Optimized Design and Fabrication of Pedestal Bearing

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Abstarct - Pedestal bearing are widely used for providing support for a rotating shaft with the help of compatible bearings and various accessories. It is also known as pillow block (or) Plummer block. It is used for long shafts requiring intermediate support. It facilitates easy assembly and periodical replacement of the worn parts. It protects the bearings from heat and contamination. It consists of unique design so that pedestal provides complete rigidity. Pedestal bearing consist of following parts 1) a cast iron pedestal 2) gun metal (or) brasses 3) a cast iron cap and two mild steel bolts 4) block. These parts can design with the help of CATIA (Computer Aided Three Dimensional Interactive Analysis) software. All components of the pedestal bearing assemble to a single unit and coupled to a rotating shaft for intermediate support. Finally the component has fabricated by using CNC Milling.

Key words: Pedestal bearing, Gun metal, CATIA, CNC Milling.

1. MOTIVATION

The motivation for this paper is to obtain the defect-less pedestal bearing. As the existing pedestal bearings life is less we are interested in increasing the life and also the strength of the pedestal bearing .These are mainly used in the supporting the long shafts for transmitting power without any losses. If these bearings are not used in such conditions the life of the shaft decreases and there may be power losses for a given input the output decreases. So our region of interest included in the re-designing of the existing component.

2. INTRODUCTION OF PEDESTAL BEARING

Pedestal bearing is used to provide support for a rotating shaft with the help of compatible bearings & various accessories. A bearing is machine part, which support a moving element and confines its motion. The supporting member is usually designated as bearing and the supporting member may be journal. Since there is a relative motion between the bearing and the moving element, a certain amount of power must be absorbed in overcoming friction, and if the surface actually touches, there will be a rapid wear. In split type it can be easily mounted to the shaft and whenever there is a wear in the component we can easily replace it .It s used where short duration of shafts are required. In non split type it is used for longer duration.

Fig 2.1 : Types of Pedestal bearings

3. DESIGN AND ANALYSIS

Performed analysis on the existing dimensions of the component and also modified the dimensions of the selected component. The following are the results obtained by modeling in CATIA and ANSYS.

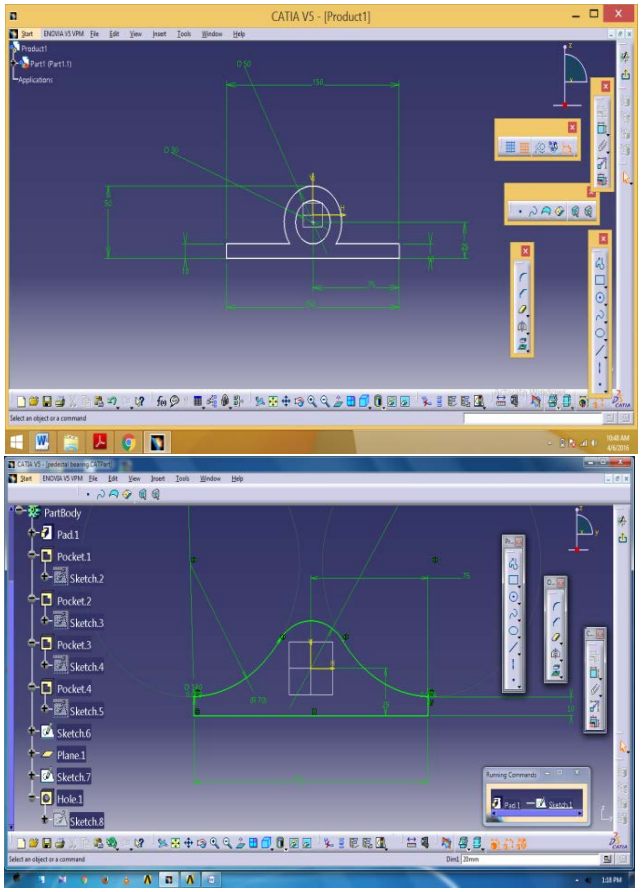
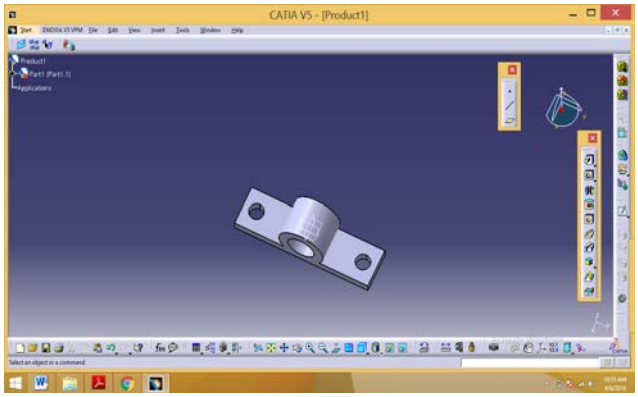


