of this organization was to prepare the technical regulation that could comprise the competition. Dick Van der Veer was the first president of the GKCA. Duffy Livingstone and partners, Res Desbrow and Bill Rowles built a new go-kart Mfg.Facalitiy in Azusa, California in 1959 (Figure 1.2) (DiNozzi. B, 1999).

Figure 1.2: This is the old Drone testing on the new "Azusa" track in early 1959 (www.vintagekarts.com, 1999)

© Universiti Teknikal Malaysia Melaka

In 1960, in California they had their own racing team such as Go-kart Manufacturing and Bug who already had their own facilities like bus transports. During that time, there was Championship held at Rockford, IL, for the North American Kart Association (NAKA) National Championships in California.

Figure 1.3: Go-kart Manufacturing Company's class "B" drivers
(www.vintagekarts.com, 1999)

In 1961, GKCA published kart magazines named "The Karter" issued on the February 1961. Then GKCA became International Kart Federation (IKF) initiated by GKCA president 1961 for the reason of it was important to divide the kart club and the manufacturer (DiNozzi, B, 1999).

Figure 1.4: The Karter magazines February edition
(www.vintagekarts.com, 1999)

© Universiti Teknikal Malaysia Melaka

1.3 Problem Statement

Most of the manufacturer of go-kart used to design for go-kart circuit only but not for the normal road in Faculty of Manufacturing Engineering (FKP) or even the world. At the moment the engine for go-kart has a very low central fugal gravity force in order to stabilize the go-kart but it can not used for normal road, which is used to be rough in some part of the road. This is the main problem for current go-kart chassis design available in the market.

Based on this problem, this research would like to modify or improved the current go-kart chassis for more comfortable design which is suitable not only for go-kart circuit but also for normal road. This research project will redesign the go-kart chassis to suit the go-kart circuit as well as for normal road. In order to it more feasible, the new design go-kart chassis will used KR-150 go-kart engine so that the horse power for this engine is manage to carry total weight of the go-kart including driver.

1.4 Objective of the Project

The general objectives of the project is the modify or redesign the go-kart chassis for better performance in the go-kart circuit and normal roads. The specific objectives are as follow:

(a) To construct the optimum design of go-kart for better performance.
(b) To assemble the KR-150 engine in the new go-kart chassis which has been develop.
(c) To test dynamically for its performance and suitability of campus use.

The new developed of go-kart should be more versatile and suitable to used the UTeM campus in the near future.

© Universiti Teknikal Malaysia Melaka

1.5 Scope of Project

The scopes of the project are as follow:

- To suite the KR-150 engine into develop chassis.
- To mount disc break application.
- To apply the simple design of steering system to suite into GK-150 project.
- To apply the suitable suspension system into GK-150 project

1.6 Summary

As a summary, this chapter listed the objectives, significant and scopes of the project and problem statements. The objectives of this project will ensure that this project has a target to be achieved. From the chapter, it allows the author to be known what needs to be done in completing the project such as the project requirements and the product of the project.

1.7 Outline of Thesis

The objectives, significant and scope of the project are explained including the problem statements. The main important thing is the objectives of this project. Significance of project is more about what this project is done for. Then, the scope of the project tells about what are the project requirements and the product of the project. The methods and the procedures that involve in this project are discussed more in the project methodology.

© Universiti Teknikal Malaysia Melaka

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter focuses on all features of go-kart parts which is to modify go-kart design with different types of material used. In addition, this chapter also emphasizes on information needed crucially to encounter the problem to the existing go-kart. This chapter also discusses the definition of all go-kart features, basic go-kart theory on every part or system, effect of chassis flexibility and COSMOSworks express using Solidworks.

2.1 Basic go-kart chassis theory

According to Martin, (2000), it is the responsibility of the karter to determine his own requirement and to obey the rules stated by the organization. This is true because the option of setting up the go-kart such as which type of chassis preferable depends to the convenience of the karter. The combination of knowledge and experienced would the best requirement to set up a good chassis. The understanding of basic chassis setup would assist the rookie on setting up the chassis but experienced will lead to improvement and development in tuning up the chassis. Furthermore, the fundamental of go-kart needed crucially as a main reference for the author to design new chassis.

© Universiti Teknikal Malaysia Melaka

2.1.1 Chassis Design

Chassis is a frame on which the body of an automobile or air plane is mounted (Licker, 2003). Typically, chassis designs have three basic designs. There are frame, unit body and space frame construction. According to Capitani (2007) go-kart is the simplest form of motorsport run with small cars with essential shape. The essential shape refers to the tubular form of the frame. The author agreed with Capitani view, because based on the author study most go-karts are made from hollow steel tubing. Referring to the existing go-kart, the chassis was too stiff. Therefore, to solve this problem, the author has designed a new chassis with longer rails to increase the flexibility and improve the go-kart handling.

2.1.2 Body and frame Construction

Generally, this type of frame supports the engine, rear axle, transmission and all suspension components. It consists of Channel shape steel beams welded together. Such frame is compatible for trucks and any larger vehicle. It is easy to identify ladder frame because the chassis look like a ladder once the body is removed. At the perimeter of the frame, there are lots of welded and riveted unit on the frame member (Halderman, 2000).

