SYSTEM INTEGRATION FOR MECHANISM AND TEST BED OF CONE LAYING SYSTEM

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This report is submitted
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DECLARATION

I declare that this project report entitled “System Intergeration For Mecahnism And Test Bed On Cone Laying System” is the result of my own work except as cited in the references

Signature : .....

Name : .....

Date : .....

APPROVAL

I hereby declare that I have read this project report and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering.

Signature	:.	.....
Name of Supervisor	:	.....
Date	:	.....

DEDICATION

To my beloved mother and father

ABSTRACT

This project is aim to design the test bed and to create the system integration between cone laying system. The methodology used to fulfill the project requirements contain of Project Design Specification (PDS), Morphology Chart, Concept Generation and Concept Evaluation. Next, procedure is the design analysis to ensure the standard part will well design using Solidwork and the maximum stress and force calculated using related formula to make sure the project meet the factor of safety required. Then the Finite Eliment Analysis (FEA) in Solidworks software is used to test run to the critical component such as frame, slider and hook. Lastly, the fabrication process such as cutting, grinding, welding and milling held at a workshop at Kompleks Makmal Kejuruteraan (KMK) UTeM. In this project student can show and apply their knowledge and skill in manufacturing, fabricating process, Mechanical Design, Solid Mechanic and Solidwork Software to complete this project. Besides that, the cost and time managements together with good planning is important to make sure the project went smoothly and finish at given deadline. Finally, student need to give full commitment, discipline and good communication to complete this project successfully.

ABSTRAK

Projek ini bertujuan untuk mereka bantuk ruang pengujian dan untuk mewujudkan sistem integrasi diantara sistem pemasangan kon. Metodologi yang digunakan untuk memenuhi keperluan projek mengandungi Spesifikasi Reka Bentuk Projek (PDS), Carta Morfologi, Generasi Konsep dan Penilaian Konsep. Seterusnya, prosedur adalah menganalisis reka bentuk untuk memastikan bahagian standard akan direka dengan baik menggunakan 'Solidworks' dan tegasan maksimum dan daya yang dikira menggunakan formula yang berkaitan untuk memastikan projek itu untuk memenuhi faktor keselamatan yang diperlukan. Kemudian Keadah Unsur Terhingga (FEA) dalam perisian 'Solidworks' digunakan untuk menguji beberapa komponen kritikal seperti bingkai utama, gelansar dan cangkuk. Akhir sekali, proses fabrikasi seperti pemotongan, pengisaran, kimpalan dan pengilangan diadakan di bengkel di UTeM Kompleks Makmal Kejuruteraan (KMK). Dalam projek ini pelajar boleh menunjukkan dan menggunakan pengetahuan dan kemahiran mereka dalam pembuatan, proses fabrikasi, Reka Bentuk Mekanik, Perisian Mekanik dan 'Solidworks' untuk melengkapkan projek ini. Di samping itu, kos dan pengurusan masa dan perancangan yang baik adalah penting untuk memastikan projek berjalan lancar dan selesai pada tarikh akhir yang diberikan. Akhir sekali, pelajar perlu memberi komitmen penuh, disiplin dan komunikasi yang baik untuk menyelesaikan projek ini dengan jayanya.

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LIST OF ABBREVIATION

CAD	Computer Aided Design
PSM	Projek Sarjana Muda
BC	Before Century
PDS	Product Design Specification
QFD	Quality Functional Deployment
HOQ	House of Quality
WBS	Weight Breakdown Structure
SW	Solidworks
GD&T	Geometrical Dimensioning and Tolerances
FBD	Free Body Diagram
FEA	Finite Element Analysis
ANSI	American National Standard Institute
Max	Maximum
Min	Minimum
3D	3 Dimension
2D	2 Dimension
CNC	Computer Numerical Control
CAM	Computer Aided Manufacturing

CHAPTER 1

INTRODUCTION

1.1 Background

Traffic cone are often used to create separation or merge lanes during road construction projects or automobile accidents, although heavier, more permanent markers or signs are used if the diversion is to stay in place for a long period of time. They are usually cone-shaped markers that are placed on roads or footpaths to temporarily redirect traffic in a safe manner and they also call pylons or witches' hats. The material of cone is wire and cable fluff consists mainly of plasticized vinyl, along with other contaminants such as cross-linked PVC, polyethylene, PET, nylon, aluminum, copper, rubber, and fluoropolymers (Adrian, 1987).. The cleanliness of the final workable material depends upon the cleaning processes and normally correlates with the purity of the incoming feed.

