UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Manufacturing Process Selection for Circular Blade Using Analytical Hierarchy Process

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

By

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Manufacturing Process Selection for Circular Blade Using Analytical Hierarchy Process

SESI PENGAJIAN: 2012/2013 – Semester 1

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I hereby, declared this report entitled "Manufacturing Process Selection for Circular Blade Using Analytical Hierarchy Process" is the results of my own research except as cited in references.

Signature : …….

Author's Name : SYAFIQ BIN RAMLI

Date : 20 DISEMBER 2012

APPROVAL

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

……..

Dr. Hambali bin Arep @ Ariff

(Project Supervisor)

ABSTRAK

Projek ini menerangkan pendekatan berdasarkan proses hierarki analisis (AHP) yang membantu pembuat keputusan atau keputusan jurutera pembuatan. Proses ini juga menentukan proses yang paling sesuai yang boleh digunakan dalam pembuatan "*Circular Blade*" pada dalam pembangunan produk. Masalah dalam proses pemilihan juga dianggap sebagai suatu fungsi yang pelbagai dalam pemilihan kriteria yang mempengaruhi dalam proses pemilihan. Salah satu cara yang boleh digunakan bagi membantu kejuruteraan pembuatan adalah Proses Analisis Hierarki (AHP). Terdapat lima jenis proses pembuatan yang melibatkan "*Circular Blade*" yang dipertimbangkan iaitu "Stamping Process", "Milling Process", "CNC Stamping", "CNC Milling" dan " CNC Wirecut". Oleh itu, AHP telah digunakan bagi menentukan proses terbaik untuk "Circular Blade" berdasarkan faktor utama dan faktor-faktor yang lain. Sembilan langkah-langkah terlah dilakukan bagi menentukan proses pembuatan yang betul berdasarkan konsep AHP. Keputusan menunjukan bahawa "CNC Wirecut" merupakan pilihan pertama kerana ia mempunyai jumlah yang tertinggi (40.69%). Keputusan ini disokong oleh perisian "MindDecider".

ABSTRACT

This project describes an approach, based on the analytical hierarchy process (AHP) that assists decision makers or manufacturing engineers determining the most appropriate manufacturing process that to be employed in manufacturing of circular blade in the early stage of the product development process. The manufacturing process selection problem has also been treated as a multi function of criteria decision making due to various factors affecting the selection process must be considered. One of the decision making tools that can be implemented to assist manufacturing engineers determining the most optimum manufacturing process is analytical hierarchy process (AHP). There are five types of manufacturing processes involving circular blade being considered namely stamping process, milling process, CNC stamping, CNC milling and CNC wirecut. Therefore, AHP was used to determine the best process for circular blade by considering various selection factors and sub factors. The results showed that the CNC wirecut was a first choice due to it has the highest volume (40.69%) and the last choice was CNC Stamping (CS) with a value of only 0.209336 (20.93%). These results were also verified by MindDecider software.

DEDICATION

"In the Name of Allah, the most Beneficent, the Most Merciful"

Special dedication to my beloved parents:

Ramli Bin Abd Samat & Waginah Bt. Abd Majid

My supporting siblings:

Raihan Bt. Ramli

Najib B. Ramli

Hafiz B. Ramli

My respects supervisor:

Eng. Dr. Hambli B. Arep @ Ariff

My friends and my fellow lecturers

Thank you for all your care, support and believe in me

ACKNOWLEDGEMENT

First of all, I would like to thank to my supervisor, Engr. Dr. Hambali bin Arep @ Ariff because gives me a lot of knowledge and give a lot of information during this final year project period. Without his support and encouragement I can afford to complete this final year project. I also would like to thank to my entire lecturer in Universiti Teknikal Malaysia Melaka (UTeM) who have helped me from the beginning until the end of this final year project period. Without their support and advice I can never fill up this technical report in success. Then a special thanks to my fellow friend because help me very much in getting the information and detail about anything that related to this final project. They give full commitment in helping me finding any problem and solve it together. Not to be forget to all my family members because they had give a lot of support and attention to me to doing and finished with success on this final year project. I am really appreciated for what you guys have done for me. Thank you so much.

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List of Abbreviations, Symbols and Nomenclatures

AHP - Analytical Hierarchy Process

AV - Availability of Equipment and Labor

CD - Complexity of the Design

ERP - Enterprise Requirement Planning

GD - Geometry of the Design

LC - Labor Cost

PQ - Production Quantity

PSM - Projek Sarjana Muda

PT - Processing Time

RP - Rate of Production

R&D - Research and Development

SWOT - Strength, weakness, opportunity, threat Size

ATB – Alternate Top Bavel

FT – Flat Top

HSS – High Speed Steel

CAD – Control Aided Design

SP – Stamping Process

TP – Turning Process

CP – Cutting Process

SP – Shaping Process

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