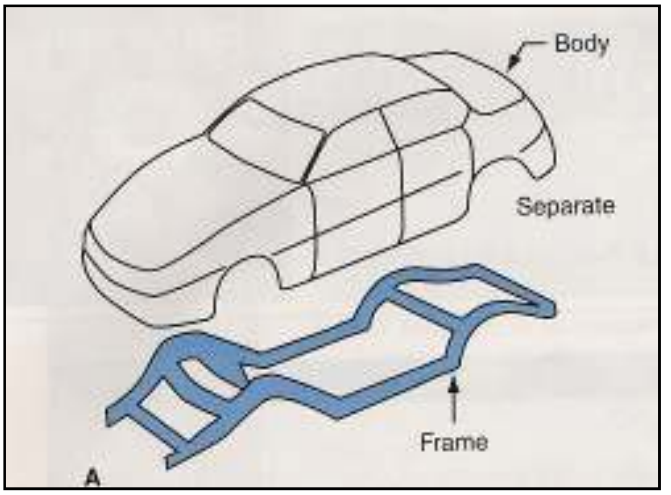


Figure 2.1: Body and Frame construction (Halderman J. D, 2000).

© Universiti Teknikal Malaysia Melaka

2.1.3 Unit body construction

Unit body construction can be defined as a combination of body and the structure of the frame. The body itself consists of stamped panels welded together and functions to support the engine drive line components, suspension and steering components. The shape of the body influences the strength of the chassis. As a study proposed, this type of chassis consists of 10.000 parts to make it as a complete product (Halderman, 2000). Figure 2.2 shows the example of unit body construction and an example of this construction is shows in figure 2.3.

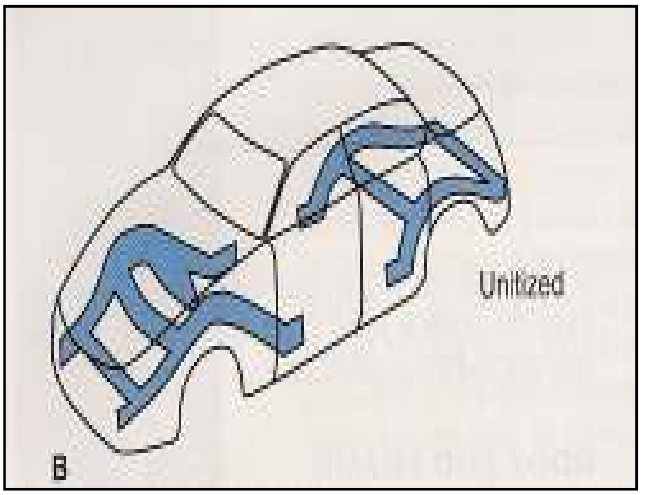


Figure 2.2: Unit Body Construction (Halderman J. D, 2000).

2.1.4 Space frame construction

This type of frame consists of formed sheet metal used to construct a frame work for the entire vehicle. Such vehicle is drivable with-out the body because the frame works are all covered with plastics or steel panels (Halderman J. D, 2000).

© Universiti Teknikal Malaysia Melaka

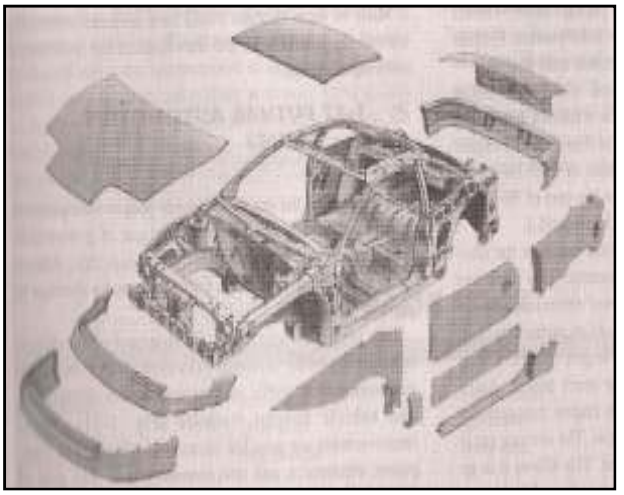


Figure 2.3: Space frame construction (Halderman J. D, 2000)

2.1.5 Platform

Standard platform of a vehicle is referred to its basic size and shape allowing different vehicle manufactures to insert the same drive train, suspension and steering components. A platform consists of all major sheet metal components that form the load bearing structure for a vehicle, including the front suspension and engine supporting section. A track and wheelbase of the vehicle are the other components of a platform that affect the handling and ride of a vehicle (Halderman, 2000).

2.1.6 Go-kart frame

A go-kart has a frame provided with longitudinal frame rails, a rear cross member extended across the rear ends of the longitudinal rails and resiliently connected thereto, and suspension arms positioned to the sides (Capitani, 2007). The tubular iron used as the foundation of the chassis itself functioned as a suspension and has relatively high degree of flexibility. At the back itself, located the engine mounting on the suspension arm which hold a variety weight of engines. Since the frame show in figure 2.4 is quite flexible, the wheels of the kart tend to remain in contact with the ground even where the track has wide surface irregularities. Also, the longitudinal rails bow upwardly over the rear axle with sufficient clearance to permit axle

© Universiti Teknikal Malaysia Melaka