"ANGULAR GEARLESS POWER TRANSMISSION SYSTEM"

Prajapat kamlesh. M.[1] , Chauhan dhiren.D.[2] , Malete Akash.M[3],Chahuhan Govind.N[4]
.

Mr. Rahul M. Desai[5]

[1] *U.G. Student, Mechanical Engineering Department, SCET, Himmatanagar, Gujarat, India*

[2] *U.G. Student, Mechanical Engineering Department, SCET, Himmatanagar, Gujarat, India*

[3] *U.G. Student, Mechanical Engineering Department, SCET, Himmatanagar, Gujarat, India*

[4] *U.G. Student, Mechanical Engineering Department, SCET, Himmatanagar, Gujarat, India*

[5] *Assistant Professor, Mechanical Engineering Department, SCET, Himmatanagar, Gujarat, India*

Today's world requires speed on each and every field. Hence rapidness and quick working is the most important. Now days for achieving rapidness, various machines and equipment are manufactured by man.

The engineer inconstantly conformed to the challenges of bringing ideas and design in to reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. The project GEARLESS TRANSMISSION is being compact and portable equipment, which is skillful and is having something precise in transmitting power at right angle without any gears being manufactured.

Keywords: - *Bearings, hub, shaft,driving shaft rod, driven shaft rod, angular guideway, bolted link ,shaft support*

1. INTRODUCTION

1.1 Definition:-

Power transmission is a process to transmit motion from one shaft to another by using some connection between them like belt, rope, chain, and gears. To connect the shafts, mainly two types of connectors are used, one is flexible and other is rigid. In flexible types of connection, there is relative velocity between shaft and connectors due to slip and strain produced in the connectors. But in case of rigid connection, there is no relative velocity between the connector and shaft.

.

1.2 Types by which we can transfer the motion:-

1. Belts and ropes
2. Chain drive
3. Gears
4. Clutches

1.3 Chain drive:-

Chain Drive is used when the distance between the shaft centers is short and no slip is required. These connectors are referred to as a positive or non-slip drive.

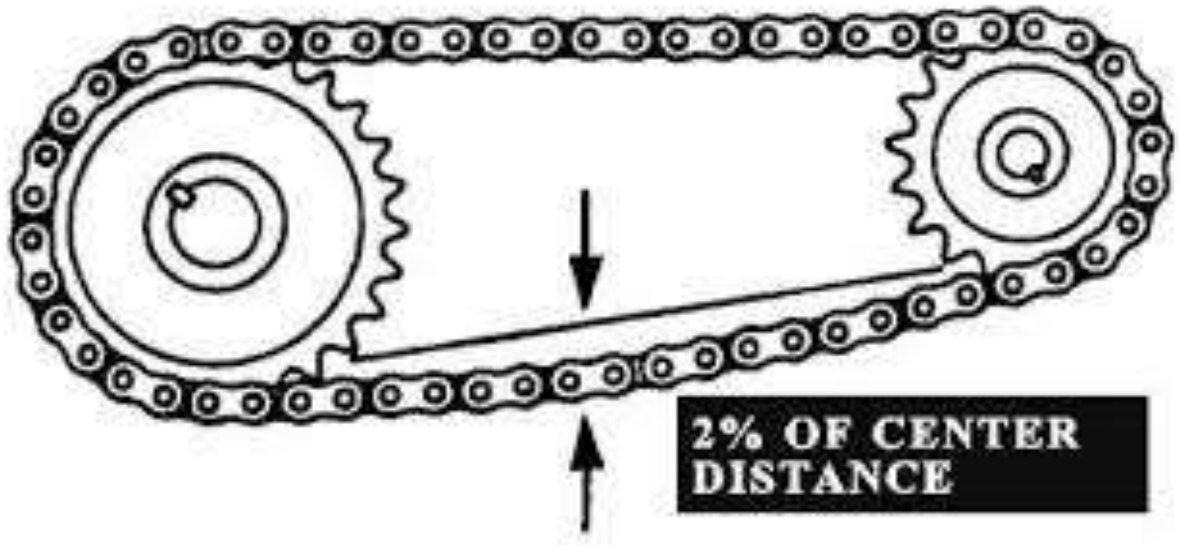


Figure 2:- Chain drive

Advantages of Chain drive:-

1. As no slip take place during chain drive, hence perfect velocity ratio is obtained.
2. Since the chains are made of metal, therefore they occupy less space in width than a belt or rope drive.
3. It may be used for both long as well as short distances.
4. It gives a high transmission efficiency (up to 98 percent).
5. It gives less load on the shafts.
6. It has the ability to transmit motion to several shafts by one chain only.
7. It transmits more power than bents.
8. It permits high speed ratio of 8 to 10 in one step.
9. It can be operated under adverse temperature and atmospheric conditions.
10.

