VARIABLE POSITIONING SMART COUPLING

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Abstract:*A coupling is mechanical device that permanently joints to rotating shafts to each other. The present study focused on new and innovative idea on coupling which is named as "variable positioning smart coupling". It is design and fabricated by using 12V DC motor with 60 and 120 RPM. It consists 1.9 cm diameter of two M S shaft, which are linked by interconnecting T-Joints and I-Joints. When the torque is transmitted from driving shaft to the driven shaft, the same torque is experienced by the driven shaft, this driven shaft is connected to the joints, threads and screws supported by two bush bearings. With the help of lead screw the driven shaft can be parallel positioned or moved. Design calculation is carried out and design parameters are seen to be safe with the requirement. The most common applications for variable couplings are drilling and cutting machines.*
Keywords*: Coupling, DC Motor, T-Joints, I-Joints*

1. INTRODUCTION

1.1 Transmission shafts: The term transmission shaft usually refers to rotating machine element, circular in cross section, which supports transmission elements like gears, pulleys and sprockets and transmits power couplings can be defined as a mechanical device that permanently joints to rotating shafts to each other's. The shafts that are connected by the coupling can be disengaged only after dismantling the coupling. There are two main applications of the couplings, one is the joining of shafts of two separately built or purchased units so that a new machine can be formed. Another is used to make long line shafts by joining individual shafts. Besides these applications, couplings are also used to join shafts at angles, to compensate for misalignment between the shafts, to prevent the transmission of overload torque and to alter vibration characteristics of the drives, in some cases.

There is a basic difference between a coupling and clutch. Coupling is permanent connection. The shafts joined by the coupling can be disconnected only after the dis-assembly of the coupling. A clutch permits rapid connection or disconnection of two shafts while in motion and at the will of the operator.

Two shafts connected by the coupling may have co-linear axes, intersecting axes that are parallel at a small distance apart as is shown in following figure 1.

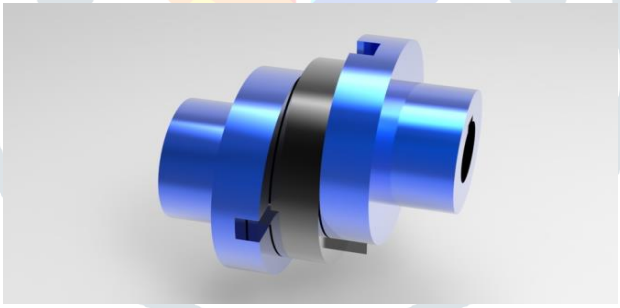


Figure 1: Coupling

Variable positioning smart coupling: Here we going to present newest and innovative idea on coupling, which is named as 'variable positioning smart coupling'. In normal coupling, we cannot change the position of the shaft. We can change the position of the one shaft on running condition at a certain distance by using T- links and I -links, distance is depending upon usage of I-links and T-links. Arrangement of T-links and I-links show in the below figure 2.

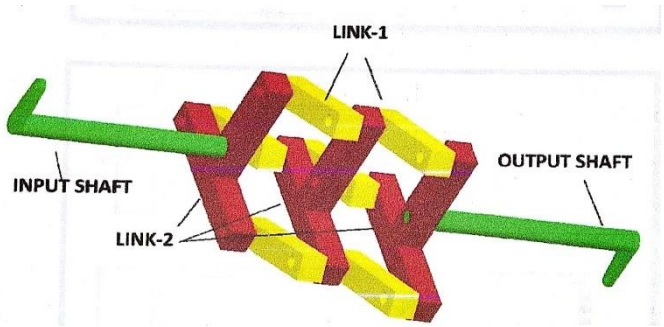


Figure 2: Arrangement of I-links and T-links

2. OBJECTIVES

1. To reduce the friction in the shaft by T-link

In conventional Old-ham's coupling, at higher torque transmission the intermediate piece and other parts get wear out. The maintenance or repairing of this involves more cost. Hence, our main objective is to reduce this maintenance cost by finding alternative for it.

2. To reduce the friction

There is more rubbing surface area in case of conventional Old-ham's coupling. Due to this it has maximum friction which is unavoidable. Thus, it causes the wear and tear. Hence our subsequent objective is to reduce the friction during torque transmission.

3. To reduce the stress concentration.

For the accuracy of fits, there are sharp corners provided on the intermediate piece and flanges of the conventional Old-ham's coupling. It gives rise to more stress concentration in the vicinity of sharp corners so it will reduce the strength of coupling, Hence our next objective is to work out on the parameters of reduction of stress concentration.

