

Failure Analysis of Flange Coupling with Two Different Materials

Kondru Nagendra Babu
M.Tech(Machine Design) scholar
Narasaraopet Engineering College
Guntur,India

Dr D Suneel
Professor and HOD of Mechanical Dept.
Narasaraopet Engineering College
Guntur,India

Abstract: A coupling is a device which is responsible for the effective power transmission between two shafts rotating at a certain rpm. Couplings are connected at the ends of the shafts and these may slip or get disconnected depending upon the torque limits. In fact, these are critical parts of any transmission system, providing the smooth transmission of power and they can last long if maintained properly. This paper deals with the possible causes of failure for a flange coupling which occur mostly at the areas of contact, analysis of such failures and suggestions to minimize the failures occurred thereof. In this regard, a model of the flange coupling would be prepared and with the help of an analysis workbench, proper material would be assigned to that particular flange coupling and points of failure would be noted accordingly. Secondly, a different material in fact, a better one which would withstand more amount of stress would be assigned and failure results would be noted again. Finally, from the results obtained comparison would be made between the two results and suggestions would also be prescribed

I. KEYWORDS: MODELING, ANALYSIS, SUGGESTIONS, FAILURE;

II. INTRODUCTION

Shaft couplings play a key role in any power transmission system. Couplings can be used for several purposes which include connection of two shafts or they can be used as the alternative whenever the connection between two shafts is subjected to any sort of repair. Along with it, couplings also find application in providing the alignment for misaligned shafts and to impart the mechanical flexibility. One of the major uses of couplings is it provides resistance to the material when it is subjected to over loads. To perform all these actions effectively, a coupling must have high torsional rigidity. It must be noted that the coupling which we design must not have any sharp edges or corners.

III. PARAMETERS INVOLVED IN CHOOSING THE RIGHT COUPLING

The common and primary requisite for all the coupling applications is that a good quality shaft coupling must be chosen. Coupling two shafts together might sound very simple but in real, it is very much different and difficult. Most of the shafts in the market are subjected to a greater or lesser amount of misalignment but they are being used for accurate transmission of power. Maintaining the Integrity of the Specifications

The type of coupling that is best suited for an application depends upon shaft diameter, power transmitted, misalignment present in the shaft and also taking the operating conditions

into consideration. Therefore, unless the designer is aware of the working conditions of the coupling, it becomes highly difficult for him to produce a proper design. The following specifications govern the selection of a coupling:

A. Horsepower

Most of the couplings are selected based upon the horsepower they transmit. Hence, it is very important to design the dimensions of the coupling accordingly.

B. Type of drive

If the power source, we will have a higher service factor. If the engine is less than four cylinders you may have to consult the factory for design assistance. The problem here is torsional vibration in a continuous steady form, that can be transmitted directly into the driven machine. The elastomeric design coupling can help to dampen this vibration.

C. Type of driven equipment

Driven machines are many in number depending upon the load characteristics and service factor is also selected relatively. Multiplication of service factor by the input horsepower gives you the design horsepower upon which most couplings are designed.

D. Operating conditions

Selection of couplings are made largely depending upon the operating speed (RPM). As speed increases, torque also increases respectively. It is always essential to ensure that operating speed doesn't exceed maximum speed of the coupling selected. Along with the speed, temperature at which the coupling operates also plays a key role. If the temperature is high, it can change the operating characteristics of the some couplings (elastomeric). In some cases, it also affects the lubrication.

E. Space limitations & shaft sizes

We need to ensure that the coupling's length & diameter will fit within the necessary confines. Also, bore size is one of the limiting factors in selecting the coupling since often, larger coupling than what design indicates are selected to match with the bore size.

