CHAPTER 3

METHODOLOGY

3.1 Flow Chart

Start

Title selection

Literature review

Methodology

No

Experiment

Yes

Result and Analysis

Presentation

End
3.2 Selection of Cutting Parameters

Surface quality and dimensional accuracy are the two important aspects of a product in any machining operation. Several factors influence the final dimensional accuracy in a CNC milling operation. Generally it depends on many parameters such as tool material, work material, machine-tool rigidity and various cutting conditions including feed rate, depth of cut and cutting speed.

However, factors such as tool wear, chip loads and chip formations, or material properties of both tool and work piece are uncontrollable during actual machining. The presence of chatter or vibration of the machine tool, defects in the surface of work material, wear in the tool or irregularities of chip formation contribute to the surface damage in practice during actual machining operations.

In any experimental study, it is difficult to consider all these factors that affect the dimensional accuracy in pocketing process. Available literature reveals that depth of cut, spindle speed and feed rate are the three primary machining parameters and thus these are considered as design factors in the present study.

3.2.1 Calculation

The recommended cutting speed shown in previous chapter is to calculate the spindle speed (RPM) for the cutter. Using 2 flutes 10mm diameter end mill and recommended cutting speed (40m/min), hence, the spindle speed for the cutter was obtain from this formula (Equation 2):
\[
Spindle speed (\text{rpm}) = \frac{\text{Cutting Speed} \times 320}{\text{Tool Diameter}} \quad (2)
\]

The spindle speed obtains from formula is the recommended value. The value then increase by 50% to obtain higher value for spindle speed. The lower value of spindle speed obtains by decreasing 50% from recommended value.

For the feed rates, it is given feed per tooth of 0.05mm/tooth as it recommended value.

\[
\text{Feed rates (mm/min)} = \text{Spindle speed} \times \text{number of teeth} \times \text{feed per tooth} \quad (3)
\]

The feed rates obtain from the Equation 3 then increased by 50% and decreased by 50% to obtain the higher and lower value of feed rates respectively.

3.3 Work Piece Material Used

This study was carried out with mild steel. The chemical composition and mechanical properties of the work piece materials was describe in previous chapter. All the specimens were in the form of 100mm \(\times\) 100mm \(\times\) 75mm blocks as shown in Figure 3.1.