Disadvantages of Chain drive:-

1. The production cost of chain is relatively high
2. The chain drive needs accurate mounting and careful maintenance, particularly lubrication and slack adjustment.
3. The chain drive has velocity fluctuations especially when unduly stretched.

2.0 Material Selection and Component Design Calculation:-

2.1.1 Mild Steel:-

- Mild steel is a very popular metal and one of the cheapest types of steel.
- Mild steel also available easily.

Properties:-

- Hardness (BHN) :- 126 BHN
- Tensile Strength (Ultimate) :- 440 MPa
- Tensile Strength (Yield):- 370 MPa
- Density:- 7.87 g/cc
- Elongation at Break:- 15%

2.1.2 Grey Cast Iron:-

Properties:-

- Hardness (BHN):-160 to 300 BHN
- Compressive (Crushing) strength:- 570 to 1290 MPa
- Shear strength:- 180 to 610 MPa
- Tensile strength:- 160 to 450 MPa
- Elongation at break:- 0.52%

2.1.3 design of Mild Steel:-

BHN: - 126

Tensile strength (ultimate):- 440 MPa

Density: - 7.87 g/cc

Allowable bending stress σ_b = 0.46×440 = 202.4 N/mm^2

Allowable shear stress τ = 0.3×440 = 132 N/mm^2

Power of motor = 0.5HP

= 0.5×746 = 373 Nm/s

RPM of motor = 500 rpm

P = $\frac{2\pi NT}{60}$

2.1.4 Design of Hub:-

Consider the outer diameter D = 90 mm

Inner diameter d = 30 mm

Rod hole in hub diameter đ = 12.5 mm

Length of Hub L = 40 mm

Volume V = $\frac{3.14}{4}(D^2\text{-}d^2)$ L - 3×3.14×đ²×$\frac{L}{4}$

= 226080 – 14718.75

= 211361.25 mm^3= 211.361 cm^3

Weight of hub P = V×ρ = 211.361×7.87

= 1667.40 g = 1.667 Kg

= 16.318 N

Bending Stress σ_b = $\frac{PD^2}{D^2-d^2}$

= $\frac{16.318\times30^2}{90^2-30^2}$

= 2.039 N/mm^2 < 202.4 N/mm^2

So, Design of hub is safe.

2.1.5 Design of Shaft:-

Consider the shaft diameter D = 30 mm

Shaft length L = 250 mm

Bending moment M_b = P×L

= 16.318×250

= 4079.5 N.mm

σ_b= $\frac{32M_b}{\pi D^3}$

= $\frac{\overline{32\times4079.5}}{3.14\times30^2}$

= 1.539 N/mm^2 < 202.4 N/ mm^2

Shear stress $\tau = 16T/\pi D^3$

$= 16\times7127.3/(3.14\times30^3)$

$= 1.345\ N/mm^2 < 132\ N/mm^2$

So, Design of Shaft is safe.