3. METHODOLOGY

1. Firstly assemble the part that is bearing, shaft, linkage attachment, guide rail.
2. Keep the input shaft and output shaft co-axial
3. After that rotate the input shaft so that output shaft is also start to rotate that means at the co-axially or at zero eccentricity it is rotate.
4. After that by using handle of guide rail change the eccentricity in positive direction then output shaft is also rotate. In that way if we change the eccentricity up to the certain limit output shaft is continuously rotating.
5. If we change the direction that means if we change the eccentricity at that time also it works.
6. That means if we change the eccentricity up to the certain limit in positive or negative direction that coupling is work.

Figure 3: Methodology

4. FABRICATION OF THE MODEL

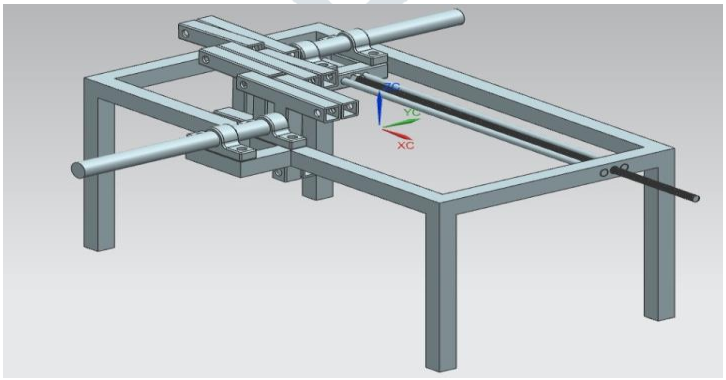


Figure 4: 3- D model designed by using UG NX10

Figure shows 4:3-D model designed by using UG NX10 software as per the following dimensions

Table 1: Model dimensions

SL.No	Parameters	dimensions
01	Length	600mm
02	Height	275mm
03	Thickness	25mm

5. DESIGN CALCULATION

Table 2: Parts description

Sl .NO	MATERIAL	QUANTITY
1	12V DC Motor	1
2	Shafts	2
3	T Links	3
4	I links	6
5	Screw rod	1
6	Bearing	4
7	Nut & bolts	9
8	Battery	1

6. MODELING

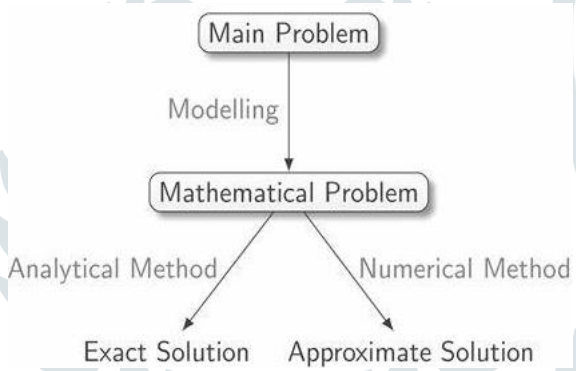


Figure 5: Numerical Methodology

Modeling of the machine components and assembly has been done by using Solid Work Software.

FRAME:

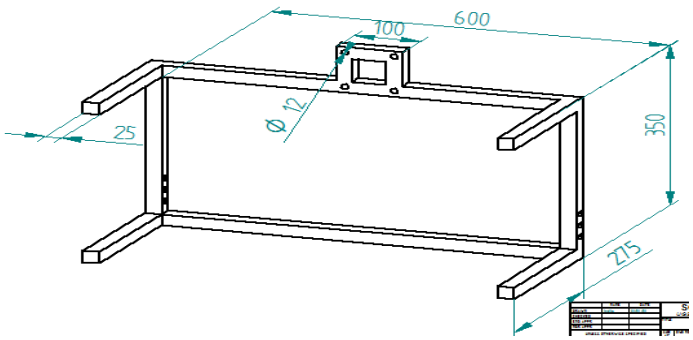


Figure 6: Frame

Frame plays a very important role in any machine, because it holds all the working part. All the parts are perfectly mounted on the frame. Generally, M.S. pipe having rectangular cross-section is used for the frame. In this machine we will going to use light weighted and rigid frame. The base area required for this frame is 650*350 MM

T-LINK:

