DESIGN AND ANALYSIS A NEW SIMPLE TIRE NUT OPENER

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JUDUL: DESIGN AND ANALYSIS A NEW SIMPLE TIRE NUT OPENER♦

SESI PENGAJIAN: 2009/2010

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FACULTY OF MECHANICAL ENGINEERING

We certify that the project entitled "*Design and Analysis a New Simple Tire Nut Opener*" is written by *Mohd Hasrul Naim Bin Md Rahim*. We have examined the final copy of this project and in our opinion; it is fully adequate in terms of scope and quality for the award of the degree of Bachelor of Engineering. We herewith recommend that it be accepted in partial fulfillment of the requirements for the degree of Bachelor of Mechanical Engineering *with Automotive Engineering.

Examiner: DR. AGUNG SUDRAJAD Signature:

DESIGN AND ANALYSIS A NEW SIMPLE TIRE NUT OPENER

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Thesis submitted in fulfilment of the requirements
for the award of the degree of
Bachelor of Mechanical Engineering with Automotive Engineering

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NOVEMBER 2009

SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering with Automotive Engineering.

Signature
Name of Supervisor: MUHAMAD MAT NOOR
Position: Lecturer
Date: 24 November 2009

STUDENT'S DECLARATION

I hereby declare that the work in this project is my own except for quotations and summaries which have been duly acknowledged. The project has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature
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INTRODUCTION

1.1 PROJECT BACKGROUND

One of the problems of a vehicle is tire problem. If the vehicle tires have some problem such as puncture or become flat, then the user must remove the tires and fix the problem. And for the car user, especially women, it is difficult to remove tire's nut. The issues are about time wasted and high force needed to remove the nut. The time to open a car's tire nut is too long and has waste the car user's time with utilization of high force that is hard for women users. A tool have been designed to remove tire nuts and the mean while with force used decrement to reduce the time waste and high force needed.

The tire nut removal has been designed with 114 pitch circle diameter (PCD) for the project before. This tool can open four nuts in one time and the force utilization has been reduced. This tire nut removal is operating with a gear system usage to reduce the force needed to remove a nut and straight remove all four nuts in one time. This project maybe has solved the four nut removal problem and force usage utilization. This tire nut removal with 114 PCD has some potential in Malaysia automotive market. This project is quite successful but the tool also has some problems.

For my final year project, the tire nut removal with 114 PCD also is chosen to be improved and repaired the errors. This tire nut removal has been designed to remove two nuts in one time and decreased the force usage. The force usage has been decreased lower than the force needed to remove a nut.

In this project will introduce the design tools for the structure work using Finite Elements Method (FEM). Now days, FEM is the most powerful and useful tool for the computational engineers. This tool helps the engineers to simulate the stress analysis of a structure of the automatic tire nut removal. The application of this tool is to redesign a tire nut removal.

1.2 PROBLEM STATEMENT

From the introduction, we can see some problem emerge. This tire nut removal is designed for facilitate the four nut 114 PCD car user. There are some problems that come out from the production of the tire nut removal. The problems are the tire nut removal is too heavy where it is hard for user to use the tool. So this project would reduce the time that required removing the nut and making the tools lighter.

1.3 OBJECTIVE

1. Improve and optimize the tire nut removal base on the original design.
2. Redesign new gear ratio and smaller square or compact design of product.

1.4 SCOPES OF WORK

The scope of the project:

1. Design an automatic tire nut removal by using Solidwork tool.
2. Analysis the project with Finite Element Method.

ABSTRACT

Tire nut removal is a tool and gadget to help the user to loosen and tight the tire nut. This project was carried out to improve and optimize the tire nut removal for wheel with Pitch Cycle Diameter (PCD) 114.4 mm such as Proton Waja, Proton Saga, Kia Careens, and Hyundai Sonata. In this academic project, the main objective was to improve the tire nuts removal in term of size, weight, efficiency and flexibility. The tire nut removal prototype had been involved design, design calculation, analysis, simulation approach and material selection. The project applies the consideration a failure analysis of the structure analysis. In fact, the spur gear was one most important redesign part for this project to minimize the human involvement and make the car tire removal process easier and flexible. This flexible tire nut removal allows the user to operate it in the situation with or without electricity supply from the car cigarette lighter plug. Because the user could disassembly the motor casing by easily when want to operate it manually. The new gadget could help the user to change tire by easily lower the torque that requite to remove tire nut. So this tool able to reduce the torque requires removing tire nut until 162 times lower than original torque.

ABSTRAK

Alat pembuka tayar kereta adalah satu perkakas yang digunakan untuk melonggarkan dan mengetatkan tayar nat. Projek ini dibangunkan adalah bertujuan mengubahsuai satu alat pembuka tayar kereta untuk Pitch Cycle Diameter (PCD) 114.3 mm seperti Proton Waja, Proton Saga, Kia Careens, dan Hyundai Sonata. Tujuan projek ini adalah mengubahsuai alat pembuka tayar dari segi berat, saiz, keanjalan, dan kecekapan. Mengumpul data, maklumat mengenai alatan pembuka tayar, serta lukisan kejuruteraan mekanikal, pemilihan bahan dan analisis serta pengiraan merupakan kaedah yang digunakan dalam projek ini. Alat pembuka tayar kereta ini dapat berfungsi dalam keadaan dengan elektrik atau tanpa sumber elektrik. Perkakas ini dapat memutarkan dua nat tayar kereta dalam satu masa yang sama secara automatik atau manual. Ini adalah menepati dengan cara membuka yang lama di mana untuk membuka nat, bukaan nat hendalah dilakukan secara silang. Ia juga dapat mengurangkan daya kilasan yang dikenakan semasa memutar nat tayar kereta. Oleh sebab itu, alat ini dapat mengurangkan nisbah daya yang dikenakan sebanyak 162 kali ganda dari daya kilasan asal.

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