2.1.6 Design of Rods:-

Consider the rod diameter D = 12 mm

Rod length L = 220 mm

$Z = 0.78R^3$

$= 0.78\times6^3$

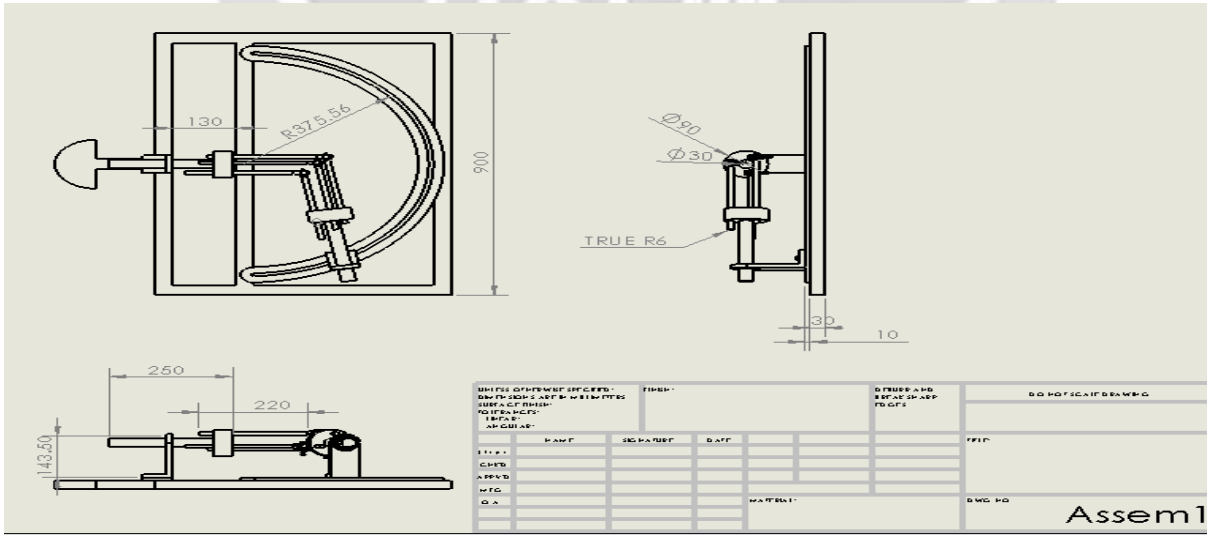
$= 168.48\ mm^3$

Bending stress of rod $\sigma = \frac{PL}{4Z}$

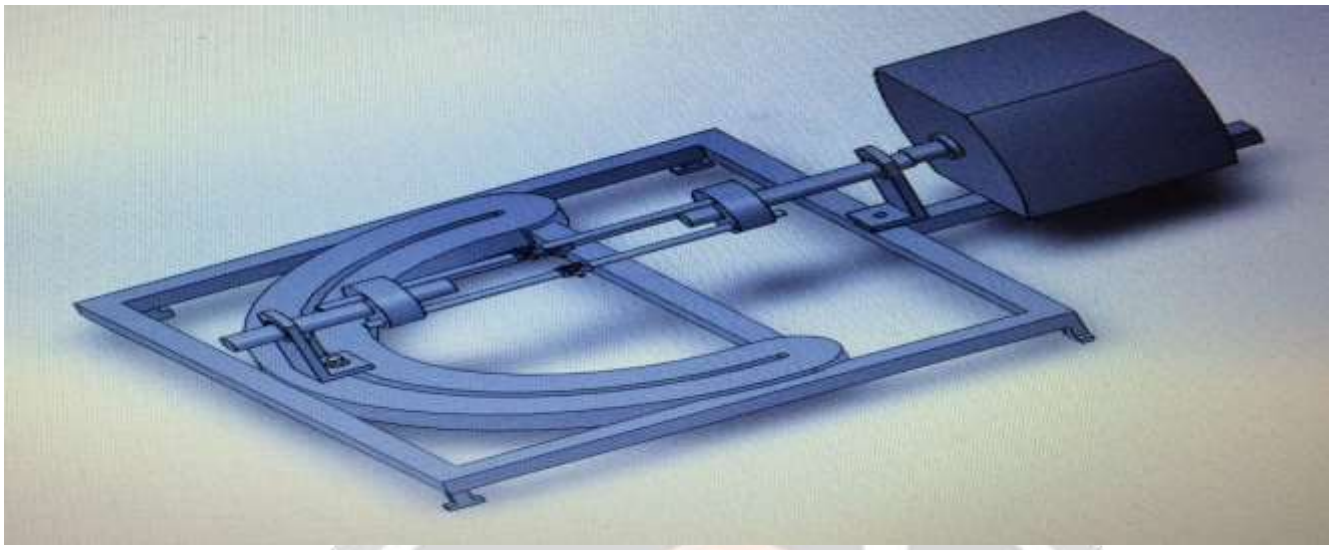
$= \frac{16.318\times220}{4\times168.48}$

= 5.347 N/mm2

3.1Drafting Sheet of Mechanism:-



3.2 Modelling of Gearless Power Transmission System:-



Conclusion:-We have concluded that, when the power transmitting on driver shaft, hub is rotate with reference to axis of shaft and rods are sliding motion in the hub. When the rods are sliding in hub then occur minor deformation but where the coupling of two rods or pair of rods have occur maximum deformation at one pair of rod. If the system at 90˚ power transmit, occur maximum deformation compare to the 180˚ or 160˚ deformation. When we change angle 90˚ to 180˚ then reduce the maximum deformation.

3.4 References:-

1. Design of Machine Element by V.B. Bhandari, Tata McGraw Hill Publication, India.
2. Design and Fabrication of gearless power transmission for skew shaft, R. Somraj, B. Sailesh.
3. Gearless mechanism in right angle, Atish Lahu Patil, Vinay Prabhakar Jadhav.
4. Design and analysis of gearless power transmission through elbow mechanism, Solanki Nehal Pramesh.
5. The Meccano Magazine (106)-A Curious Right-Angle Drive Pg. No. 1079, Print-1927.
6. Charles Kostka A Pin-And- Slot, Angle-Drive Wrench Ser. No. – 735276.
7. Jack W. Stage Limited Angle Universal Joint Patent No. - S6287206B1.
8. Navneet Bardiya1, karthik.T2, L Bhaskara Rao3"Analysis and Simulation of Gearless Transmission Mechanism" International Journal Of Core Engineering & Management (IJCEM) Volume 1, Issue 6, September 2014.
9. Jagushte G. S1Kudalkar Hrishikesh2 Patil Vikas3 Varak Vishal4"Design, Analysis and Fabrication of Gearless Transmission by Elbow Mechanism" International Journal for Scientific Research & Development| Vol. 4, Issue 02, 2016 | ISSN (online): 2321-0613.
10. R. Somraj1, B. Sailesh2"Design and fabrication of gearless power transmission for skew shafts" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 04 Issue: 04 | Apr -2017,ISSN: 2395-0072.