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"COMPARISION OF STAINLESS STEEL, EPOXY GLASS BALL BEARING AND CAST NYLON BUSH FOR OPTIMIZATION OF NATURAL FREQUENCY WITH THE HELP OF FEM"

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Abstract

According to GTU for industry define problem (IDP) , We visited " Meera Industry pvt. Ltd." situated at SACHIN GIDC, SURAT .This is about two for one yarn twister machine (TFO machine).In two for one twister yarn (thread twisting) machine ,There is major problem of vibration in machine due ti high speed of gears with cams ans also problem is wearing quickly of bushing material contacted with rotating cams in Gear box because of high speed of cam and high friction of bush and we have to replace in a time .

By this problem we have suggested a solution to change a better material instead of current bushing material element. For it we will design in PRO E and analysis in ANSYS of diffrent materials. Through comparision of numerical analysis data of different materials we will choose better material elements instead of current bushing material.

This will help in the problem of wear out of the bush in machine with suitable root cause we will solve this problem in two for one yarn twister machine in which bushing material has developed because of its combination of low coefficient of friction with self-lubricating properties, good mechanical properties and dimensional stability .

Keywords*-component; formatting; style; styling; insert (key words) (minimum 5 keyword require) [10pt, Times new roman,Italic, line spacing 1.0]*

1. INTRODUCTION

1.1 OVERVIEW OF TFO MACHINE:

TFO –two for one yarn twister machine is used for twisting of two yarn thread to one yarn. It is worldwide use in textile marketing in a days. There are following over view of TFO machine and yarn twisting process.

Fig. 1.1 TFO Machine

There is main componenet is gear box which have to concentrate in this project.

The gear box of TFO machine consists following components:

- Cams ,
- Horizontal spindle ,
- gears drives ,
- bushing element

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The ball bearing is useful for high speed rotary machinery, because the power loss is lower than that of other types of bearings and it seems to have high damping properties due to the oil films of the sleeve. Good stability characteristics with simple construction make possible to use ball bushing bearing for Two for one machine use in textile industry for twisting the thread of raw yarn .

The machine consists of 5Hp, 3φ AC induction motor, which rotates 200 sets of spindles through flat belt at speed of 14000to 20000 rpm. The current machine spindle use bushing element, which replaced by ball bush bearing. Current research aims to improve the design of two for one machine spindle through ball bush bearing and study stability and frictional performance of dynamically loaded bearing for the spindle of two for one machine instead of nylon bush in placed at gear box.

2.0 NUMERICAL ANALYSIS OF BUSH & BEARING

In this thesis, various modal analyses have been done for the previously prepared model which was prepared in Pro-E 5.0 and then imported to ANSYS WORKBENCH 14.5

2.1 MODAL ANALYSIS

Numerical tests are used to validate the experimental results. Cast nylon bush , stainless steel bearing and epoxy-glass bearing are designed by the Pro-E 5.0 and then analyzed by the ANSYS 14.5.material property for the both plate are taken as shown in table below.

