UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND ANALYSIS OF MULTI LED MACHINE FIXTURE USING CAD TOOLS

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

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2009

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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TAJUK: Design and Analysis Of Multi Led Machine Fixture Using CAD Tool

SESI PENGAJIAN: 2008/09

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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:

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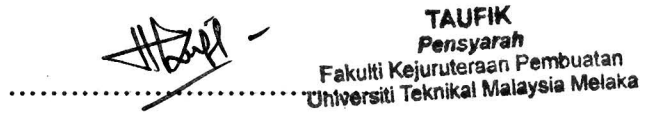

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ABSTRACT

The purpose of this project is to design and analysis of "Multi LED Machine Fixture" using CAD tools. This project is carried out to create a new machine fixture of cutting and bending simultaneously for the small electronic industry. This machine has a lot of advantages which the geometry design machine is not too big and the height is comfortable at worker's sitting and standing position. Otherwise this machine is easily movable and the design meet quality standard; i.e. machine height and working coverage competent done by machine. CAD tools have been used which are COSMOSXpress and ANSYS. The new fixture has three new main parts which are cover, base and cutter. The cover is a place to cut and bend the LEDs, the base is to hold the LED and the cutter function is to cut the LEDs. In addition, the safety factor for base has been successfully determined as safe part and it is suitable for 2000 life cycle. As a results new fixture machine has been developed.

ABSTRAK

Projek ini bertujuan untuk merekacipta dan menganalisa sebuah mesin "Multi LED Machine Fixture" dengan menggunakan perisian CAD. Projek ini dijalankan untuk menghasilkan satu lagi mesin baru bagi aplikasi potong dan bengkok secara serentak untuk industri kecil elektronik. Mesin ini mempunyai banyak kelebihan antaranya seperti rekaan geometri mesin yang akan dihasilkan tidak terlalu besar dan ketinggiannya mengikut kesesuaian pekerja sama ada dalam keadaan duduk mahupun berdiri. Selain daripada itu, produk ini juga adalah jenis mudah alih dan ia direka bentuk untuk memenuhi piawaian kualiti, contohnya seperti had ketinggian mesin dan liputan kerja yang mampu dilakukan mesin. Perisian CAD digunakan antaranya ialah COSMOSXpress dan ANSYS. *Fixture* baru ini mempunya tiga bahagian utama antaranya ialah penutup, tapak dan pemotong. Penutup adalah tempat untuk memotong dan membengkokkan kaki LED, tapak pula digunakan untuk menahan LED dan fungsi pemotong adalah untuk memotong LED. Dalam pada itu, faktor keselamatan pada tapak adalah selamat dan ianya sesuai digunakan sehingga 2000 penggunann. Keputusannya mesin *fixture* baru telah dihasilkan.

DEDICATION

A million praise towards my parents, my respectful supervisor, examiner and lectures and to all my friends for their support and cooperation in helping me to complete the report.

Thanks to UTeM staff for their guidance and information given during my PSM. Their information helps me a lot in preparing the report.

Lastly, your supports are highly appreciated and very meaningful to me.

ACKNOWLEDGEMENT

Greatest praise to Allah Almighty. Grateful to Him with His will, I had successfully finished in preparing this 'Projek Sarjana Muda' thesis and completing my Bachelor's degree in Manufacturing Engineering in Design at Universiti Teknikal Malaysia Melaka (UTeM).

I would like to express my sincerity appreciation to my supervisor, En. Taufik for the arrangement, an advice and assistance given for my PSM project.

I would like to take this opportunity to express my warmest and greatest appreciation for all the parties who had assisted me in making this PSM program a success one. My thanks go to Faculty of Manufacturing Engineering (FKP) management, library department and project PSM members for their willingness in giving me opportunity to undergo my PSM.

Last but not least, my thanks go to all friends that give much support during the completion this final year project report. This opportunity absolutely taken to wish special thank for several people especially mom and all the family members for supporting physically and spiritually throughout in completing this project.

Thank You

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LIST OF ABBREVIATIONS

$	-	Dollar
3D	-	Three-Dimensional
a	-	Lever Length
AG	-	Aktiengesellschaft (German Words: Domain)
BMW	-	Bayerische Motoren Werke
C++	-	C Plus Plus
CA	-	Customer Attributes
CAD	-	Computer Aided Design
CAE	-	Computer Aided Engineering
CAM	-	Computer Aided Manufacturing
CATIA	-	Computer Aided Three Dimensional Interactive Application
CAx	-	Computer Aided Technologies
CFD	-	Counterfactual Definiteness
CNC	-	Computerized Numerical Control
dB	-	Decibel
DELMIA	-	Digital Enterprise Lean Manufacturing Interactive Application
Dr.	-	Doctor
E.g.	-	Example
En.	-	Encik (Sir)
etc	-	"and other things" or "and so on"
F	-	Human Force
FKP	-	Fakulti Kejuruteraan Pembuatan
HoQ	-	House of Quality
i.e.	-	Example
IBM	-	International Business Machines
in	-	Inch
kg	-	Kilogram
lb	-	Pound