The design of traffic cone were invented by Charles D. Scanlon, an American who got the idea while working as a painter for the Street Painting Department of the City of Los Angeles. Traffic cones were first used in the United Kingdom in 1958, when the M6 motorway opened. These traffic cones were a substitute for red lantern paraffin burners being used during construction on the Preston Bypass. David Morgan believes that he constructed the first experimental plastic traffic cones, which replaced pyramid-shaped wooden ones previously used in 1961.

The traffic cone may fill with the flashing light for extra precaution. And traffic cone are usually used at the outdoor during road construction or other situations requiring traffic redirection or advance warning of hazards or dangers. They also can be used for the night

time traffic cones are usually fitted with a reflective sleeve to increase visibility (Adrian, 1987).

1.2 Problem Statement

According to the market basically the current cone lifting machines are provided using complex system such as hydraulic system, built with lorry and not compatible with small lorry. The normal method are designed to operate manually with human on it. However, the project is need to design the test bed mechanism that can move lifting cone mechanism left and right. The problem statements are as follow:

i. Casualty of raied workers during laying cone on highway for the purpose of maintenance.

ii. Low efficiency of the manual cone laying system procedure.

iii. To design low cost of semi-automatic cone laying system.

1.3 Objectives

Basically, the purpose of this project is to expose student to complex engineering problems in designing an engineering product/process such constraints as public safety and health, cultural society and environment. Besides, this project is also important to enhance student's skill in project implementation and management. However, the product must have sufficient strength while functioning the require task with reliability. Thus, the aims of the project are all the following:

i. To design the test bed of cone laying system.

ii. To create system integration between cones laying mechanism of the test bed.

1.4 Scope

In this project, we will focus on designing, calculating, analyzing and fabricating a test bed mechanism. Every part of our project will have its own function which are manually fabricate by our hands. The aim is to build the test bed to hang the lifting mechanism and move it left and right with specific position. The scope of the project are all the following:

i. Detailed design for the test bed (CAD)

ii. Detailed design of the system integration.

CHAPTER 2

LITERATURE REVIEW

2.1. Material for Test bed

Material for test bed are the most importance things in building the good structure. The good material give the good result and the good material it not easy to broke or snap while the machine operate with the full power.

2.1.1 Structure of Material

(Becque & Rasmussen, 2009) said that a finite element model was advancement to study the interaction of local and overall buckling in lipped channel columns. The model accounts for the particular material characteristics of stainless steel: non-linear stress strain behavior, anisotropy and increased corner properties because of cold-working.

Moreover, in the analysis of the directional relationship between two different types of bands uncover that few slip system, which can follow the shear strain. This is considered to result from the limited slip systems of the steel and the obstruction of separation of movements by the current band (Kim, Kim, & Shin, 2001). The stronger material the lower banding deformation and it not easy to break.

Furthermore, from (Liu & Young, 2003) stated The design strengths were determine based on the material properties obtained from the complete experiment, which takes into account the enhancement of the material properties due to cold-working. He said that the material properties is importance in order to get high strength.

For the summarization, mostly from the research we should know that the strength of the object is came from the properties of the material that the object used, the stronger the bond the stronger the object.

2.1.2 Structure Bond

The union of two or more masonry units so that the combination acts as a single unit and provides the same structural strength as a single unit of the same material. The modern scientific and technical revolution is responsible for increasing interest and impulse in the search for materials possessing specific and wanted properties (Vajeeston, Ravindran, Ravi, & Asokamani, 2001). In this paper, they said we must responsible of increasing technical revolution in the modern world today our technology must grow faster if not we will miss it.

The combination of high strength, enormous elongation, light weight, high rised temperature strength, and high-strain-rate super plasticity is encouraging for future uses as various kinds of structural materials (Inoue, Kawamura, Matsushita, Hayashi, & Koike, 2001). The combination to make the strong bonding element and can be used as the strong structure material in the industry. It also good for our project to give it stronger bond of material to prevent it from break.

