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DESIGN AND CONSTRUCTION OF A UNIVERSAL COUPLING

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Abstract - *A coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both.*

A Universal coupling is a special type of coupling in which misalignment of shafts is allowed. Shafts are free to move any direction in order to transmit torque or power from one shaft to another.

In this project work a Universal coupling was designed, in which safe torque on shafts and pin size of cross determined.

Finally the Universal coupling made by Mild Steel, which is low cost and available in every workshop.

1. INTRODUCTION

The disappointment of coupling can be minimized by legitimate upkeep, such as-checking and changing grease routinely, performing visual review, checking signs of wear and weariness and cleaning coupling frequently etc..[1]

The essential reason of couplings is to connect two pieces of turning gear whereas allowing a few degree of misalignment or conclusion development or both. By cautious choice, establishment and upkeep of couplings, considerable investment funds can be made in diminished support costs and downtime. There are different sorts of coupling based on region of application and misalignment or degree of opportunity to move in any heading. Such as the all inclusive coupling permits the shafts to move in any headings. The distinctive sorts of arrangements are :[2]

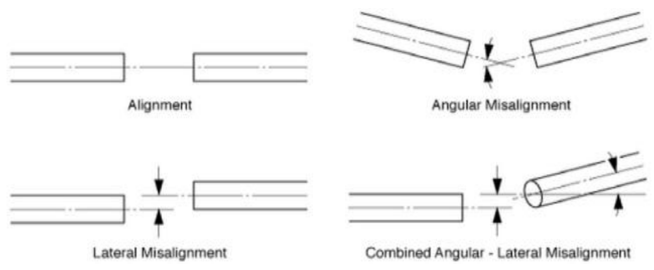

Figure 1Types of joints

2. PROBLEM

A universal coupling (universal joint, or Hooke's joint) is used to connect two shafts which intersect but which are not necessarily in the same straight line, as shown in Fig below. The angular velocity of the output shaft is not equal to the angular velocity of the input shaft, unless the input and output shafts are in line. The ratio of speeds is given by

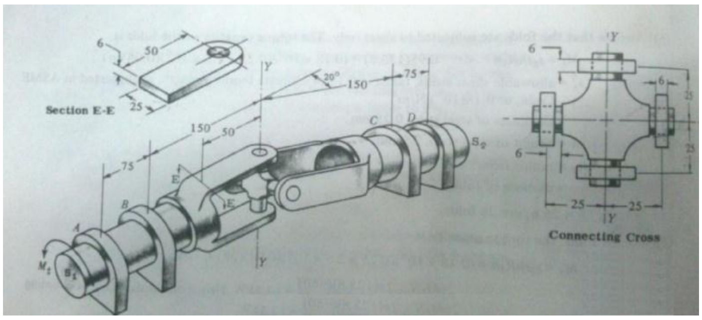

Figure 2 Problem

$$\frac{Ns2}{Ns1} = \frac{\cos\theta}{1 - \mathrm{Cos}2\alpha\mathrm{Sin}2\theta}$$

Ns2 = angular velocity of the driven shaft

Ns1 = angular velocity of the driver shaft

θ=angle between axes of the shafts

α= angle of the driving shaft from the position where the pins of the drive shaft yoke are in the plane of the two shafts.

2.1 Problem statement

A. Determine the torque on shaft S2 for the position shown in Fig.

B. Determine the size of the pins of the connecting cross for an allowable bearing stress of 14 MPa (per projected area), an allowable bending stress of 140 MPa, and an allowable shear stress of 70 MPa.

C. Calculate the maximum shear stress on section E-E, which is 50 m from axis Y-Y.

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3. SOLUTION

A.

The components of F, acting on the shaft S1, are F cos200 and F sin200.

The troque acting on the shaft S1 due to the action of the cross is

Mt= (F cos200)(0.05) or, 40 = (F cos200)(0.05) or, F = 851N

The torque on the shaft S2 is

0.05 =(851)(0.05) = 42.6 Nm. (Ans.)

B.

The maximum pin load is 851N.

Diameter of pin based on bearing:

$$S_b = \frac{F}{A}$$

$$\text{or, } 140 * 10^6 = \frac{851}{0.006d}$$

or, d = 10 mm

(2) Diameter of pin bending on based:

$$s = \frac{Mc}{I}$$

$$\text{or, } 140 * 10^6 = \frac{851*0,006(\frac{1}{2}d)}{(\frac{\pi}{64})d4}$$

or, d = 7.2 mm

C.

(3) Diameter of pin based on transverse shear:

$$S_s = {}^4/_3 * {}^F/_A$$

$$\text{or, } 70 * 10^6 = ({}^4/_3)({}^{851}/_{\frac{1}{4}\pi d2})$$

or, d = 4.6 mm

Therefore bearing dictates the minimum size of pin; a 10mm diameter pin should be satisfactory.