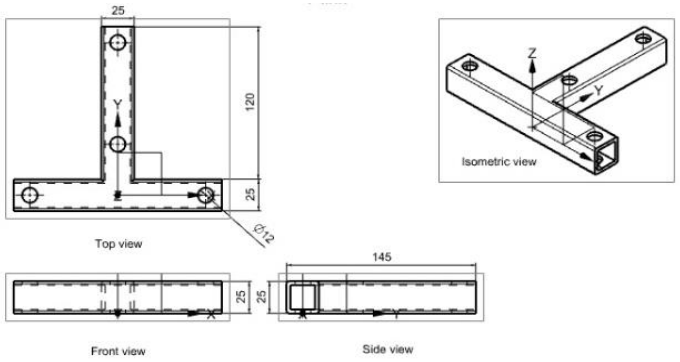


Figure 7: T-Link design

In this project T-links are used to transmit the rotary motion from one shaft to another shaft by using I- LINKS, by the help of these links we can extend the distance of out put shaft.

I-LINK:

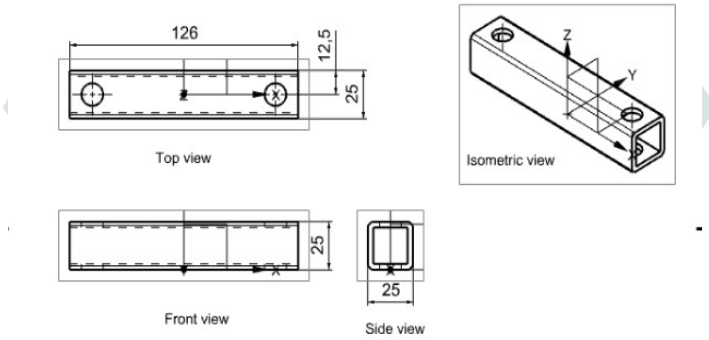


Figure 8: I-Link design

A mechanical I-linkage is an assembly of bodies connected to manage forces and movement. The movement of a body, or link, is studied using geometry so the link is considered to be rigid. The connections between links are modeled as providing ideal movement, pure rotation or sliding for example, and are called joints.

SHAFT:

Figure 9: Shaft

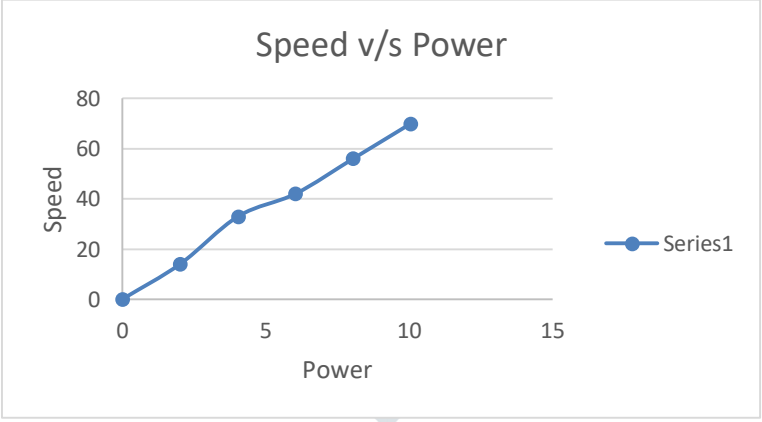
A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power.

Tensile strength- 700N/mm2
Yield strength- 350 N/mm2
N-30rpm
Firstly, find out the torque apply on shaft
Consider the manual force applied on handle is 5kg
We know that
F=mxg
=5 x9.81
=49.05 N
The length of shaft is 205
T=Fxr
= 49.05 x 205

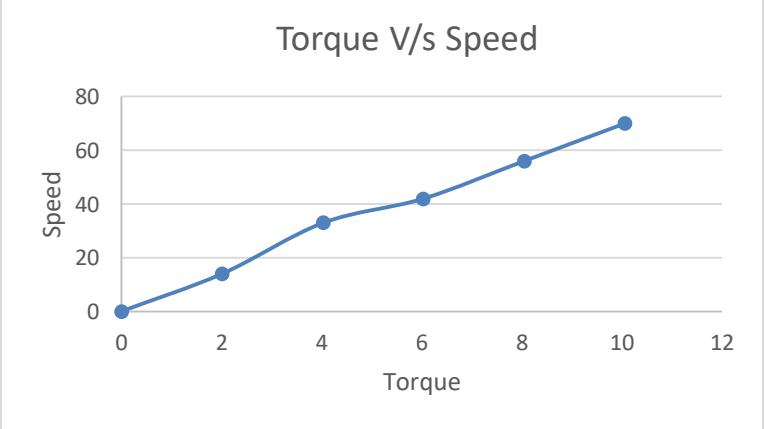
=10055.25 Nmm
= 10.055 Nm
Torque of shaft-1
P=2 πNT/60
= (2x3.14x30x10.055)/60
P=31.5727 w
Shear stress -ultimate strength actor of safety FOS-4.
T = 700 /4
=175N/mm2
T=(π/16) x d3t
D = 6.63mm= 7mm
So we select diameter is20 mm
20mm >7mm
Therefore, design is safe.