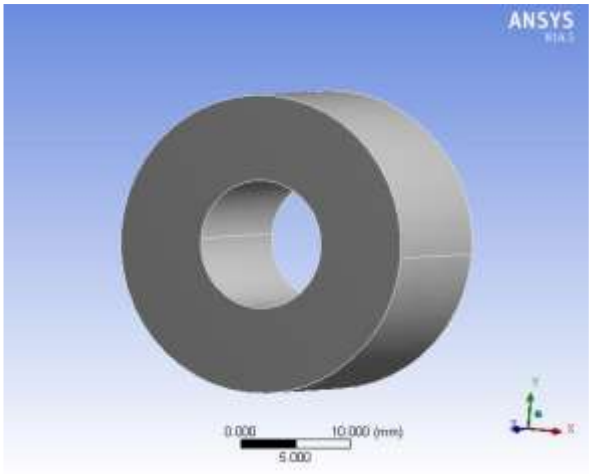


Fig 2.1 : Model of bush/bearing for numerical analysis

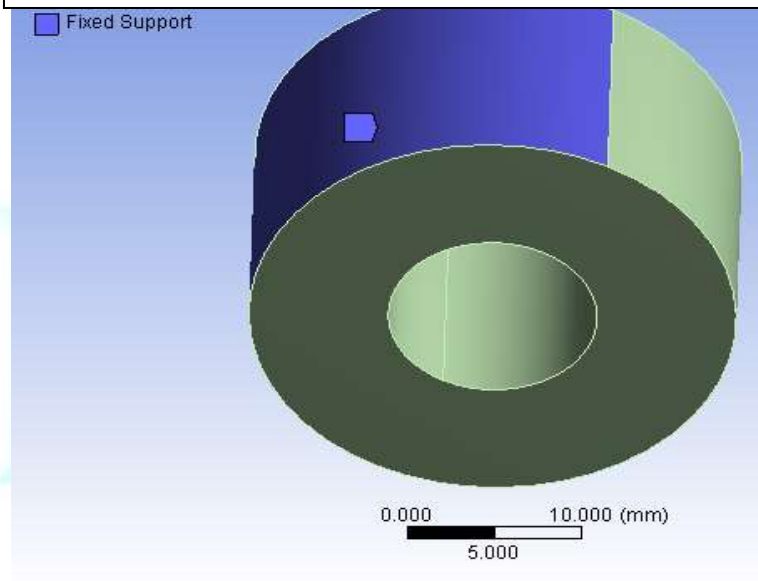


Fig 2.2 : Fixed Support

	Cast nylon bush	***Ep***
Density	*1.15e-006 kg mm^-3*	*1.9 3*
Coefficient of Thermal Expansion	*9.555e-005 C^-1*	*3.e*
Young's Modulus (MPa)	*32800*	*49*
Poisson's Ratio	*0.39*	*0.2*
Bulk Modulus (MPa)	*49697*	*32*
Shear Modulus (MPa)	*11799*	*19*

Table 1.1 : Material property of Cast Nylon , Epoxy-Glass & stainless steel

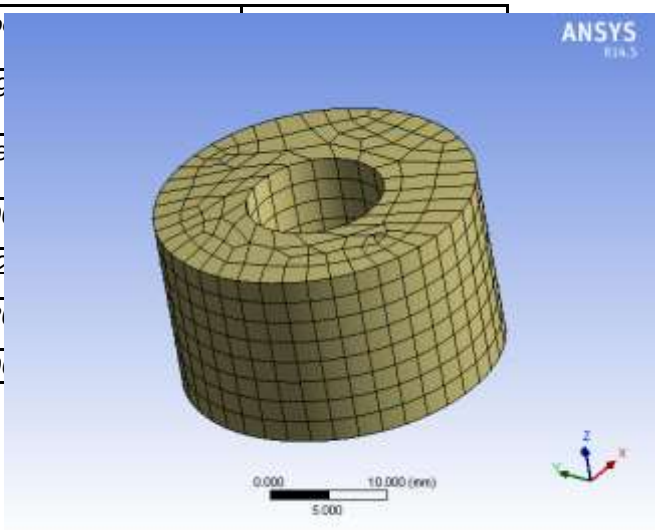
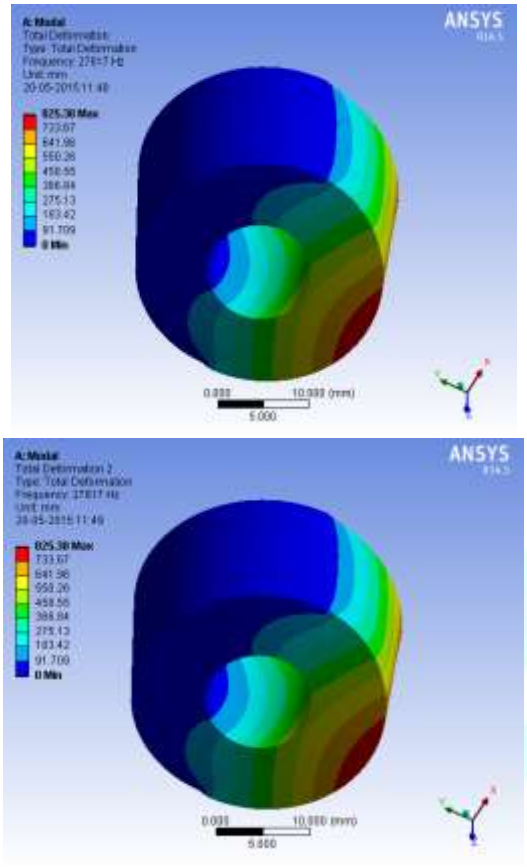


