Open Ended Lab

IE322 L
Machine Processes Lab

Resource Person: Muhammad Ammar Arshad

Student Name: Mohammad Abubakar Atiq (F2022031002), Barira Qasim (F2022031016), Hannan Ahmed Siddiqui (F2022031008), Sarim Ullah (F2022031008)

Section: A - BSIE

Semester: Fall 2024

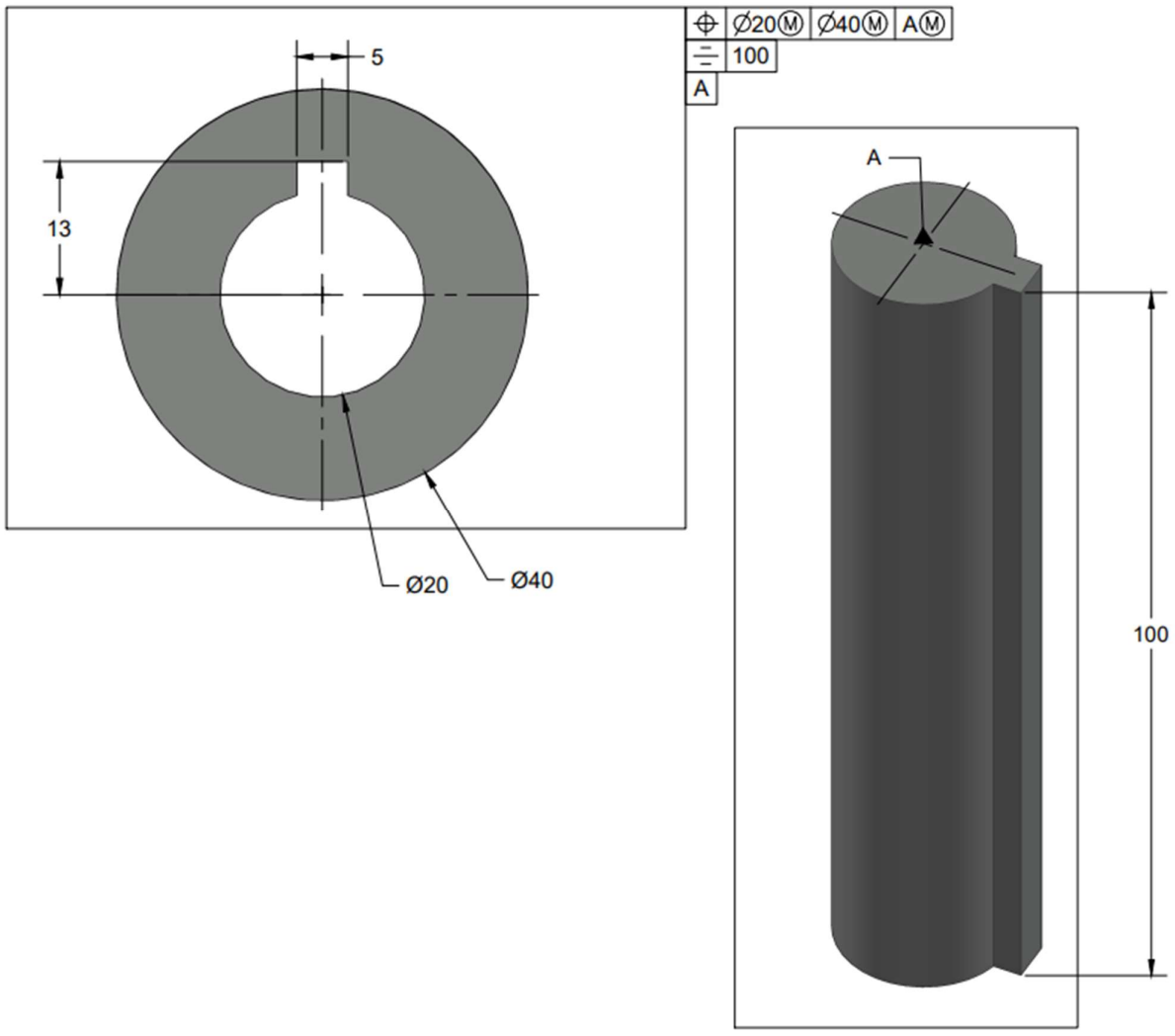
Department of Mechanical Engineering

School of Engineering
University of Management and Technology Lahore

Simple Turning and Wire Cut on Cylinder Aluminum Shaft

Objective:

