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Design of Experimental Setup for Disc Coupling Test

Mr. A.V. Javir[1],Student-Mr.Satyajit.S Sakapale[2],Student- Mr.Sourabh.S Kulye[3], Student-Mr. Shankar.STandel[4],Student-Mr.Rakesh.M Desai
Department of MechanicalEngineering,Rajendra Mane college Of Engineering And Technology,Ambav, Devrukh Pin-Code:415804[1,2,3,4]*,Affiliation name-Mumbai Univercity*[1,2,3,4]
Email: arun.javir@gmail.com[1] *,sssakapale@gmail.com*[2]

Abstract-In the transmission of power, the coupling plays an important role,but the coupling consist of two flanges and in between two flanges the shims are placed .If the coupling not having the shims ,the coupling can breaks earlier so to avoiding this, the shims are used, but conventionally the material used for shim is rubber which is not durable, so to test the different metal shims the setup is made . The setup is made noise free with minimum vibration. In the setup, concentricity, linearity of shafts is checked by using dial gauge indicator. The application of this set up is to check power transmission, typesof coupling and various shims.

1. INTRODUCTION

1.Disc coupling

Originally designed in the early 1900s, disc couplings have been adapted for demands of modern high performance equipment and are frequently used for non -lubricated coupling applications. Flexibility is obtained from the deflection of the pack and varies with the length between adjacent bolts; increasing the number of bolts raises the torque capacity and decreases the flexibility of the coupling. Most disc couplings use many thin discs to make one pack instead of one thick disc for increased flexibility and minimal reaction forces; the practical thickness of the individual disc ranges from 0.008 in to 0.025 in. High performance couplings have discs made of corrosion resistant steels, 300 series stainless, PH stainless, or high strength nickel alloys. Many disc options are available including circular, hex, scalloped, and segmented discs for different stress and flexibility patterns; the most popular for high speed service are the hex and scalloped designs, since they possess the best service characteristics.[1]

2. Misalignment:

There are three types of misalignment a coupling is subject to by an equipment train, and which the coupling must accommodate; angular, offset, and axial. The combination of all three of these at the same time is called overwhelming.The centre lines of the two equipment shafts the coupling connects are not parallel and they intersect at an angle angular misalignment is produced. Offset misalignment, commonly called parallel offset, when the two shaft centre lines are parallel and they do not intersect, they are "offset" by some distance. By changes in the axial position of the shafts the axial misalignment occurs, which moves the shafts closer together . It is important to recognize that while the equipment places the coupling under combinations of these three types of misalignment, the coupling itself sees only angular and axial misalignment. This way each element can deflect angularly and connect the two shafts that are offset misaligned.[1]

2. PROBLEM DEFINATION

In the transmission of power conventional type of coupling are doesn't give the proper alignment and torque . Generally the material used in coupling like rubbers not so durable therefore by taking tests on different materials like steel, aluminium ,brass in which the better performance discs will be suggested.

3. MATERIAL AND METHOD:

3.1 Design and CAD model

The design of shaft, i.e its diameter is calculated by using the permissible tensile stress and that values are given in the deign data book by taking that calculated shaft diameter. According to shaft diameter the coupling is used. So the setup design is ready for testing. The CAD model is prepare according to the setup(fig.2)

3.2Material selection

The motor is to drive the shaft and it is selected as 1 hp DC motor,

The motor and shaft is connected through the belt drives

The shaft is of mild steel materialand shaft having keyway to coupling.

The coupling is selected according to shaft and the discs are selected of brass, mild steel,

3.3Fabrication and assembly of setup

The setup consist of motor , belts, shafts, bearings , coupling , shims. Now proceeding ahead first of all the base of the setup is made .Then the motor is placed on one side of the base .on the vertical support through

the pedestal bearing the shaft is mounted on that and two shafts are coupled with coupling . The shaft is driven by the motor using the belt drives connected one end of driving and driven shafts. By using dial gauge indicator, surface plate is used for placing dial gauge and we check the linearity of shafts(Fig.3) and also check on the coupling(Fig.4) .The plunger of gauge is place perpendicular on the shaft and continuous rotating the shaft and take reading and dial gauge set to the zero and check the difference between the reading .So by placing the shims between two flanges of coupling by using this setup we can test the

different shims .For less noise and vibration the shaft should be linear, and it also reduces whirling of shafts.

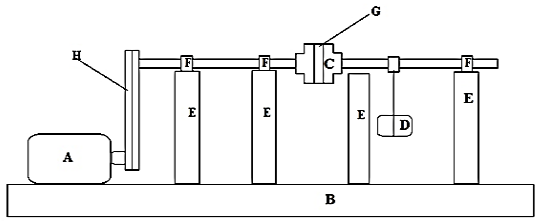

Fig.1. Experimental setup
A;DC motor, B-Base, C-Coupling ,D-Pan For Load E- Supports ,F- 4-Pedestal Bearings., G-Setof discs , H-Belt

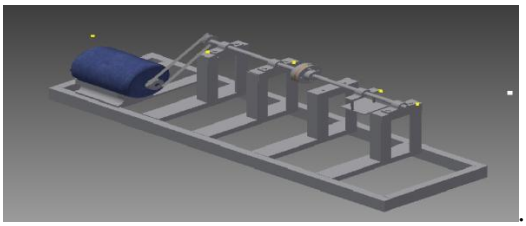

Fig.2.CAD model

Fig.3.Checking Linearity of Shaft

Fig.4.Checking linearity of coupling

3.4 Inspection

3.4.1.Concentricity using dial gauge(Fig.3 & Fig.4)
By using dial gauge we checked the concentricity of coupling and linearity of shaft,The shaft is linear and dosen't give any vibration.
3.4.2. Leveling using water tube level
By using this we also checked the linearity of the base of experimental setup.
3.4.3.Noise and vibration
By giving the proper linearity to the setup ,the setup is free from noise and vibration.

3.5 Experimental testing of coupling and metal discs

For testing the setup ,the metal disc are used of mild steel and brass material, firstthe mild steel material is used for testing, it results the vibration and noise ,after that the second material brass is used and it results less vibration than the mild steel.

Table 1. Dimensions

SR .No	Description	Unit
1	Shaft diameter	20mm
2	Length of Shaft	914.4mm
3	Hub Diameter	52
4	Length of hub	20
5	Outside diameter of coupling and shims	102.2
6	Thickness of shims	0.5 TO 1 mm

Table 2. Properties

Properties	Brass	SS301	Mild Steel
Young's modulus(MPa)	102000	193257	200000
Poisson's Ratio	0.31	0.3	0.3
Density,lbs/in^3,(g/cm^3)	8.3-8.7 g/cm^3	0.285(7.88)	7.860

4. RESULT AND DISCUSSION

For shim coupling test & shim experimentation it is important to check the linearity of driving and driven shaft .In this research ,we have taken the linearity test using dial gauge indicators. These dial gauge have given negligible deflection i.e less than 0.01 mm Angular, axial and offset misalignment can be lead to damaging the coupling and bending of shaft.

5.CONCLUSION

By checking the linearity of shafts , the setup is running noise free with less vibration,so we conclude that the setup is ready for the experimentation.

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