Fig 2.3 : Meshing of Bearing



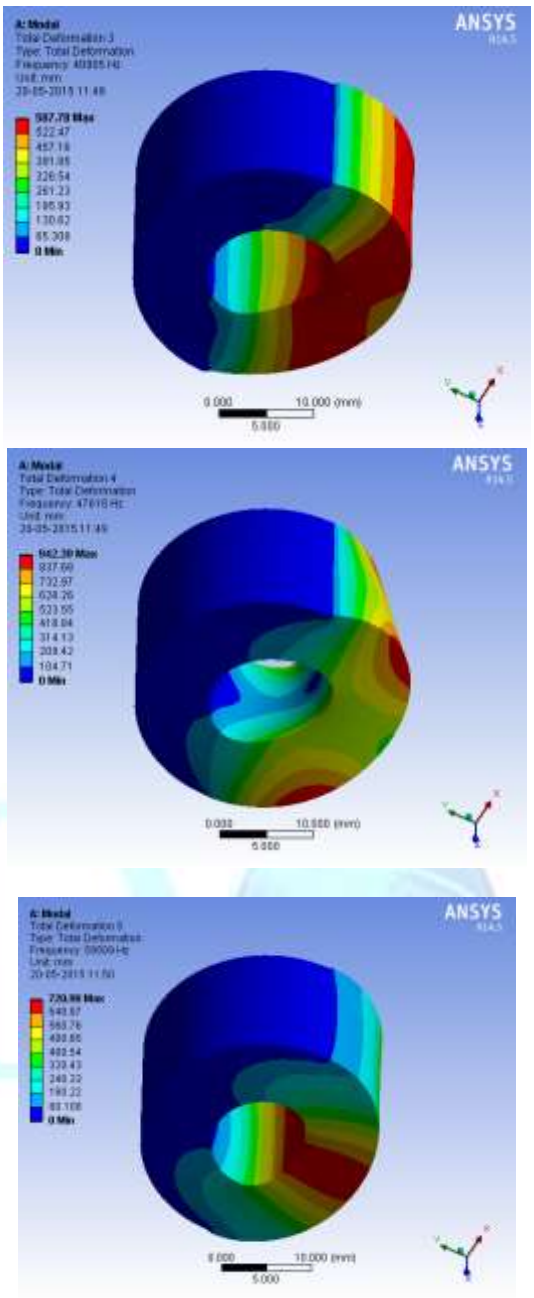
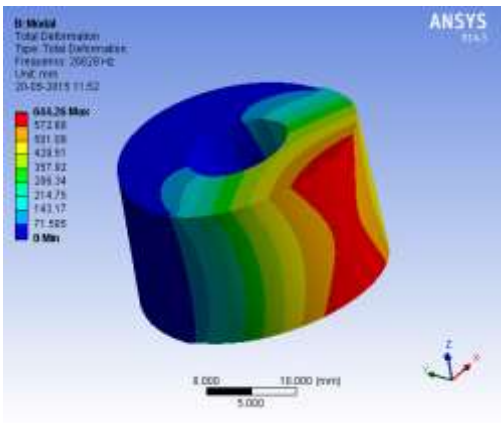
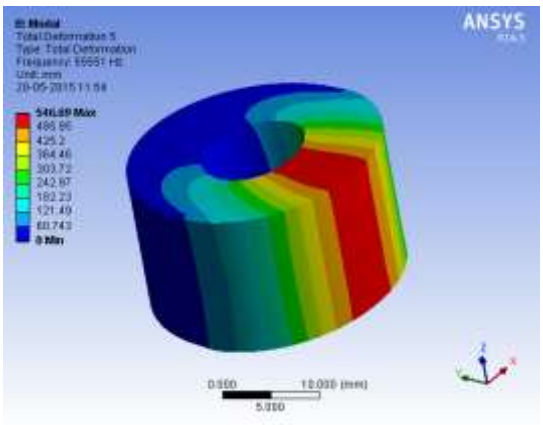