In this OEL, we did turning Operation and wire cut to make the shaft keyhole and keyway. Which are shown below:



Initial and final conditions:

Before machining:

1. Workpiece material: aluminum
2. Diameter: 50mm
3. Length: 256mm

After machining:

1. Workpiece shape: two separate pieces produced from the 256mm length
2. Outer keyhole diameter: 40mm
3. Inner keyway diameter: 19mm

NOTE:

1. Outer keyhole: turned on the lathe machine.
2. Inner keyway: produced using CNC wire cut technology
3. Tolerance is $\pm 1mm$

Cutting parameters

1. Cutting tool types:
   1.1. Uncoated: depth of cut = 1.5-5.0 mm; feed = 0.45mm/rev; cutting speed = 490 m/min.

Machines used

1. Lathe machine
2. CNC Wire Cut machine
   2.1. Model: DK7745
   2.2. Cutting speed: standard = 110-120 mm/min; maximum = 160-180mm/min

Results and observations:

Turning Operations:

Material removal rate (MRR) & Machining time (T_m):

$$f = \frac{0.45mm}{rev}, V = 490\frac{m}{minute},$$

$$D_i = 55mm, D_f = 40mm$$

$$d = \frac{55-40}{2} = 7.5mm, D_{avg} = \frac{55+40}{2} = 47.5mm$$

$$V = \pi D_{avg} N, N = \frac{V}{\pi D_{avg}} = 3284\ RPM$$

$$MRR = vfd = 490 \times 0.45 \times 10^{-3} \times 7.5 \times 10^{-3}\ \left(\frac{m^3}{minute}\right)$$

$$MRR = 1.35375 \times 10^{-3}\ \left(\frac{m^3}{minute}\right)$$

$$MRR = 1.35375\frac{mm^3}{minute}$$

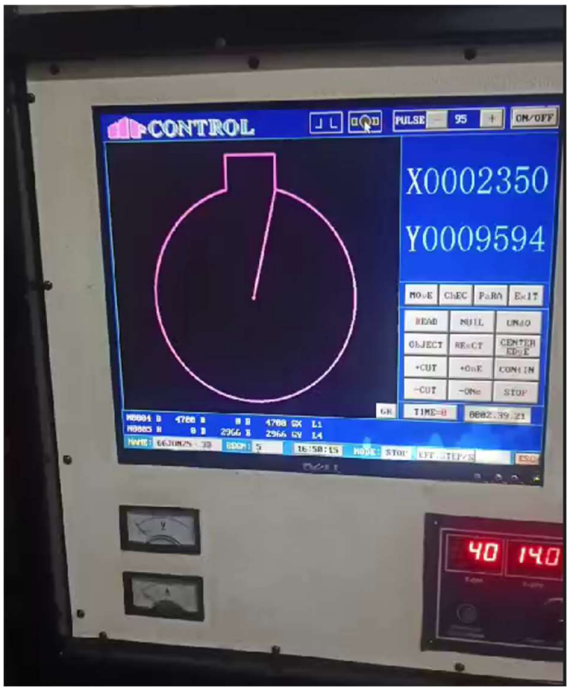
$$T = \frac{l}{fN} = \frac{256}{0.45 \times 3284} = 0.1723230477min$$

$$T_{actual} = (4.83, 5.74)min$$

After turning operations → *CNC Wire Cut*

Workpiece was divided into two equal pieces of length $128mm$.

Figure 0-1: Adjusted for center reference



These two pieces are made on HF Control CNC wire cutting machine. Each piece length was set $100mm \pm 1mm$. As you can see in pictures mentioned above, keyhole and keyways are generated after turning.