International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 07 | July -2017 www.irjet.net p-ISSN: 2395-0072

OPTIMIZED DESIGN AND ANALYSIS OF PEDESTAL BEARING HOUSE

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Abstract - The main aim of the project is to Modeling, Analysis and Manufacture of Pedestal Bearing House. A journal bearing is a machine element which supports another moving machine element known as journal. the basic use of a bearing is to support a frictionless environment and guide a rotating shaft. A good bearing material should be heat resistant, corrosion resistant. It should have good conformability, embed-ability. It should have high compressive strength to withstand high pressure. It should have proper endurance strength to avoid failure due to pitting. In order to reduce the frictional resistance and wear, and to carry away the heat generated, a layer of fluid which is known as lubricant has to provide to the bearing. The lubricant can be a gas, fluid, grease or solid of mineral oil, vegetable oil etc. Industrial machinery with a large horse power having high loads and speeds such as steam turbines, centrifugal pumps, compressors and motors, utilize journal bearing as rotor support. bearings may fall short in the improper load conditions, insufficient lubrication, contamination of lubricant, improper selection of bearing material; dust conditions, improper alignment. We have used CATIA software for modeling, ANSYS software for analysis and CNC Vertical Machining Centre for manufacturing the component CATIA (Computer Aided Three-Dimensional Interactive Application) modeling software is used to generate the 3-D solid model of master connecting rod. It is a multi-platform computer-aided design (CAD)/computer-aided
manufacturing (CAM)/computer-aided
engineering (CAE) software suite developed by the French company Dassault Systems. ANSYS software is used to analyze the design of Pedestal Bearing House. It is a analyzing software which offers engineering simulation solution sets in engineering simulation that all design process requires. The tools put a virtual product through a rigorous testing procedure before it becomes a physical object. It is used to analysis the stress strain deformation of Pedestal Bearing House by varying loads with same geometry. The machining pedestal housing is carried out in CNC Vertical Machining Centre. It works on automated movement with the help of programmable codes. The part program for the model of master connecting rod is developed based upon the drawing. Machining of components with complicated shapes including contours is difficult on conventional machines. CNC efficiently overcomes these problems. It has the advantages of repetitive accuracy and high productive rate over conventional machines with in less time.

Key Words: Pedestal Bearing House, CATIA software

1. INTRODUCTION

A Pedestal bearing is a machine element which supports another moving machine element known as journal. One of the basic purposes of a bearing is to provide a frictionless environment to support and guide a rotating shaft. A good bearing material should be heat resistant, corrosion resistant. It should have good conformability, embed ability. It should have high compressive strength to withstand high pressure. It should have proper endurance strength to avoid failure due to pitting and cracks. A Properly installed and maintained, pedestal bearing should have more life. It permits a relative motion between the contact surfaces of the members, while carrying the load with little loss of power due to friction. In order to reduce the frictional resistance and wear, and to carry away the heat generated, a layer of fluid which is known as lubricant has to provide to the bearing. The lubricant can be a gas, fluid, grease or solid of mineral oil, vegetable oil etc. Industrial machinery with a large horse power having high loads and speeds such as steam turbines, centrifugal pumps, compressors and motors, utilize journal bearing as rotor support. A bearing may fail in the improper load conditions, insufficient lubrication, contamination of lubricant, improper selection of bearing material,
dust conditions, improper alignment etc.

1.1 Classification of turbines

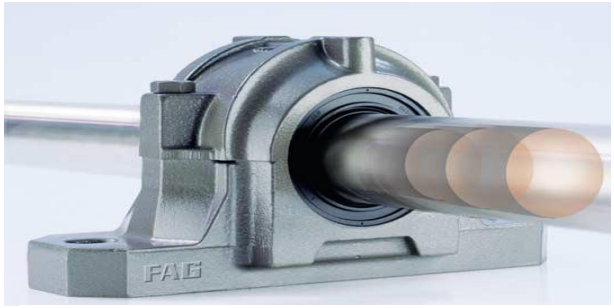
There are mainly two types of Pedestal Housings:
I)UN-SPLITHOUSINGS
II)SPLIT HOUSINGS

I) UN-SPLIT HOUSINGS (SINGLE PIECE HOUSINGS)

