CHAPTER 3 EXPERIMENTAL PARAMETERS

3.1 Surface roughness

The geometrical features of a surface include Macro-deviations, Micro-irregularities and Surface waviness. Surface roughness number (Ra) is expressed in microns. Ra = \( \frac{(h_1+h_2+\ldots+hn)}{n} \).

![Diagram of Surface Roughness](image)

Figure 3-1 Surface roughness

Actual profile (Af)

It is the profile of the actual surface obtained by finishing operation.
Datum profile (Df)

It is the profile, parallel to the reference profile. It passes through the lowest point B of the actual profile.

Reference profile (Rf)

It is the profile to which the irregularities of the surface is referred to. It passes through the highest point of the actual profile.

Peak to valley height (Rₚ)

It is the distance from the datum profile to the reference profile.

Mean Profile (Mf)

It is that profile, within the sampling length chosen (L) such that the sum of the material-filled areas enclosed above it by the actual profile is equal to the sum of the material void area enclosed below it by the profile.

Mean roughness index (Ra)

It is the arithmetic mean of the absolute value of the highest hi between the actual and mean profile.

\[ Ra = \frac{1}{L} \int_{x=0}^{x=L} |hi| \, dx \]  

Where L is sampling length

3.2 Cutting parameters

General cutting formulas are given below. Find various cutting parameters related to material of workpiece and tool type.
Cutting speed $V_c$ (m/min)

$$V_c = \frac{D_m \times \pi \times n}{1000}$$  \hspace{1cm} 3-2

Spindle speed $n$ (rpm)

$$n = \frac{V_c \times 1000}{\pi \times D_m}$$  \hspace{1cm} 3-3

Metal removal rate $Q$ (cm$^3$/min)

$$Q = V_c \times a_p \times f_n$$  \hspace{1cm} 3-4

Net power $P_c$ (kW)

$$P_c = \frac{V_c \times a_p \times f_n \times k_c}{60 \times 10^3}$$  \hspace{1cm} 3-5

Machining time $T_c$ (min)

$$T_c = \frac{l_m}{f_n \times n}$$  \hspace{1cm} 3-6

$D_m$  Machined diameter in mm  \hspace{1cm} mm

$f_n$  Feed per revolution  \hspace{1cm} mm/r

$a_p$  Cutting depth  \hspace{1cm} mm

$n$  Spindle speed  \hspace{1cm} rpm

$P_c$  Net power  \hspace{1cm} kW

$Q$  Metal removal rate  \hspace{1cm} cm$^3$/min

$T_c$  Period of engagement  \hspace{1cm} min
After complete the operation in CNC machine measured dimension of selected component. There are various dimensions of component but here only one dimension of diameter (25.02 to 25.05 mm). This dimension was measured by micrometer and change parameter see the effect on this dimension.

3.4 Coolant properties

The essential capacity of machine coolant is temperature control through cooling and lubrication. Utilization of machine coolant likewise enhances the nature of the work piece by consistently expelling metal fines and cuttings from the apparatus and cutting zone.

Temperature Control

As machine coolant is connected amid machining operations, it evacuates warm via diverting it from the cutting tool/work piece interface. This cooling impact keeps apparatuses from surpassing their basic temperature extend past which the device diminishes and wears quickly. Machine coolants additionally lubricate up the cutting tool/work piece interface, limiting the measure of warmth produced by rubbing. A machine coolant's cooling and lubrication properties are basic in diminishing apparatus wear and expanding device life. Cooling and lubrication are additionally essential in accomplishing the coveted size, complete and state of the work piece.

Stability and Rancidity Control

In the beginning of the mechanical insurgency, grease oil was utilized as a machine coolant. Following a couple of days, fat oil would begin to ruin and emit a hostile smell. This rancidity was caused by microbes and other minuscule living beings that
developed and increased inside the oil. Current machine coolants are powerless to a similar issue.

**Corrosion Protection**

Machine coolants must offer some level of erosion assurance. Newly slice ferrous metals tend to rust quickly since any defensive coatings have been expelled by the machining operation. A decent machine coolant will repress rust development to maintain a strategic distance from harm to machine parts and the work piece. It will likewise grant a defensive film on slicing chips to keep their erosion and the development of hard to-oversee pieces or clinkers.

**Viscosity and Transparency**

In a few operations, machine coolant straightforwardness or clearness might be a coveted trademark. Straightforward machine coolants enable administrators to see the work piece all the more plainly amid machining operations.

Consistency is a vital property regarding machine coolant execution and upkeep. Lower consistency machine coolants enable coarseness and soil to settle out of suspension. Expulsion of these contaminants enhances the nature of the machine coolant recycling through the machining framework. This can affect item quality, machine coolant life and machine shop efficiency.

**Toxicity**

Most machine coolants are not profoundly harmful. The machine coolant getting to be plainly smelly, super focused, or defiled for the most part causes toxicological issues related with machine coolants. The fundamental courses of introduction for machine coolant incorporate inward breath.

**Misting**

Fast metalworking operations, for example, pounding may atomize machine coolant, making a fine fog, which can be an inward breath risk for machine operator. Clouding likewise makes a grimy workplace by covering hardware and the encompassing work region. Non-clouding machine coolants give more secure working conditions to the machine operator.
Flammability

Machining operations ordinarily produce a lot of heat, which can cause machine coolants to smoke or potentially light. A machine coolant ought to have a high flashpoint to maintain a strategic distance from issues related with heat damage, the generation of smoke, or machine coolant start.