DESIGN AND FABRICATION OF A CHECKING FIXTURE FOR A PRESS PART COMPONENT

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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TAJUK: Design and Fabrication of a Checking Fixture for a Press Part Component

SESi PENGAJIAN: 2008-2009 Semester 2

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Signature : ........................................
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APPROVAL

This PSM submitted to the Senate of UTeM and has been as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design). The members of the supervisory committee are as follow:

(Wahyono Sapto Widodo)

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ABSTRACT

This thesis contains the report of checking fixture design and fabrication for a press part component; caster. The aim of this thesis is to present checking fixture for a wheel caster. Actual measurement data of wheel caster is gathered and transform into CAD data. Design of checking fixture and caster are made through the use of Solidwork design software. This report consist of six chapters which is chapter one explain about the objectives and scopes of the project, chapter two going through about the study of checking fixture design and fabrication. Chapter three is explaining about methodology chosen to achieve the objectives stated. Chapter four is explaining about result of each objective while chapter five describe about discussion of the result. Techniques of inspection are also indicated and explained. For the chapter six, it is conclude the whole project in term of the achievement of the objectives. This study is important to apply basis understanding of design and fabrication techniques.
ABSTRAK

ACKNOWLEDGEMENTS

Dear Mum and Dad at Jelebu, Negeri Sembilan, thanks for your prayers, blessing, and financial support. Not to forget my siblings that gives me a support when each time I’m feeling down. To all my friends, thanks a lot for sharing an idea to complete this thesis.

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<th>Definition</th>
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<tr>
<td>CNC</td>
<td>Computer Numerical Control</td>
</tr>
<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
</tr>
<tr>
<td>CADCAM</td>
<td>Computer Aided Design and Computer Aided Manufacturing</td>
</tr>
<tr>
<td>CMM</td>
<td>Coordinate Measuring Machine</td>
</tr>
<tr>
<td>CPU</td>
<td>Computer Processing Unit</td>
</tr>
<tr>
<td>AISI</td>
<td>American Iron and Steel Institute</td>
</tr>
<tr>
<td>POM</td>
<td>Polyoxymethylene</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
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</table>
CHAPTER 1

INTRODUCTION

1.1 Background

In this several decades, manufacturing sector was expanded widely. It was generated through as an expanded of global economy. The first and third country is developed through the manufacturing sector which is validated for today. Because of the manufacturing sector expanded widely, many industries in manufacturing sector are developed. For examples are automotive, electronics, metal fabrication, and plastics. Mostly, all product manufactured are necessary an inspection process in order to conform the quality of the product. Many kind of inspection method are using such as visual inspection and through a conformance gauge. Therefore, a checking fixtures or jigs are built to fulfill the needs of the industry.

Checking fixture is a tool or devices that built as a gauge to conform whether the products produced are meet the specification or not. In a fixture design and fabrication, a basic element that should be included are, body of fixture, locating and support element, and clamping mechanisms to hold products securely during inspection. Most checking or inspection process is made manually and the common product that inspected through this technique is a part produced by a stamping machine. An advance manufacturing industries are using power generated checking fixture which is combine with pneumatic devices and controlled through a program generated via matlab or visual basic program. It is usually to inspect the attribute data of product such as light brightness and sound. For example is a manufacturer of digital cameras.
1.2 Problem Statement

When a product is manufactured through a press machine, inspection and checking process is needed in order to conform the products are meet the specification and dimension. Some products and data are able to inspect through a visual inspection but this method is just suit to the non-counted data, although it is the simplest way and less cost. Therefore, design a fabrication of a checking fixture is necessary to meet the needs of better inspection process. Through the use of checking fixture, products are inspected in allowable variations, although a fixture is design and fabricated with certain tolerances. It is because the products should be passes the inspection of several point on the products that fit to the quality data.

1.3 Objectives of the Project

The main objectives of this project study are to design and fabricate a checking fixture for a caster. The outcomes of this project study will be:

i. Design a checking fixture for a press caster.

ii. To Make a CNC program of machining process of checking fixture.

iii. Fabricate a checking fixture for a caster through CNC Machining, conventional machining, and several fabrication techniques.
1.4 Scope and Key Assumptions

The scopes of this project are:

i. To Create a CAD data from physical model of wheel caster through a manual drawing using Solidwork.

ii. To design a checking fixture and generate CNC program using CADCAM software.

iii. To fabricate a checking fixture and validate the checking fixture accuracy using Coordinate Measuring Machine (CMM).

1.5 Importance of the Study

Studies on this project generate proper understanding on the concept of jig and fixture design and fabrication. Although this project looks simply, but it is apply proper design of jig and fixture especially a checking fixture. The use of fixture element is studied to gain a best result of design and function of checking fixture. Studies on this project also improve designing skill through the use of CAD software. This checking fixture is fabricated through the use of CNC machining and conventional machining. Therefore, it will improve the understanding of CNC machining and also conventional machining. As a conclusion, this project brings the understanding of need of design and fabrication of checking fixture.
## Gantt Chart for PSM 1

### Table 1.1: Gantt chart PSM 1

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<th>October</th>
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**Table 1.2: Gantt chart PSM 2**

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1.8 Summary

This chapter indicates the basic introduction about the project of designing and fabricating a checking fixture for a press part component. Also state the problem statement that makes the study is necessary and also the objectives and scopes of the project. As mention before, the main objective of this study is to design and fabricate a checking fixture for a press part component which is wheel caster. The outcomes expected from this project are to apply and understanding design concept of checking fixture that commonly practice in industry.
Chapter 2

Literature Review

2.1 Introduction

A press is a process of changing a shape of sheet metal using a force according to the shape of dies which this process is widely used in industrial practice. Most of automotive parts and metal base product are manufactured using this method. For an automotive part that produced using this technique are car’s door components, bracket for mounting engine parts, engine mounting base, etc. For metal base product that manufactured via this method are aluminum home sink, CPU casing, door knob components, etc.

At manufacturing practice, a quality conformation on the part manufactured using press method is inspected through a special tool called checking fixture. This tool is designed and fabricated for locating, holding and then checking a certain points on part. There are two types of checking fixture which the first is gauging fixtures and measuring fixtures. Gauging fixtures used to check the part against a standard of known size and can only determine if a part is in or out of tolerance and measuring actually measure a part and can indicate exactly where and by how much a part is out of tolerance.

Generally, basic components of checking fixtures are locating components, clamping mechanisms, assist support components, body of fixture, and power mechanisms if the checking fixture is operated trough automation or require devices that control the operation of checking fixture. Figure 2.2 below shows classification of the fixture component. [Kailing Li et al, 2006]
Figure 2.1(a): Example of checking fixture

Figure 2.1(b): Example design of checking fixture