(c)Maximum compressive stress at section E-E is

$$Sc = \frac{Mc}{I} + \frac{P}{A} = \frac{851*0{,}05*0.0125}{0.006*(0.025)3/12} + \frac{291}{0.006*0.025} = 65.9 \text{ MPa}$$

$$\text{Maximum shear} = \frac{1}{2} * (65.9) = 33 \text{ Mpa (Ans.)}$$

4. DESIGNED DIMENSION

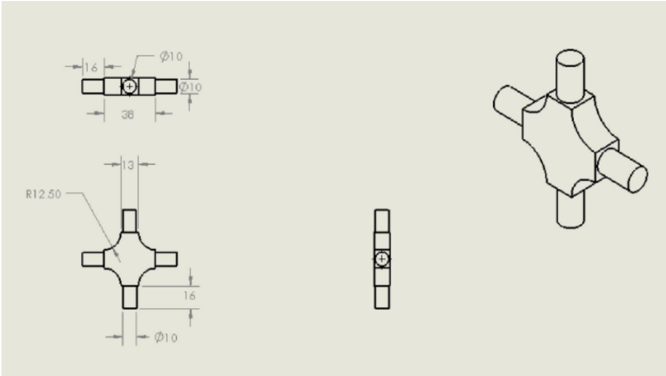

Figure 3 Assembly

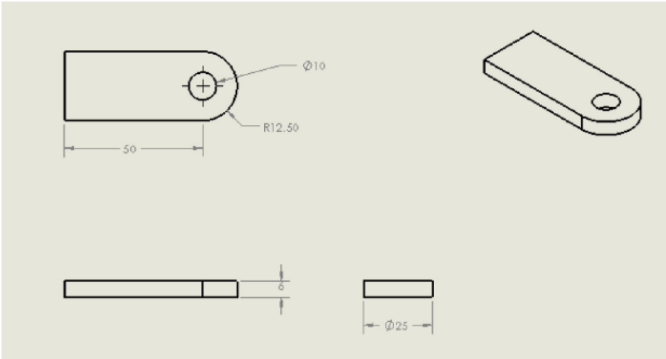

Figure 4 Components

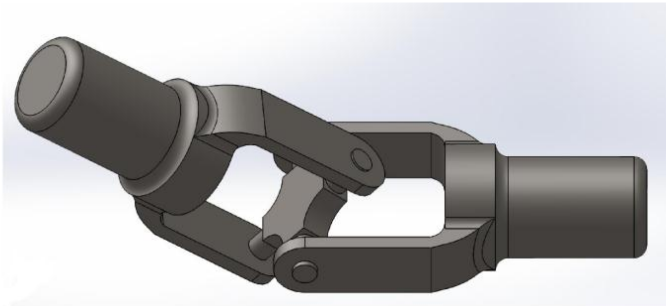

Figure 5 3D Model

5. DISCUSSION

Mechanical couplings have a vital utilize within the association of pivoting shafts for the exchange of rotational movement and torque. As with all mechanical gadgets, a coupling must coordinate its' expecting reason and application parameters, counting numerous distinctive execution, natural, utilize and benefit components.

There are different reasons for which a coupling falls flat, such as-improper establishment, over the top vibration, unusual commotion and chattering etc.

The disappointment of coupling can be minimized by legitimate upkeep, such as-checking and changing grease routinely, performing visual review, checking signs of wear and weariness and cleaning coupling frequently etc.

6. CONCLUSION

Mechanical design is a complex undertaking, requiring many skills. Design and fabrication of a Universal coupling was done in this project work. In designing problem safe torque on shaft was dogged. The cross pin size was firm since bearing stress, shearing stress and bending stress taken into account. Thus the application also studied.

REFERENCES

[1] http://www.brighthubengineering.com/machine-design/43237-shaft-couplingstypes/#imgn_1

[2] https://www.google.com.bd/search?q=types+of+misalignment&espv=2&biw=1093&bih=534&tbm=isch&imgil=NT3Hyamp4X71M%253A%253BWa1ZBFnm6w2zQM%253Bhttp%25253A%25252F%25252Fsdpsi.com%25252FD757%25252Fcouplings1.htm&source=iu&pf=m&fir=NT3Hyamp4X71M%253A%252CWa1ZBFnm6w2zQM%252C_&usg=__Ctk4urH8tWcUMRt3asG7xLg nZ1E%3D&ved=0CDoQyjc&ei=LQaFVfKnHY28uATA5YMg#imgrc=NT3Hyamp4X71M%253A%3BWa1ZBFnm6w2zQM%3Bhttp%253A%252F%252Fsdpsi.com%252FD757%252FImages%252Ffig1.gif%3Bhttp%253A%252F%252Fsdpsi.com%252FD757%252Fcouplings1.htm%3B550%3B250&usg=__Ctk4urH8tWcUMRt3asG7x LgnZ1E%3D

[3] Mills, Allan, "Robert Hooke's 'universal joint' and its application to sundials and the sundialclock", Notes & Records of the Royal Society, 2007, accessed online 2010-06-16

[4] http://ode-wiki.org/wiki/index.php?title=Manual:_Joint_Types_and_Functions

[5] http://www.techdrives.co.uk/Multimedia/Shaft%20Couplings/shaft-couplings-universaljoints-feb13.pdf

[6] Budynas–Nisbett," Shigley's Mechanical Engineering Design", Eighth Edition, McGrawHill, ISBN: 0–390–76487–6

[7] Hall, Holowenko,Laughlin,"Theory and problems of Machine Design" ,SI metric edition, Schaum's outline series.

[8] https://www.slideshare.net/AnkitSahu47/universal-joint-dme