CHAPTER 1

INTRODUCTION

1.1 Electrical Discharge Machining

Electrical Discharge Machining (or EDM) is a machining method primarily used for hard metals or those that would be impossible to machine with traditional techniques. One critical limitation, however, is that EDM only works with materials that are electrically conductive. EDM can cut small or odd-shaped angles, intricate contours or cavities in pre-hardened steel without the need for heat treatment to soften and re-harden them as well as exotic metals such as titanium, hastelloy, kovar, and inconel.

The control parameters optimization for individual machining characteristic is concerned with separately maximize the material removal rate, separately minimize the tool wear ratio and separately obtained a good surface finish. There are many input parameters which can be varied in the EDM process which have different effects on the EDM machining characteristics.

Sometimes referred to as spark machining or spark eroding, EDM is a non-traditional method of removing material by a series of rapidly recurring electric arcing discharges between an electrode (the cutting tool) and the work piece, in the presence of an energetic electric field. The EDM cutting tool is guided along the desired path very close to the work but it does not touch the piece. Consecutive sparks produce a series of micro-craters on the work piece and remove material along the cutting path by melting and vaporization. The particles are washed away by the continuously flushing dielectric fluid. It is also important to note that a similar micro-crater is formed on the surface of the electrode, the debris from which must also be flushed away.
1.2 Parameter Of Edm

Polarity is one of the parameter in EDM. The polarity in EDM is the designation of positive or negative electrical potential to the electrode. The changing of this parameter also will affect the material removal rate (MRR), electrode wear ratio (EWR) and surface roughness (SR).

1.3 Important Of Research

This research is significant because of several causes:-

(i) Analyze the effect of the polarity to the Material Removal Rate (MRR), Electrode Wear Ratio (EWR) and Surface Roughness (SR)
(ii) Finding and decide the best polarity that produce high material removal rate, low wear electrode , low surface roughness and produce low time of machining
(iii) Analyze about and how to calculate the Material Removal Rate (MRR), Electrode Wear Ratio (EWR) and Surface Roughness (SR)

1.4 Problem Statement

There has been a lot of discussion over the years about what makes good EDM machining. During the machining process, the problem that occurs is how to choose between electrode and workpiece as a terminal positive or terminal negative. As reported by Roger Kern (2008), it is very important to pay attention to the recommended polarity of various electrode-workpiece combinations. The wrong polarity can have significant implications on speed, wear, and stability. It is best to consult the specific power supply technology documentation for polarity recommendations.
1.5 **Objective Of Research**

(i) Investigate the effect of polarity to the Material Removal Rate (MRR), relative electrode wear and Surface Roughness (SR) on the machining of tool steel work piece using Electric Discharge Machining (EDM)

(ii) Determine the optimum condition using orthogonal arrays and response graph

(iii) Determine the most significant and significant factor using ANOVA and F-Test.

1.6 **Scope Of Research**

A research will focus the effect of Polarity Parameters to the Material Removal Rate (MRR), relative electrode wear and Surface Roughness (SR) when use Electric Discharge Machining (EDM). The tools that will use are EDM Sodick AQ55L for machining, Electronic analysis balancer for weighting workpiece and surface roughness for measure roughness of the surface workpiece.