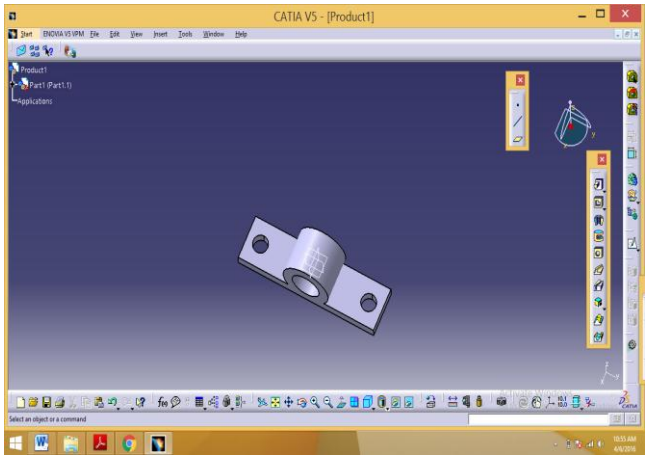
The **Un-split Housings** are the type of pedestal housings are made as only one single piece where the bearing is placed in the hole made at the center of the metal piece, as shown in the figure below. The diameter of the hole of these housings will be of fixed sizes depending upon the requirement. The holes for these housings are made based on the outer diameter of the bearing which is going to be placed in it

II) SPLIT HOUSINGS (MULTI PIECE HOUSINGS)

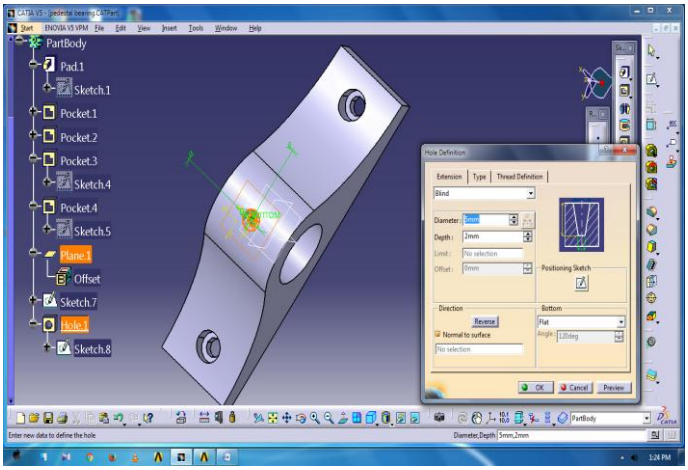
The Split Plummer block housings, fig. Designed according to the modular system and developed on the basis of the housings. Rolling bearings of diverse diameter and width series can be mounted in any housing if they have an outside diameter suitable for the housing.



2 . DESIGN OF PEDESTAL BEARING

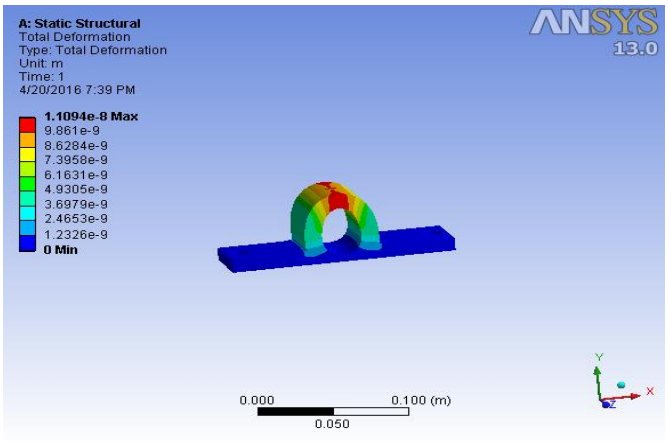


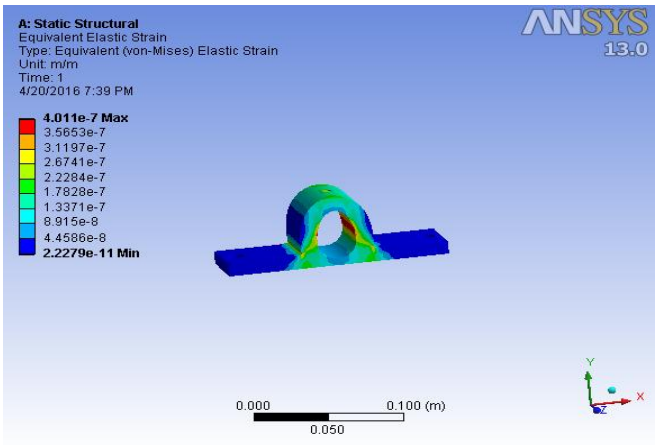
Snapshot of 3-D view of pedestal bearing house



