

Study and Analysis of Shaping Tool Fixture



Prashant Mane, Poster Advisor: Dr. Jeremy (Zheng) Li
 Department of Mechanical Engineering
 University of Bridgeport, Bridgeport, CT

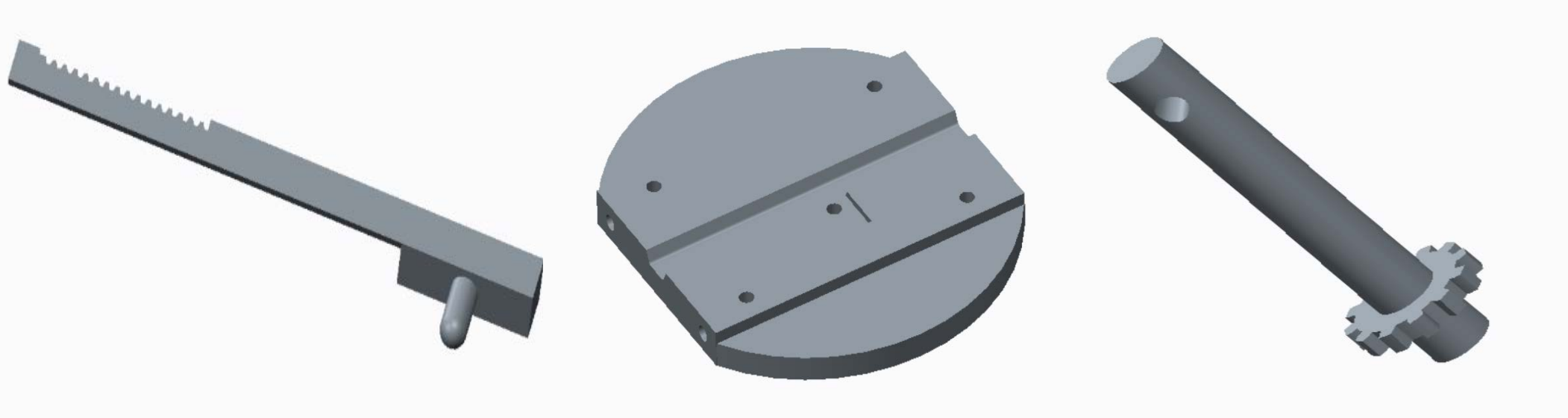
Abstract :

This poster introduces the new techniques to achieve the complicated operations done with the help of fixtures. The computer-aided structural analysis and simulations have been performed to study the stress and deformation of mechanical components in assembly process.

Objective:

1. To analyze the stresses and vibrations of fixture.
2. To achieve low vibration and high accuracy.
3. To minimize the production time.

Working :



To calculate the cutting force which is acting on the cutting tool equation (i) and (ii) is used.

$$F_n = \frac{25 \times Q'w}{V_s}$$

Where,

F_n = Normal force;