Fig 2.4 : Modal frequency at mode number 1,2,3,4,5, for Cast Nylon bush





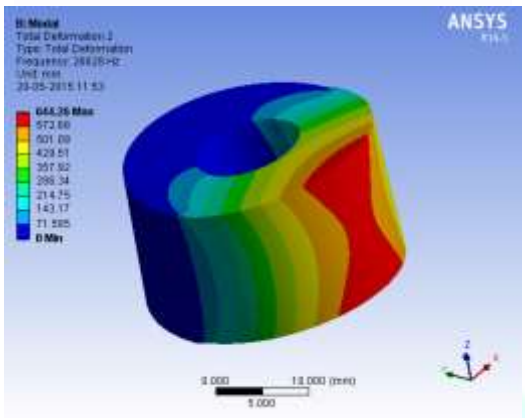
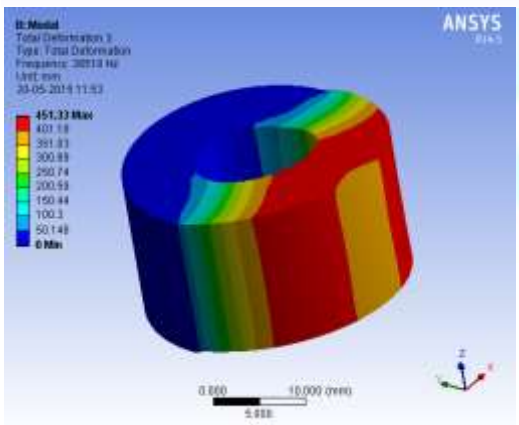
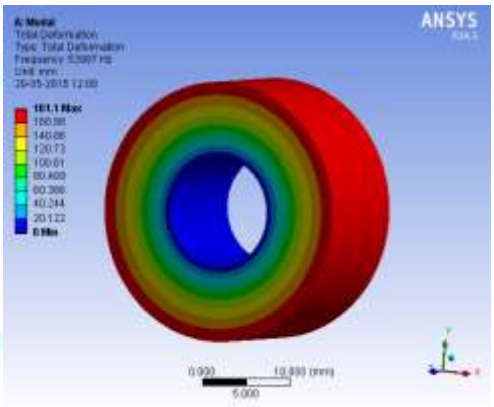
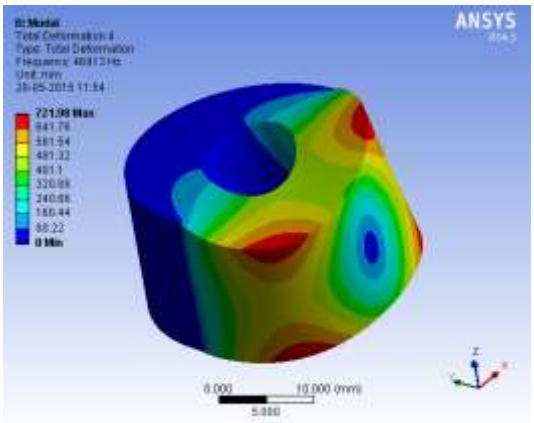
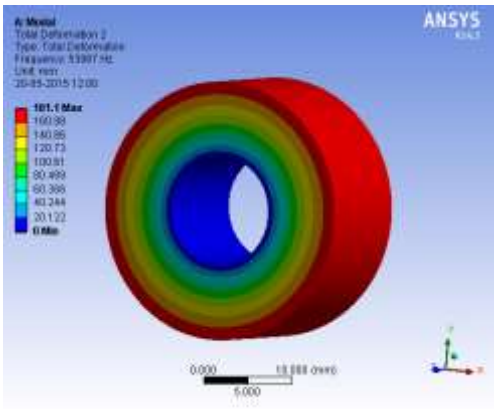