Fig: 3.1 snapshot of 2-D view of existing and modified components



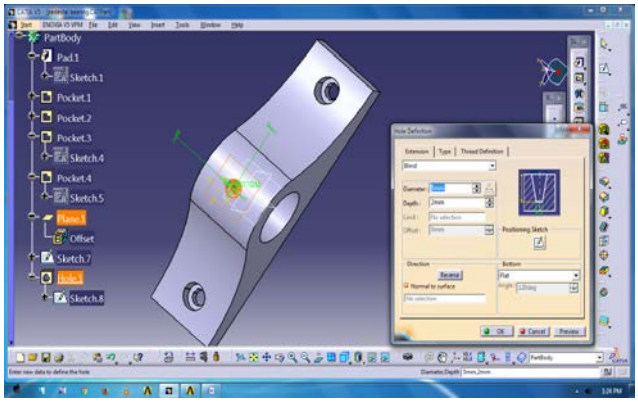
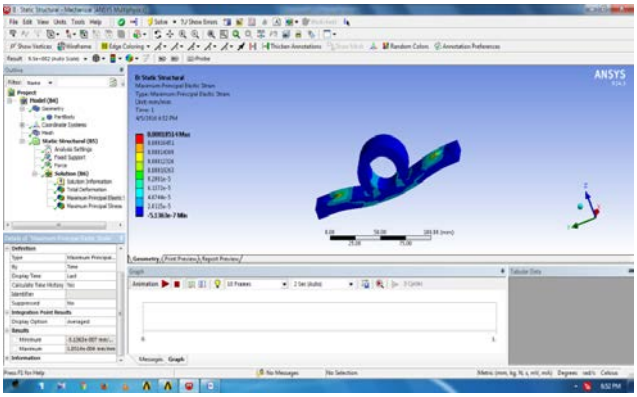


Fig: 3.2 Snapshot of formed pockets on the existing and modified components



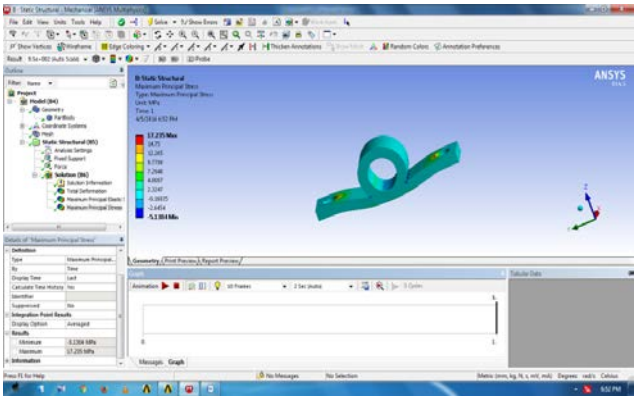
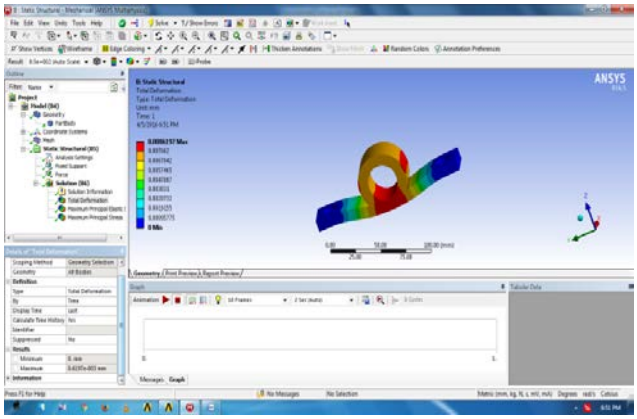


Fig: 3.4 Snapshot of results of stress and strain of existing component



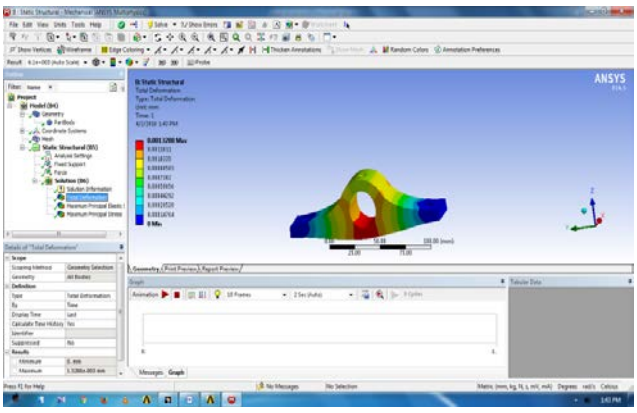
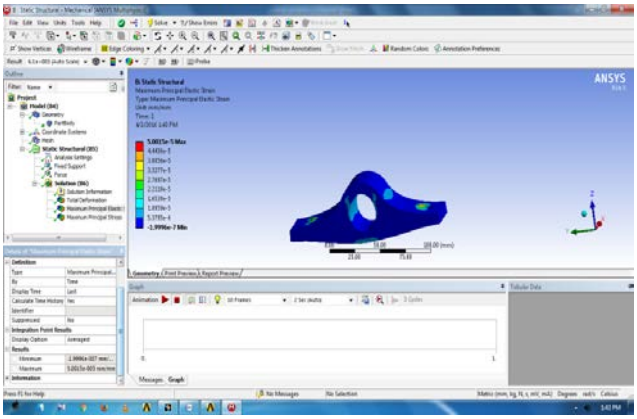


