CHAPTER 1

INTRODUCTION

1.0 Introduction

Electrical discharge machining (EDM) is a non-traditional manufacturing process based on removing material from a part by means of a series of recurring electrical discharges between a tool called electrode and the part in the presence of a dielectric fluid (Lin et al., 2002). This technique has been widely used in modern metal-working industry because of its ability to cut fully hardened steels especially in the die making industry. One critical limitation, however, is that EDM only works with materials that are electrically conductive.

The machine used in this study is a AQ55L (ATC) EDM and the workpiece material used is a mild steel with AISI 1020 grade. The important output parameters of the process are the material removal rate (MRR), electrode wear ratio (EWR) and surface roughness (SR). Wu.H.H (1996) stated that Grey Relational Analysis (GRA) is a method that used to get the desired information based on the relation with incomplete information. GRA require only a limited amount of data to estimate behavior of unknown systems. By using this method, we can determine and find the suitable parameter to optimize the electrical discharge machine on mild steel workpiece. This project is to investigate the optimum parameter required for MRR, EWR and SR by using GRA.
1.2 **Important of research**

The important of doing this research are:

i) Improve the quality surface finish of the cut metal.

ii) Improve efficiency of production process.

iii) Minimize the cost of production process.

iv) Enhance the production rate.

1.3 **Objective**

The objectives of the study are to:

i) Optimize the surface roughness (SR), electrode wear ratio (EWR) and material removal rate (MRR) by using GRA with Orthogonal Array (OA).

ii) Discuss on the significant result by using analysis of variance (ANOVA).

1.4 **Problem statement**

During the machining process, wear will occur on the electrode. This will affect the machining efficiency and cost. Other than that, crack also will occur due to the workpiece material condition. Mild steel AISI 1020 is a soft material, thus the proper machining is required to avoid the crack.

Other than that, the optimum parameter is also problems occur in this project. The optimum parameter can affect and meanwhile optimize the EDM process.
1.5 Project Scopes

This project will focus on machining parameter and the method used to optimize MRR, EWR and SR. The parameters that would be studied in this project are:

i) Peak current
ii) Pulse off duration
iii) Pulse on duration
iv) Polarity
v) Dielectric pressure
vi) Servo voltage

This project also focuses on the methods used which are GRA, OA and ANOVA in order to obtain the data. All of the methods that used in this project were aimed to evaluate the best and optimum parameter stated above. SR, EWR and MRR could simultaneously satisfy requirements of both quality and as well as productivity with special emphasis on reduction of electrode wear that ensures increase in tool life. The optimal setting ensured minimization of SR and EWR, while maximize MRR.