Fig 2.5 : Modal frequency at mode number 1,2,3,4,5, for Epoxy glass bearing









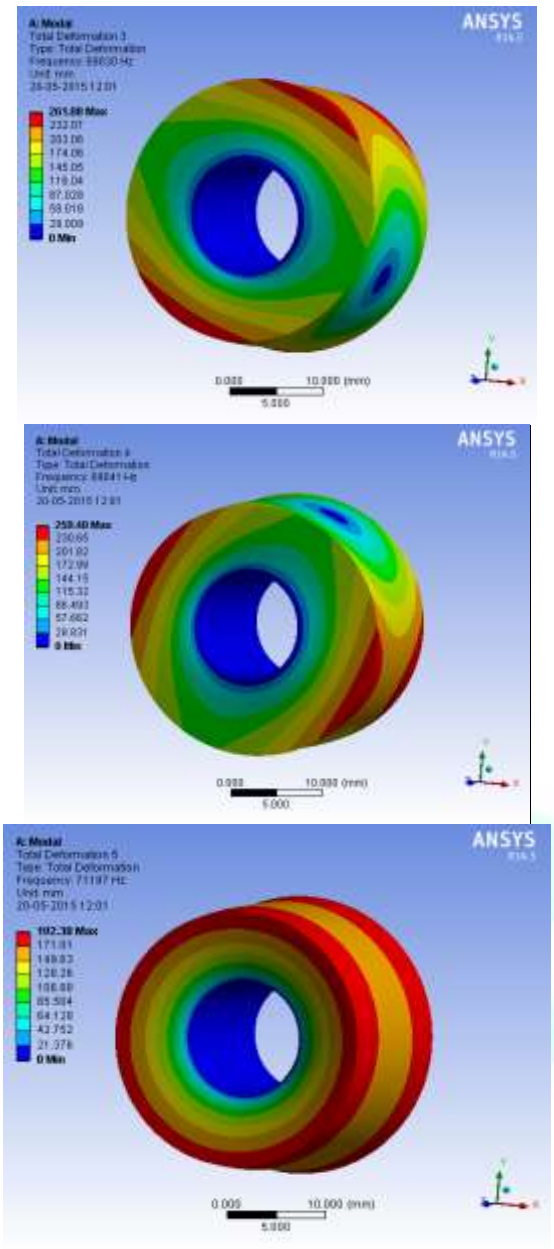


Fig 2.6 : Modal frequency at mode number 1,2,3,4,5, for stainless steel

MODE	*CAST NYLON*	*EPOXY GLASS*	*STAINLESS STEEL*
1	*27817*	*26628*	*53987*
2	*40905*	*38518*	*69030*
3	*47618*	*46913*	*69041*
4	*59509*	*55551*	*71197*
5	*70652*	*68144*	*79869*

Table 2.1: Comparison of model frequencies.

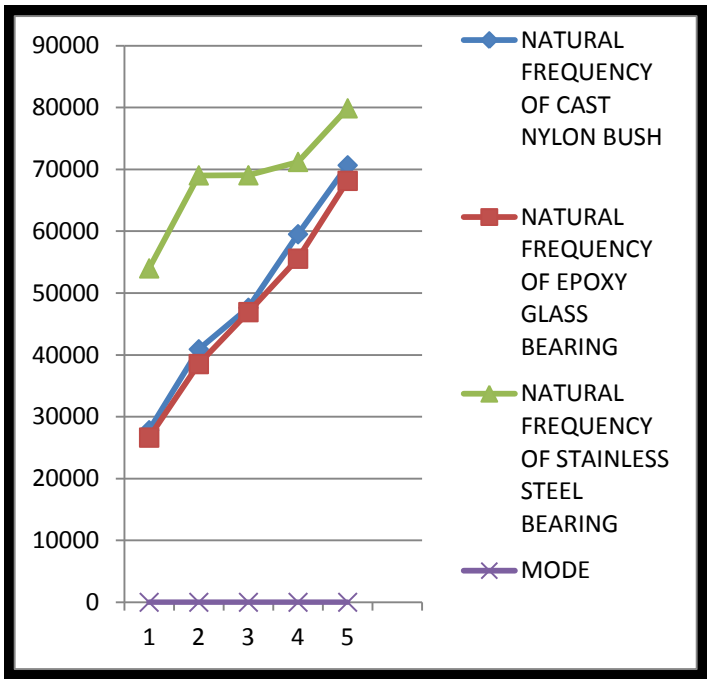


Fig 2.7 : Comparison of modal frequency

From the Experimental and numerical analysis it will confirm that the natural frequencies of the Stainless Steel bearing are better than the Cast Nylon bush and Epoxy Glass bearing.

CONCLUSION :

The comparison of Numerical modal tests for natural frequencies of EPOXY-GLASS Ball Bearing, CAST NYLON bush and STAINLESS STEEL Ball Bearing. It is shown that Natural Frequency of Stainless Steel Ball Bearing is greater than other two.

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