VISUALIZATION OF AUTOMATED PLATE CUTTING OPERATION USING
DXF FILE

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# ABSTRACT

This project is going to visualize the automated plate cutting application using plasma cutter. The problem behind this project is taken from problem aroused at Kinn Engineering Works, Malacca. But it will not act as the study case, this project is more to education based. The problems here are how to automate those application and what are the processes needed in order to automate it. The objective of this project is to automate the plate cutting operation and to develop a framework on how the automation could be performed. Due to cost constraint, the scope of this project was narrow down to just visualize it instead of perform it in real time application. All the drawing used is in 2 dimension drawing format. The product design for this project is in the .dwg format (Solidworks) and it will use the dxf file format as the interchange format file. This project has two main modules which are dxf reader and the animation of plate cutting process. This project is performed using project-based methodology. The drawing read by the dxf reader will be compared to the real drawing for validation purpose, and the animation process will be justified by the precision of the cutting route path. This system was developed in the C# and .NET framework environment. There are two results expected which are the system and the framework for the automated plate cutting application.

# ABSTRAK

Projek ini akan menganimasikan proses pemotongan kepingan secara automatik menggunakan pemotong plasma. Masalah di sebalik pengenalan projek ini adalah diambil dari masalah yang berlaku di Kinn Enggineering Works, Melaka. Tetapi, organisasi ini tidak akan bertindak sebagai kajian kes, kerana projek ini akan dibangunkan lebih berdasarkan pembelajaran. Masalah bagi projek ini adalah bagaimana aplikasi pemotongan kepingan ini dapat dilaksanakan secara automatik dan apakah proses – proses yang terlibat bagi mengautomasikan aplikasi ini. Projek ini dibangunkan bertujuan untuk mengautomasikan proses pemotongan kepingan dan membangunkan suatu rangka kerja bagaimana pengautomasian ini dapat dilaksanakan. Berikutan masalah kewangan yang dihadapi, skop projek ini telah dikecilkan dengan hanya menganimasikan proses pemotongan kepingan secara automatik tersebut. Projek ini hanya akan meliputi penggunaan lukisan dalam format 2 dimensi sahaja. Rekabentuk produk bagi projek ini adalah dalam format .dwg (lukisan Solidworks) dan menggunakan fail dxf sebagai fail perantaraan. Projek ini akan menganimasikan aplikasi sebenar berdasarkan lukisan yang diberi. Sistem ini mempunyai dua modul utama iaitu pembaca dxf dan penganimasian proses pemotongan. Projek ini dilaksanakan menggunakan metodologi berdasarkan projek. Lukisan yang dihasilkan oleh pembaca dxf akan dibandingkan dengan lukisan sebenar untuk tujuan validasi, dan animasi proses pemotongan akan dijustifikasi berdasarkan ketepatan laluan pemotongan kepingan yang dilalui. Sistem ini dibangunkan dalam persekitaran C# dan juga .NET framework. Terdapat dua hasil jangkaan bagi projek ini iaitu sistem dan juga rangka kerja bagi mengautomasikan proses pemotongan kepingan tersebut.

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# CHAPTER 1

# INTRODUCTION

## 1.1    Introduction

After the Second World War ended around the 1945, manufacturing technology had achieved their third stage of evolution which is automation technology era. This technology was proposed in order to replace manual labor and human operator control with automated operations and control. The objective of this emerged technology is to have a faster, more reliable, more accurate, more flexible and less expensive manufacturing processes.

The production automation technology is divided into two interrelated categories which are manufacturing operation and automation. Manufacturing operation is concerning with the conversion of raw material into finished product where the final product will have a few subassemblies combined. Basic equipment for the manufacturing process is called Machine Tools. Machine Tools are the machine that capable of producing itself with the help of operator. These Machine Tools is performing two basic operations which are metal cutting and metal forming. Metal cutting involves removals of material to create the final shape but metal forming involves little or no loss of material in creating the final shape.

Kinn Engineering Works is one of the factories that produce machine located at Taman Perindustrian Merdeka, Melaka. The main product of this company is produce machine according to their customer needs and customization. So, it is very important for them to really understand their customer want. Once they received an

order, they will draw the machine according to the customer needs and setup the raw material needed. After that, their mechanical engineer will draft it using the Solidworks Drawing. From the drawing, their workers will perform the operation needed. The main thing that they need to do first is cutting the raw material according to the drawing. Usually, the plate that they used is mild steel or stainless steel plate.

With the manual process, each worker has to understand and know how to read the drawing by their own to do the cutting process. This cutting process includes turning (using lathe), milling, grinding, drilling and also shaping. This project will emphasize on the plate cutting by convert the Solidworks drawing into the interchange format file (.dxf) and read by the system that will be developed before being understand by the motor that will be used to control the cutter.

## 1.2    Background of the Problem

Business is really emphasized on financing. By the manual system that the company has, every worker had to really understand on how to read the Solidworks drawing that have been produced by their mechanical engineer. The problem will arise if there are new worker in the factory. Their management has to put on training on him how to read the drawing. This really needs time and money. This is because of the ability to understand is based on everybody intellectual. The later they understand, the more money and time needed.

Other problem arise if there is new worker is, waste of product defect. What happen if the new worker is actually not really understand how to read the drawing? Of course, they will make mistake on their work. Since there is a mistake, means there is money and time wasted.

Other alternative that the company can use is using the automation technology where the programming language is the Programmable Logic Control (PLC) to cut the plate. But, the limitation of PLC as already known is, it will limit

the cutting. It cannot cut all type of shape wanted. Yet, using PLC the flexibility of production is reduced where if there are changes in the product design, they need to reprogram the code which has been coded before. Therefore, they made a decision to use computer as the alternative whereby, they can use the automation technology to cut the plate instead of human labor and the flexibility of product can be maintained by using the Soildworks. In reflect of this, this project is proposed to help the organization solve their problem. The idea is on converting the Solidworks drawing into the neutral file DXF and read by the system. Then, using the motion control card, the cutter will communicate with the computer to cut the plate as the drawing. This is based on the motor used to control the cutter.

## 1.3 Statement of the Problem

Result from the current framework of cutting operation that they have shows that the organization does not have a proper framework for its cutting operation and value added for the organization. Therefore, a framework for the operation is needed to help them monitor their performance and a system to help them organize the process better. Developing a framework and a system for the operation will help the production to answer these several question:

    i. How to automate the cutting operation?

    ii. What are the processes needed to execute the cutting operation?

## 1.4 Project Objectives

Development of this project is purposely to achieve some solutions of the current problem. The purposes of the project are:

    i. To develop a system that will automate the plate cutting operation

    ii. To develop a framework of automated plate cutting operation

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