A. PROPERTIES OF TWO DIFFERENT MATERIALS

Material – 1

Material – 2

Young's Modulus	2.5e + 015 Pa	Young's Modulus	1.9e + 015 Pa
Density	7950 kg/m ³	Density	7700 kg/m ³

Table – 1

B. RESULTS COMPARISON

Displacement (Max)	1.154e-005 mm	Displacement (Max)	2.514e-005 mm
Displacement (Min)	0.0000 mm	Displacement (Min)	0.0000 mm
Von Mises Stress (Max)	0.0135 N/mm ²	Von Mises Stress (Max)	0.0774 N/mm ²
Von Mises Stress (Min)	0.0000 N/mm ²	Von Mises Stress (Min)	0.0000 N/mm ²

Table – 2

C.RESULTS ANALYSIS

From the results (Table-1), it has been observed that there is significant improvement in the stress and displacements values. The maximum stress that the flange can withstand has been increased enormously to 0.0774N/ mm² from a previous value of 0.0135 N/ mm² and same effect is observed in the case of displacement also. Hence, it is advisable to replace the first material with second material for better life of flange.

KNOWLEDGMENT

I indeed grateful to Dr.D Suneel ,Professor & HOD of MechanicalEngineering,NarasaraoPetEngineeringCollege,Nara sarao Pet,for his guidance and willingness to share his valuable knowledge and constantly inspire us through Suggestions

I express our sincere thanks to Mr.A Chandra mouli ,associate Professor in Mechanical Departmentfor his excellent guidance .

I sincerely thank Mr V V Kondaiah And Mr.P Suresh babu for giving me heartfelt support in all stages of project work.

I sincerely thank My friends P Sai Kishore and M siva sankar for their support.

REFERENCES

- [1] Prof. R.S. Powar, Prof. N.S.Deshmukh, Dr. S.D. Suryawanshi, "Flexible Coupling a New Approach" IOSR Journal of Mechanical and Civil Engineering
- [2] "ractical Solutions of Torsional Vibration" W. Ker Wilson Volume Three – Strength Calculations – Third Edition
- [3] "Failure Analysis of Propulsion Shafting Coupling bolts"by Yuzhong Song, Hiromo Shiihara, Daisuke Shiraki, and Yuya Nagayama
- [4] Mr. S.B.Jaiswal, Prof. M.D.Pasarkar, "Failure Analysis of Flange Coupling in Industry
- [5] "analysis of common cause failures coupling factors and mechanisms from ageing point of view" by Jaroslav Holy, Mirela Nitoi, Irina Dinu, Luciano Burgazzi

Fig. (c)

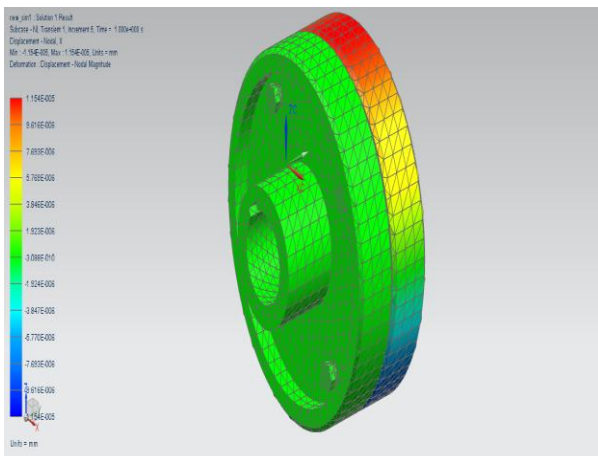


Fig. (d)

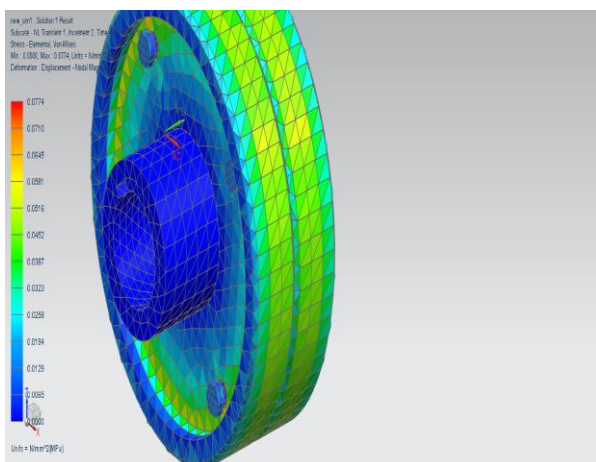


Fig. (e)

