CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

In this chapter, all the method and process that used is based on the earlier research will compromised. Methodology is the precise way of accomplishment an operation that implies precise deliberative at the end of each stage. The purpose of this methodology is to make sure the process of this research is follow from beginning until the end of the project. Figure 1 shows an illustration of simple flow chart indicate the process flow.

For this experiment, procedure and condition for tool life has been design for coated and uncoated end milling and FCD 450 cast iron workpiece. The flow chart is very importance to investigate in order to achieve the objective. Provide a flow chart before starting the research for the experiment. The experiment work of this research are based on flow chart. For the first step, select the parameter that will be used and list all control variable and measure variable that will be involved. In this experiment, tool wear rate and surface roughness are depend variable while spindle speed, feed rate and depth of cut are independence variable. Next step is preparing parametric study.

The next stage after compiling experiment is to provide raw material and tools that will be used in experiment. The specimen will be cutting by using bend saw machine and the dimensional are 150 mm x 150 mm x 50 mm. After that, the experiment is run to get the measurement of surface roughness and tool wear. Data is collected and continue with result plotted using originPro8 software. OriginPro8 software is used to find the importance factor that contribute to result beside to find optimum machining parameter.
The last step is write the conclusion from overall research and the data is documented in a form of report.

Figure 3.1: Methodology flow chart
3.2 RAW MATERIAL

The material selected for this research is FCD 450. The ductile cast iron has good mechanical properties, and is widely used for parts of automobiles, construction machinery, and machine structure and so on. The dimension for this raw material is 150 mm x 150 mm x 50 mm as shown in the Table 3.1. Figure 3.2 shows the process flow occurred on the workpiece for the tool life and surface roughness test.

**Table 3.1:** Chemical composition of the ductile cast iron (mass %)

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>Si</th>
<th>Mn</th>
<th>P</th>
<th>S</th>
<th>Mg</th>
<th>Fe</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCD450</td>
<td>3.43</td>
<td>2.37</td>
<td>0.40</td>
<td>0.02</td>
<td>0.01</td>
<td>0.17</td>
<td>bal</td>
</tr>
</tbody>
</table>

Sources: Hara T, (2013)

**Figure 3.2:** Workpiece flow chart