Fig: 3.3 Snapshot of results of total deformation of existing and modified components



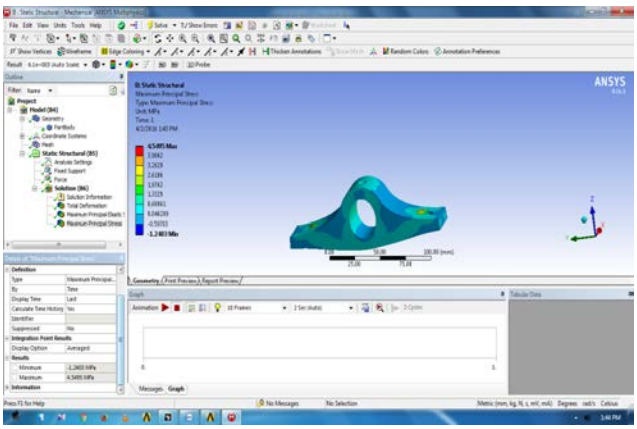


Fig: 3.5 Snapshot of results of stress and strain of modified component

4. FABRICATION USING CNC MILLING

Computer Numerical Controls is an NC system that utilizes a dedicated, stored program computer to perform some or all of the basic numerical functions. Because of trend towards downsizing in computers, most of the CNC systems sold today use a microcomputer based controller units. Over the years, minicomputers have also been used in CNC controls.

Fig: CNC Machine

4.1 Program for Pedestal bearing of Modified component:

N1: BLOCK No
G00 G80 G49 ; Cansellation codes
G28 G91 Z0.0 ; Auto retract to Home position
M06 T01 ; (D 18MM) Tool change
G90 G54 X0.0 Y0.0 ; Start point
G43 Z50.0 H01; Initial clerance
M03 S2000 ;Spindle on in clockwise direction
G00 Z5.0; Feed plane
M08 ;Coolant on
G90 G01 Z0.0 F100
M98 P162 0002;Sub programme call
SUB PROGRAMME
O0002;
G91 G01 Z-0.5 D21 R1000;
G90 G42 G01 X-15.0 D21 R1000;
G02 I15.0 ;
G40 G01 X0.0 R100;
M99; Sub programme end
G90 G00 Z50.0 Retraction height
M05; Spindle stop
M09; Coolent off
G28 G91 Z0.0; Auto retract to home position
M01; Programme optional stop
N2;
G00 G40 G80 G49;
G28 G91 Z0.0;
M06 T02 (d18mm)
G90 G54 X0.0 Y-40.0;
G43 Z50.0 H02;
M03 S2000;
G00 Z5.0;
M08;
G90 G01 Z0.0 F100;
M98 P100 0003;
G90 G00 Z50.0;
M05;
M09;
G28 G91 Z0.0;
M01;
O0003;
G91 G01 Z-0.5 F100;
G90 G42 G01 Y-25.0 D10 F800;
X75.0;
Y15.0;
G02 X20.38 Y14.50 R70.0;
G03 X0.0 Y25.0 R25.0;
G03 X-20.38 Y14.50 R25.0;
G02 X-25.0 Y-15.0 R70.0;
G01 Y-25.0;
G40 G01 X0.0 Y-29.0 R800;
Y-40.0;
N3 ;
G00 G40 G80 G49;
G28 G91 Z0.0;
M06 T03;
G90 G54 X-60.0 Y0.0;
G43 Z50.0 H03;
M03 S800;
G00 Z5.0 ;
M08;
G98 G83 Z-15.0 Q1.0 R80.0 F10;
X60.0;
G80;
G00 Z50.0;
M05;
M09;
G28 G91 Z0.0;
G28 G91 X0.0 Y0.0;
M30;

5. RESULTS AND DISCUSSIONS

The following are the analysis comparison between existing and modified pedestal bearing component:

Existing component: The Total deformation of the existing component is 8.6197 e-003mm.The maximum principle stress is 17.235MPa minimum is -5.1304MPa.The maximum principle strain is 1.8514e-007/mmMinimum is -5.1363e-004mm/mm.

MODIFIED COMPONENT: The Total deformation of the modified component is 1.3288e-oo3mm.The maximum principle stress is 5.0015e-5 Max and minimum is -1.9996e-007m/mm.The maximum principle strain is 4.5495Mpa Minimum is -2.2403Mpa.

6. SUMMARY AND FUTURE SCOPE

This study was conducted on an existing pedestal bearing used in connecting 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 modified component which as well increase the cost. Gray cast iron can resist the more load than the aluminum at different load conditions. So, gray cast iron is used for pedestal bearing to get more life. So here the total deformation maximum principle stress and strain are less when compared to the existing component the design is safe.

7. REFERENCES

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