$Q'w$ = Relative metal removal rate

V_s = Spindle speed

$$Q'w = \frac{\pi \times d_w \times V_f}{60}$$

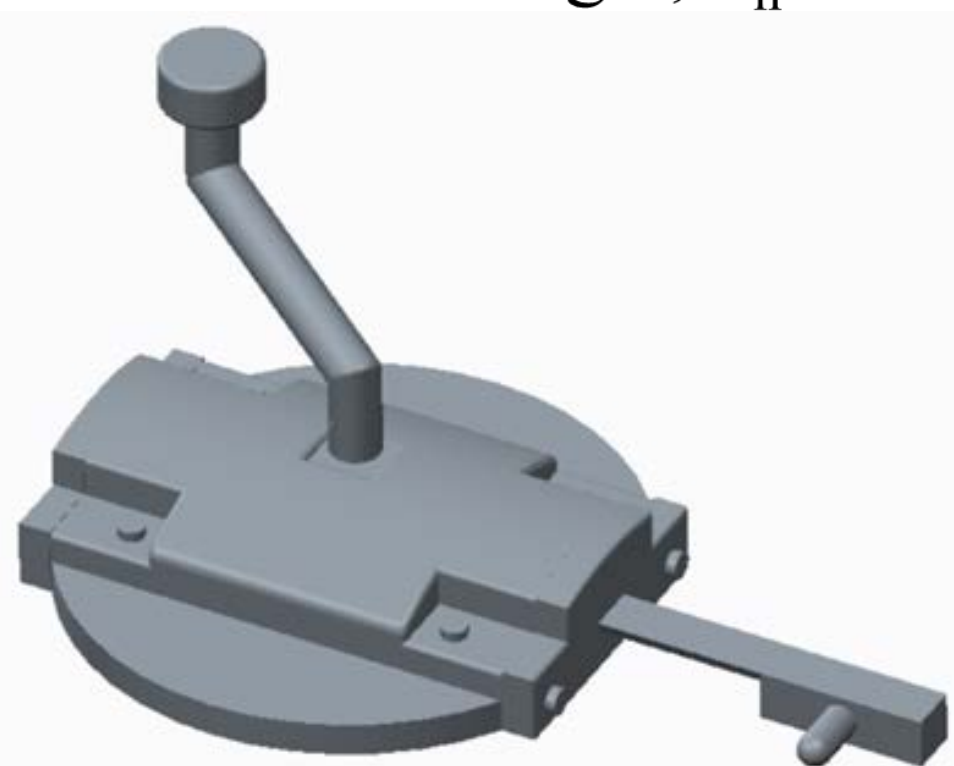
Where,

d_w = diameter of wheel

V_f = Feed speed mm/min

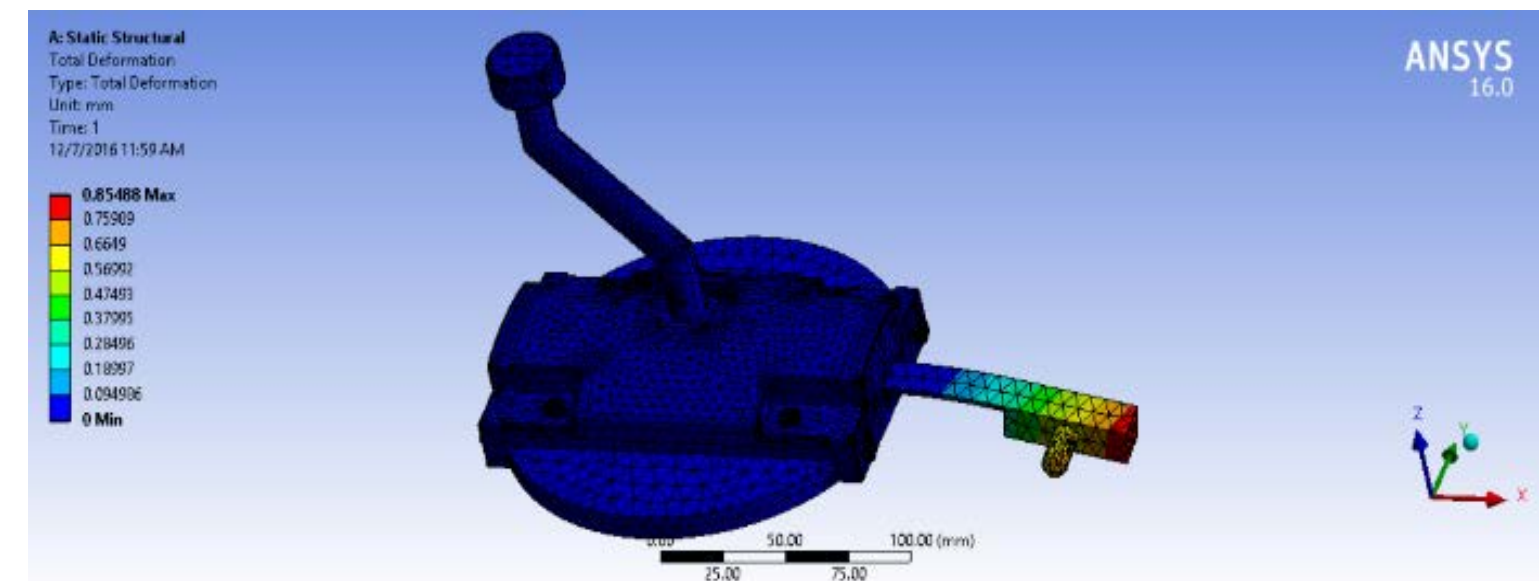
(Assume $V_f = 1$ mm/min)

Calculating with the data we get, $F_n = 100$ N.

