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To: Sir Arslan

Workshop Project Report

Hexagonal Profiled lathe operated Threaded wordkpiece

Group Members

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Project workshop

LATHE AND MILLING

TITLE : HEXAGON SHAPE ON ALUMINUM WORK PIECE

Figure 1

➢ Introduction:

✓ Apply the operations of Lathe machine milling machine and threading to give shape to aluminum cylindrical work piece of mild steel to hexagon

➢ Equipment required:

1. Lathe Machine.
2. Mlling machine
3. Cylindrical Work piece.
4. Cutting tool.
5. Chuck key.
6. Vernier callipers.

➢ Milling operations (vertical)

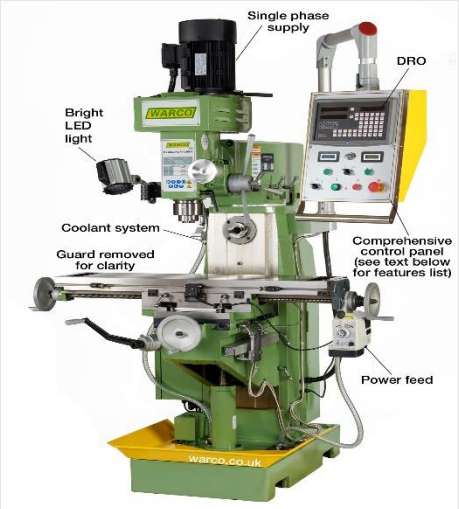

Figure 2

1. Procedure:

2. Fix the work piece in the work table
3. Fix the cutting tool in the spindle.
4. Machine must be in vertical configuration
5. Using feed mechanism control the speed of spindle
6. Move the indexing head according to formula (40/n)
7. If done correctly it must look like hexagon

2. Calculations:

1. The radius of the middle part was 24mm.
2. Found the cross flat formula **SIN(O)=perp/hyp**.
3. For getting six sides use formula 360’/6 = 60 degree per cut.
4. The radius is equal to hypotenuse and perpendicular equal to cross flat.
5. For calculating depth of cut subtract cross flat from radius **crossflaradius.**
6. For speed of cutting tool put formula (3.14dn).
7. d=cutter diameter (16mm). and n=rotation of spindle

➢ lathe operations

1. First of all fix the cylindrical work piece in the lathe machine.
2. Note down the dimension the diameter was 24 and the length 100mm.
3. Precisely fix the work piece using the chuck key.
4. Adjust RPM on the lathe machine initially it was fixed to 800 RPM .

1. Facing:

2. Facing was done on both sides of work piece to make the surface smooth on both sides.

Figure 3

2. Turning:

1. Turning was the next procedure in the operations on lathe machine this was done to remove the material to reduce diameter of the work piece.
2. The total length was 100mm and the diameter was 24 mm by turning the one side diameter was reduced to 12mm to the 40mm length.
3. From the other side diameter was reduced to 12 mm also to the 50mm length.
4. In the middle it was left of 10mm length of 24mm diameter.
5. From the side of 50mm length the diameter was again reduced to 10mm at the length of 20mm.

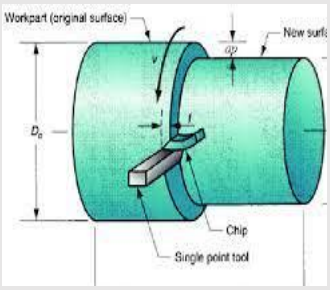

Figure 4

3. Taper turning:

1. Taper turning was done by fixing the taper angle to the 2^{o}.
2. Then it was done from end of the 20mm length side.
3. Giving the conical shape at the angle of 2^{o} of the length 30mm.

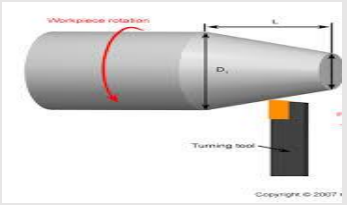

Figure 5

4.Drilling:

1. The drilling was done by fixing the drilling tool in the lathe machine
2. Then the side of 20mm length was drilled by using drilling tool.
3. The diameter of drilled hole was 0.2mm.

Figure 6

4. It was drilled to depth of 5mm.

5. Knurling:

1. It was done by fixing the knurling tool in the lathe machine.
2. Then by fixing RPM it was achieved.

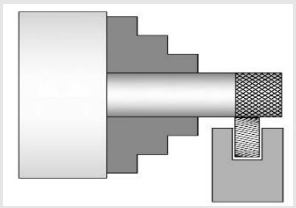

Figure 7

6. Threading:

1. External threads were created on the work piece by using the threading die of 10mm.
2. It was fix in the 10mm diameter side of work piece and rotated clockwise one stoke the half counter clockwise.
3. The threading was done to 20mm length.

Figure 8

7. Finishing:

1. In the end for finishing the hexagonal shape edges were chamfered about 45^0.
2. The drilled end was also chamfered.
3. The sand paper was used to provide lustrous appearance.

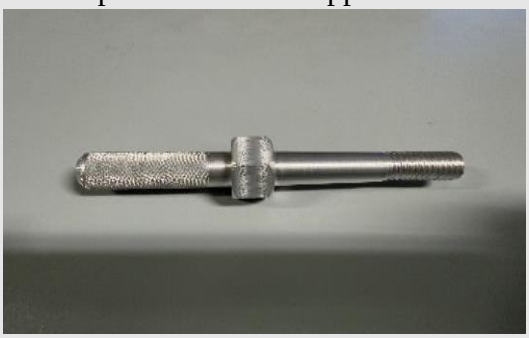

Figure 9

➢ 3d model

The 3d model of the final work piece was created in the solidworks

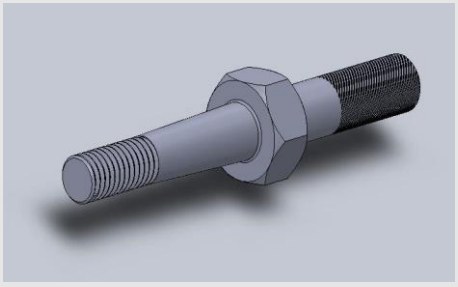

Figure 10

➢ Conclusion

The project successfully demonstrated the practical application of various machining operations to shape a cylindrical mild steel work piece into a finished mechanical component. Throughout the process, essential skills were developed and applied using both the **lathe machine** and **milling machine**, followed by **threading** and **finishing techniques**.

1. On the **lathe machine**, operations like facing, turning, taper turning, drilling, and knurling were performed. These steps helped reduce diameters, create conical profiles, add grip textures, and drill precise holes, showcasing the versatility of the lathe.
2. The **milling machine** was used to convert the central cylindrical section into a hexagonal profile through accurate depth and indexing calculations, demonstrating how rotational and linear motion can be used to create complex shapes.
3. **Threading** was carried out using a threading die to add functional external threads on the reduced diameter sections, enabling future assembly or fastening.
4. In the **finishing stage**, chamfering was applied to edges for smooth transitions, and sandpaper was used to give the workpiece a clean and polished look.

Finally, a **3D model was created in SolidWorks** was prepared to document the design and dimensions. This project highlighted the importance of precision, measurement, safety, and methodical procedure in machining, leading to a professionally finished part suitable for real-world applications.