During compaction, an increase in the density of the crystals is obtained if a certain compaction load is applied, supplying the energy needed for diminishing the distance between the ions or molecules in the crystal structure. This effect might be reversible for some materials and irreversible for others, as observed clearly for polyethylene glycol in this study (Adolfsson & Nyström, 1996). The higher compaction will increases the density and the strength of the material and get it stronger.

The summary is, we need the stronger bond to make the strong material and need to be compress to the specific load to make sure the element will not break easily.

2.2 Bending Of the Test bed

Banding is to provide or fit an object with something in form of a strip or ring, for reinforcement or decoration. For the test bed we need to know the banding deflection because the mechanism of lifting need to hang to test bed and the test bed is acting like cantilever beam.

(Bisshopp & Drucker, 1945) said that the solution for large deflection of a cantilever beam1 cannot be obtained from elementary beam theory since the basic assumptions are no longer valid. Specifically, the elementary theory neglects the square of the first derivative in the curvature formula and provides no correction for the shortening of the moment arm as the loaded end of the beam deflects.

The large deflection of a cantilever beam made of Ludwick type material under a combined loading was investigated. The problem involves both material and geometrical non-linearity and a closed-form solution to such problem cannot be obtained (Lee, 2001). In this paper, the deflection of cantilever beam is depend on the material used.

Some problems have been solved by several authors with these theories. They point out that the effects of couple stress in materials become significant when some physical dimension of the body approaches a characteristic length (Kakunai, Masaki, Kuroda, Iwata, & Nagata, 1985). In this paper, the material and the dimension diameter of the beam is most importance to get the stronger beam.

In the conclusion, the strong test bed came from the strong bond material and the good joining. There will be no deflection if used the correct material to build and hang the lifting mechanism.

2.3 Joining of the Structure

There are many type of joining for example to join the steel there using welding or bolt and nut. The meaning of joining is to combine or fasten two things together using joining tool. Joining have two varieties first eternal joining and second can be remove.

2.3.1 Welding joining

A critical temperature was found to exist between the solid and liquid phase line temperature of composite. At the point when welding temperature achieve the critical temperature, the liquid phase matrix would change the holding of fortification of reinforcement into reinforcement matrix by penetrating into the interface of reinforcement (Liu & Young, 2003). In this paper, the high temperature between two sides of steel that need to weld create stronger bonding.

(Martinelli, Scarabelli, & Vedani, 1996) said that there is incredible interest in the application of metal matrix composite (MMC) materials. Potential uses of these materials are various, in industries such as aerospace (satellite struts), defense (electronic instrument racks), automotive (drive shafts and brake discs), sports product (mountain bicycles and golf clubs), and marine (yacht fittings).

Weld interface of the lap joint showed wavy morphology and the intermediate layer was seen along the wavy interface. These microstructures are similar to that of the unstable weld lap joint (Liming, Meili, Longxiu, & Lin, 2001).

Conclusion is the welding using any type of welding will give the strong bond between two steel and it will remain stick together.

2.3.2 Bolt and Nut Joining

According to (Mackerle, 2003) stated that the local contact between the bolt and composite material may induce high stress concentration and break the material. The stress distribution near the region around the bolt joint where the interaction between the bolt and the loaded hole is taken into account, can be determined by finite element analyses.

Moreover, revolution, nuts and bolts become commonplace. The invention of the lathe in 1800 by Henry Maudslay enabled threads of any pitch and diameter to be made with a greater degree of precision and reproducibility (Kenny, Patterson, Street, & Si, 1800). The bolted joints have also been extensively used in various assemblies in recent years (electronic packaging, aircraft industry, automotive industry).

Furthermore, the computed results are based on the assumptions of plane stress behavior of the plate and rigid body representation of the pin, with frictionless contact between the pin and plate (Choo, Choi, & Lee, 1993).

Lastly, the bolt and nut now are widely used in the all sector that are the most compatible fastener. It easy to remove and assemble where you want and it also can stand high pressure depended on the material bolt and nut are used.

2.4 Movement of Test bed

The test bed need to move the lifting mechanism left and right in order to align the cone in curve and start the cone lining from left or right side of the route. The movement of the test bed need to smooth and move fast to make the work more efficient.

2.4.1 Roller Bearing

The complicated roller bearing model has been confirmed experimentally by the requesting case of a cylindrical roller bearing with four flanges under combined radial load and overturning moment. The internal geometry was chosen such that flange contact loads