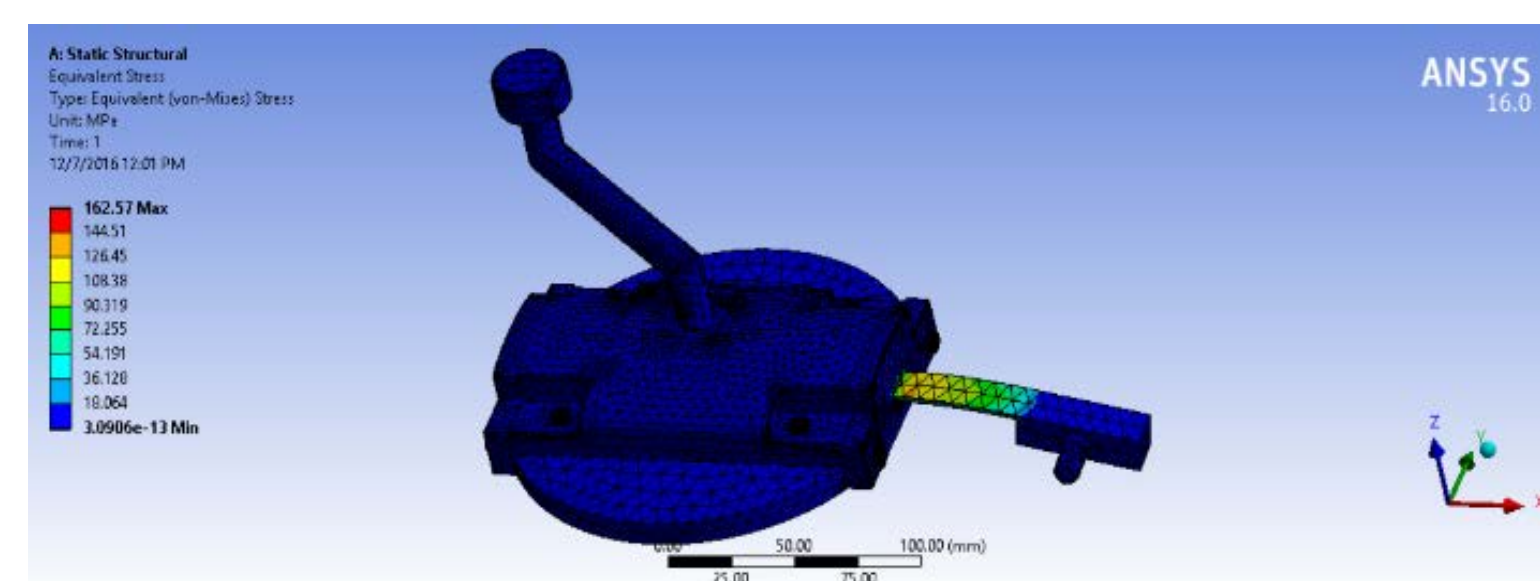


Assembly of the Fixture

Results:



Total Deformation Shows the Maximum Deformation of Model for 100N Force (0.85mm)



Stresses acting rack (162.57Mpa)

Time [s]	Minimum [MPa]	Maximum [MPa]
1.	3.0906e-013	162.57

Maximum Stress Result

To reduce the vibration, we should compare the frequency of vibration of other machine components and we should keep their frequency of vibration lower as compare to the natural frequency of vibration of a fixture. The stress should not exceed the yield strength limit of the material.

Conclusion :

- Accurate and long lasting components represent a crucial ingredient of a well-functioning, reliable fixture.
- This may prove the importance, complexity, and purposefulness secrecy of presented process. Use of a 3D CAD system allows the engineer freedom of experimentation with several design alterations before arriving to optimal solution.
- Minimum vibration and smooth profile on dressed grinding wheel.
- Dust proof hence life of fixture increases.
- No need of skilled operator.