7. RESULT AND DISCUSSION

Figure 10: working model



Graph 1: Power V/s Speed



Graph 2: Torque V/s Speed

8. WORKING

Here we are going to present newest and innovative idea on coupling which is named as variable positioning smart coupling". It is constructed by using 12v DC motor with 30 and 60 RPM.

It consists of two 2 cm dia of M. S shaft, which are linked by interconnecting T-joints and I-joints When the torque is transmitted from driving shaft to the driven shaft., The same torque is experienced by the driven shaft. the driven shaft is connected to the joints and threadedscrew and is supported by two bush bearings. By manual handling or rotation of threaded screw or lead screw, the driven shaft can be parallel positioned or moved. Two supporting rods are used to Support the driven shaft.

It has wide applications such as drilling, taping, boring, reaming etc. in these machineries the powercan be transmitted from the driving shaft to the tool holding shaft are coupled by simple couplingor by Oldham's coupling. In these two types of coupling, torque can be transmitted linearly or byfixed positions. But in our model or project we can transmit torque linearly as well as variablepositions parallel.

9. CONCLOUSION

It is concluding that this project is to successfully replace Oldham's coupling by obtaining variable position in machining operations by smart coupling technique.

As the drive shaft is connected with the motor so the driven shaft is capable of obtaining variable position for machining operations for machining operation as per the requirement, the variable position can be obtained by operating hand lever mechanism.

10. FUTURE WORK

In future it can be developed with controller programming to get the intermediate variable positions, which can be also controlled automatically by computer programming. By further research on it frictional and power loses can be reduced by which maximum efficiency can be achieved. It will definitely contribute in a great time saving technique in various machining operation.

11. REFERANCE

[1] Shiwalkar B.D. "Design of Machine Elements", 2nd Edition, Techno Publicaitons.

[2] Shiwalkar B.D "Design Data Book for Machine Elements" 1st Edition, Techno Publicaitons.

[3] Khurmi R.S. "A Text Book of Machine Design".

[4] Hariharan V. And Srinivasan P.S.S. "Vibrational Analysis of Flexible Coupling by Considering Unbalance" World Applied Sciences Journal 8 (8): 1022-1031, 2010I SSN 1818-4952.

[5] Hariharan V. and Srinivasan PSS. "Vibration analysis of misaligned shaft –ball bearing system". Vol.2 no. 9 (Sep 2009) ISSN: 0974- 6846

[6] Jackson, C., 1973, "Cold and Hot Alignment Techniques of Turbomachinery," Proc. 2nd Turbomachinery Symposium, Turbomachinery Laboratory, Texas A&M University, College Station, Texas, pp. 1-7.

[7] Mancuso, J., 1994, "General Purpose Vs Special Purpose Couplings," Proc. 23rdTurbomachinery Symposium, Turbomachinery Laboratory, Texas A&M University, College Station, Texas, pp. 167177.

[8] Mitchell John, "Introduction to machineryanalysis and monitoring" 2nd Edition, Penn well Books Publication, Tulsa, Oklahoma, 1993.

[9] Piotrowski, J., "Shaft Alignment Hand-book, Marcel Dekker Inc, 199

[10] Rao S.S, "Mechanical Vibrations" 4th edition, Pearson Education, Inc. and Dorling Kindersley Publication, page no. 31-37.

[11] Schenck H. Jr., "Theories of Engineering experimentation" 1st Edition, McGraw Hill, Inc. 1967.

[12] Sekhar, A.S., and Prabhu, B.S., "Effect of Coupling Misalignment on Vibrations of Rotating Machinery," Journal of Sound and Vibration, Vol. 185(4), 1995, pp.655-671.

[13] Sinhaa.J.K. Leesb.A.W. , Friswellc.M.I. , "Estimating unbalance and misalignment of a flexible rotating machine from a single run-down". Journal of Sound and Vibration 272 (2004) 967–989.

[14] Wowk Victor, "Machinary Vibration (Measurement and Analysis)", 1st Edition, McGraw Hill, Inc Singapore, 1991.