

Open Ended Lab

IE322 L Machine Processes Lab



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Section: A - BSIE

Semester: Fall 2024

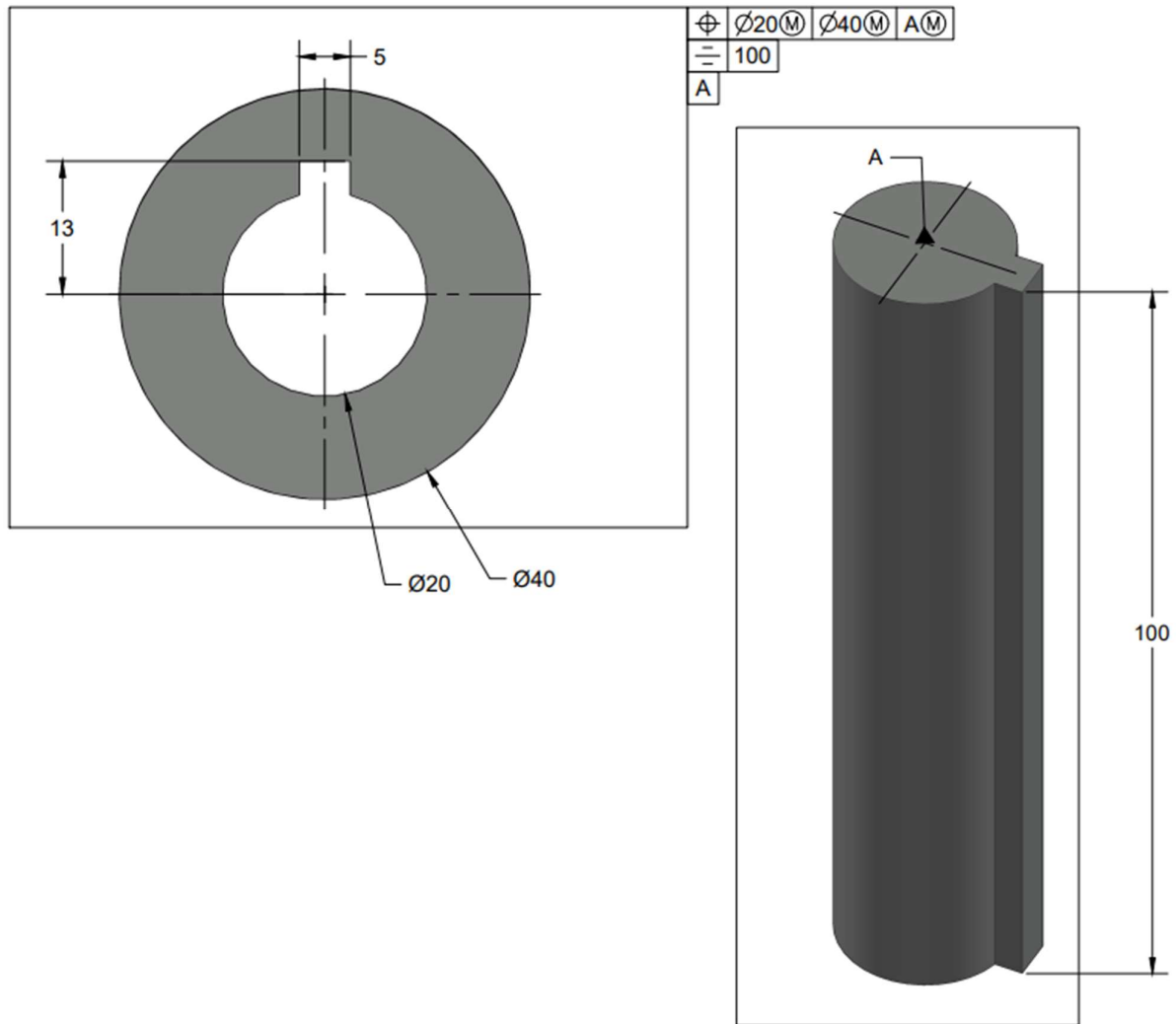
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Simple Turning and Wire Cut on Cylinder Aluminum Shaft

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):

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

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

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

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

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

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

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

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

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

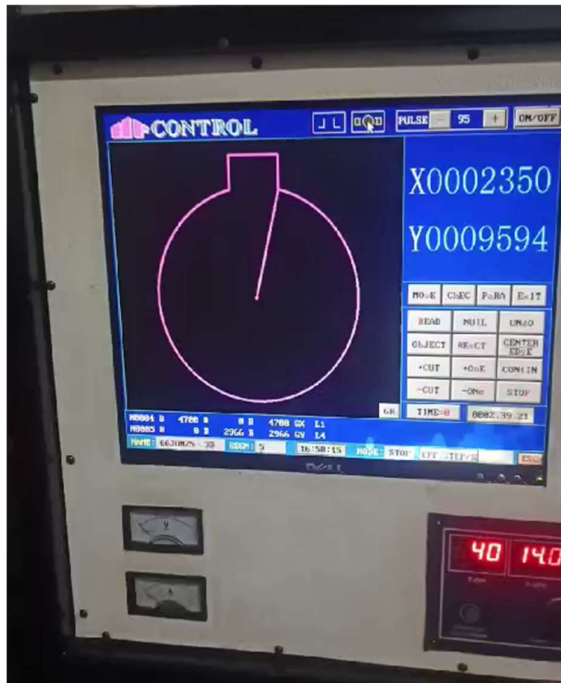
After turning operations → *CNC Wire Cut*

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 $100\text{mm} \pm 1\text{mm}$. As you can see in pictures mentioned above, keyhole and keyways are generated after turning.

Reference:

Company profile for CNC wire cutting services: Dynamic Tooling Services: Lahore office:
33/S, Quaid-e-Azam Industrial Estate, Kot Lakhpat, Lahore. info@dts.com.pk , +92-42-
35213737, Admin & Accounts DTS: +923214480052