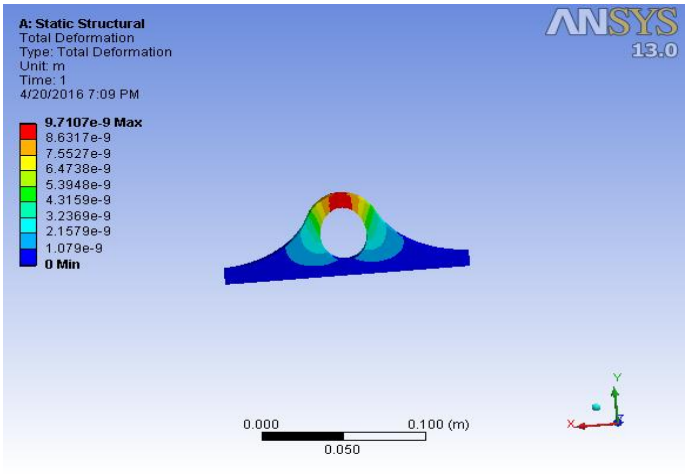
modified pedestal housing

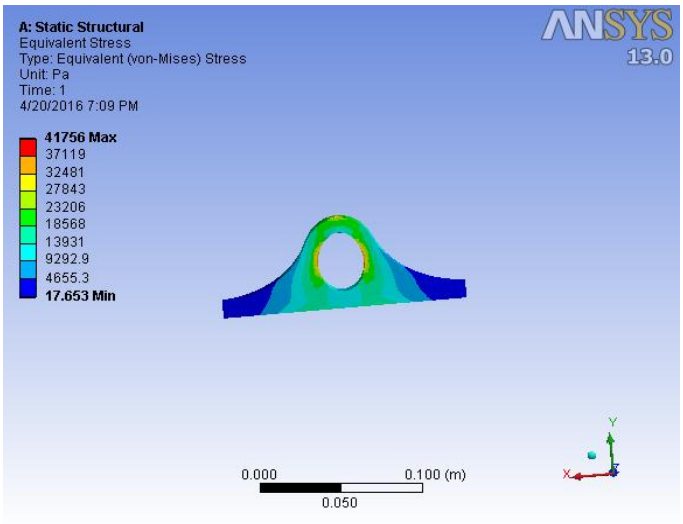
2.1ANALYSIS OF EXISTING PEDESTAL BEARING HOUSE





2.2ANALYSIS OF MODIFIED PEDESTAL BEARING HOUSE



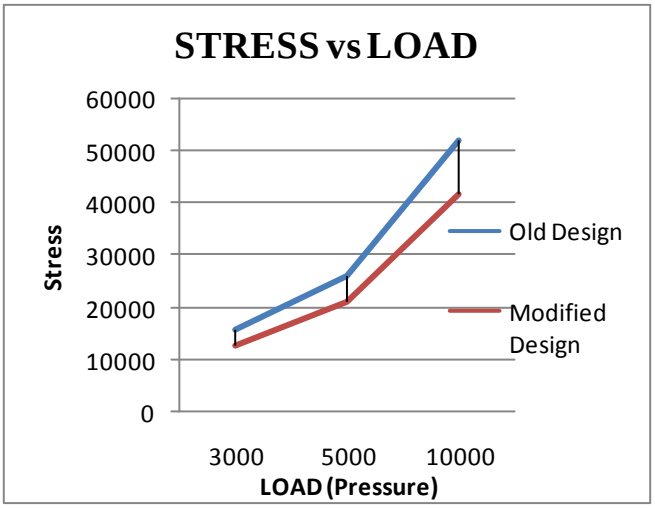


3. RESULTS AND DISCUSSIONS

ANALYSIS COMPARISION BETWEEN THE EXISTING AND MODIFIED COMPONENT

Sl. No.	PRESSURE	STRESS IN EXISTING PART(Pa)	STRESS IN NEW PART(Pa)
1	3000	15643	12527
2	5000	26071	20878
3	10000	52143	41756