LED	-	Light Emitting Diode
MEC	-	Milwaukee Electronics
mm	-	millimeter
mm^2	-	Millimeter Cubic
n	-	Number of Criteria
NX	-	Unigraphics
PCB	-	Printed Circuit Board
PLC		Programmed Logical Control
PLM	-	Product Lifecycle Management
PSA	-	Professional Sports Authenticator
PSM	-	Projek Sarjana Muda
QFD	-	Quality Function Deployment
R&D	-	Research and Development
RFID	-	Radio Frequency Identification
r_{ij}	-	Raw Rating of Concept *j* for The *i*th Criterion
RM	-	Ringgit Malaysia
SDRC	-	Structural Dynamics Research Corporation
sec	-	Second
S_j	-	Total Score for Concept *j*
STL	-	Standard Template Library
T	-	Torque
TFT-LCD	-	Thin Film Transistor Liquid Crystal Display
TR	-	Technical Requirements
UTeM	-	Universiti Teknikal Malaysia Melaka
v	-	Poisson's Ratio
V	-	Version
VOC	-	Voice of Customer
w_i	-	Weighting for *i*th Criterion
WYSIWYG	-	What You See Is What You Get

CHAPTER 1
INTRODUCTION

This report described a project on improving multi LED fixture machine in electronic industry. This chapter explained on the background of project, problem statement, objectives, scope and report outline.

1.1 Background of Project

Electronics is the study of the flow of charge through various materials and devices such as semiconductors, resistors, inductors, capacitors, nano-structures and vacuum tubes. Although considered to be a theoretical branch of physics, the design and construction of electronic circuits to solve practical problems is an essential technique in the fields of electronic engineering and computer engineering. This science starts about 1908 with the invention by Dr Lee De Forest of the valve (triode) Before 1950 this science was named "Radio" or "Radio techniques" because that was its principal application. The study of new semiconductor devices and surrounding technology is sometimes considered a branch of physics.

Malaysia is one of the leading electrical and electronic product exporters worldwide. Almost 1000 companies in this industry are incorporated in Malaysia. The industry includes major brands like Panasonic, Sony, Philips and Samsung and local brands like I, MEC, Khind and Pensonic. The production range includes air-conditioners, refrigerators, washing machines, vacuum cleaners, electric fans, instant water heaters, rice cookers, blenders and microwave ovens. Malaysia is also a major exporter of semiconductor devices, which accounted for over 30% of total electronic exports in 2000. Malaysia is currently investing in R&D in order to expand its

production to include more sophisticated high-end products such as silicon ingots, polishing silicon wafers, RFID, chip design, digital video disc players, electronic games, multimedia products and high resolution TFT-LCD and LED plasma displays.

LED means “Light Emitting Diode” which has been used a lot in electronic industry. A strip light emitter comprises an LED light-emitting strip composed of a plurality of LEDs connected continuously in parallel between two conductors that make up negative (-) and positive (+) electrodes and are disposed roughly parallel to each other, and strip-shaped synthetic resin that is wider that the LED light-emitting strip and covers the LED light-emitting strip.

The function of LED as a lamp which can give a signal or warning and not been used to lighting among area. The LED light-emitting strip can be configured to emit light from both sides, be covered by a synthetic resin made from strip-shaped transparent vinyl with half-turn twists, be configured to be flexible by bringing the conductors close together, be provided with reflective sheets, be configured as a triangular marker, and be configured a buoyant marker for sea rescue having air pockets.

A fixture is a work holding device, which on the holds and positions the workplace, but does not itself guide locate or positions the cutting tool (Chapman and Martin, 2006). A fixture is a device for locating, holding and supporting a work piece during a manufacturing operation. Fixtures are essential elements of production processes as they are required in most of the automated manufacturing, inspection, and assembly operations. A fixture is production tool that locates, hold, and supports the work securely so the required machining operations can be performed (Hoffman, 2004). Fixtures hold the workpiece securely in the correct position with respect to the machine/cutter during operation (Joshi, 2003).

Multi LED Machine Fixture is one of the projects that used to solve the problem in cut and bend the LED in the same time. This machine is not only having a variety function but it’s also saved a production time and can do the cutting process in good condition. The function of the machine is so effective to cut and bend in

automatically. Besides that it also safety guarantee and can produce a good quality product.

On the previous method, the project only used a single LED machine fixture. Means that it's only can produce one LED in one time. As a result this single LED machine fixture increase a labor cost compared to this new design; multi LED machine fixture which is yield a higher production rate and can give a better performance.

1.2 Problem Statement

Based on the study and analysis shows that LED cut and bend machine only produce one LED in one time. The problem from the previous application is waste the production time and increase the labor cost. The other problem is the operation can't perform well because of LED conductors too small and nearest to each other and make it difficult to uniform cut.

With this "Multi LED Machine Fixture", several ideas and design has been conscientious to improve the fixture application. The fixture design is based on the safety environment and safety to use.

Furthermore, final element will be done by QFD. It is aimed for producing a better quality product. In other word, it is a method for introducing quality right from design stage to satisfy the users.