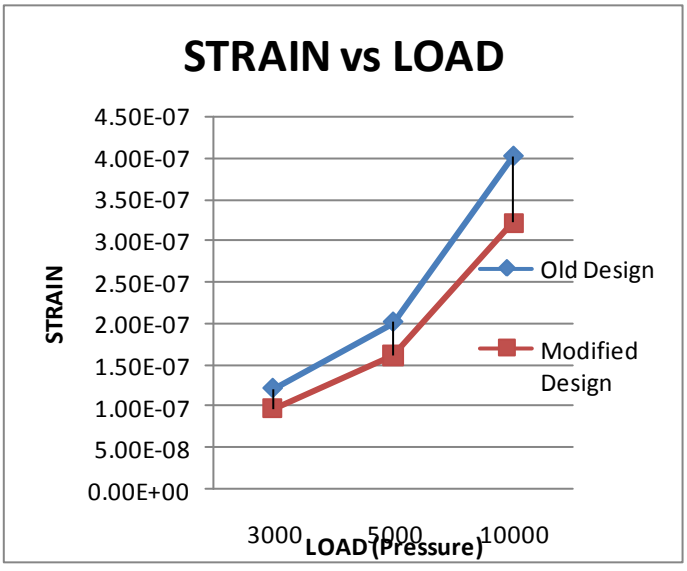
3.1 Tabulated Stress Values:



3.2 Stress vs Load Graph

Sl. No.	PRESSURE	STRAIN IN EXISTING PART	STRAIN IN NEW PART
1	3000	1.2033e-7	9.6361e-8
2	5000	2.0055e-7	1.606e-7
3	10000	4.011e-7	3.212e-7

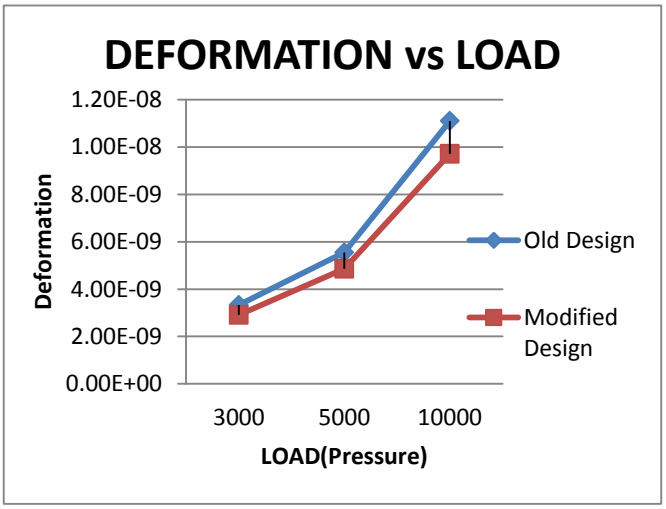
3.3 Tabulated Strain Values



3.4 Strain vs Load Graph

Sl. No.	PRESSURE	DEFORMATION IN EXISTING PART(m)	DEFORMATION IN NEW PART(m)
1	3000	3.3281e-9	2.9132e-9
2	5000	5.5468e-9	4.8553e-9
3	10000	1.1094e-8	9.7107e-9

3.5 Tabulated Deformation Values



3.6 Deformation vs Load Graph

CONCLUSION

This study was conducted on an existing pedestal bearing used in support of long shafts shows that the existing has lesser durability and strength, so intentionally we introduced extra material so as to increase the strength and durability in the newly modified component which is much efficient than the old design. As the pedestal housing is manufactured with extra material added to the old design, the added material withstands loads applied on it. This analysis helps to identify high & low stress region from the input of the material properties, boundary condition and loads. The study shows the portions or areas where maximum stress and maximum deformation develop, as it is more susceptible to the failure. The areas where the stress concentration is more, in order to minimize the stress at that stressed portion material can added.

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