

DESIGN AUTOMATION OF BEARINGS

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Abstract - This paper represents a software-based application which will replace complex conventional method used for designing, selecting and modeling of bearings which is very time consuming and include many errors. The design automation of bearings can overcome these problems and will lead to an efficient way for designing different types of bearings. Visual Basic software is used to develop an application which will take the minimal input parameter from the designer and will design the whole bearing from the calculating part to the generating and displaying the 3D – model of the bearing.

Keywords - Automate, Visual Basics.

I. INTRODUCTION

In this new era, automation has become a demand for every industry, many of the process and systems are becoming automatic. As bearings are mostly used in every machine, so it is obvious that production is done on a large scale. But designing may take a very long process. This can be done in an easy way by using a software-based calculation, designing and modeling.

The software which is developed will reduce the time for designing, selecting and generating and will also reduce the chances of error.

Over the last 40 years ever more sophisticated computers hardware and commensurate developments in software have enabled much design to be computerized. Computerization brings substantial benefits in the form of savings in skilled labor, faster design, error reduction and the ability to enhance design to a level not possible before the computer.

After knowing the running conditions of the machine, the designer will calculate the dimensions of different components of the bearings and will design 3D model proceeding with the analysis of it. If the model fails under the specified conditions, the designer will have to modify the design and have to repeat the same procedure again, hence becomes a lengthy method for developing a design.

II. OBJECTIVE

1. To minimize the time for modelling and designing
2. To Reduce different types of errors
3. To make modification easy
4. To make a model ready for analysis
5. To minimize cost

III. METHODOLOGY

1. Design of Bearings:

There are different types of bearings available in the market with their different applications, some of them are ball bearing, cylindrical roller bearing, thrust bearing, etc. Ball bearing is the most commonly used type of bearing. The procedure used for designing ball bearings is a conventional procedure as described in most of the reference books like V.B. Bhandari.

2. Selection of Standard Bearing:

Based on the dimensions of ball bearings after the design procedure, the standard bearing is needing to be selected from the table of standard ball bearings.

Principal dimensions (mm)			Basic load ratings (N)		Designation
<i>d</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>C₀</i>	
70	90	10	12100	9150	61814
	110	13	28100	19000	16014
	110	20	37700	24500	6014
	125	24	61800	37500	6214
	150	35	104000	63000	6314
75	180	42	143000	104000	6414
	95	10	12500	9800	61815
	115	13	28600	20000	10615
	115	20	39700	26000	6015
	130	25	66300	40500	6215
160	37	112000	72000	6315	
190	45	153000	114000	6415	

Table 1: Dimensions and static and dynamic load capacities of single-row deep groove ball bearings

3. Modelling of Bearings

After selecting the standard bearing from the table, we need to model these bearings for analysis purpose and even the detailed drawing is required when there is a need of production.

IV. WORKING OF VB SOFTWARE

Radial Load, Axial Load, Speed, Expected Life, Diameter of Shaft are the parameter to input.

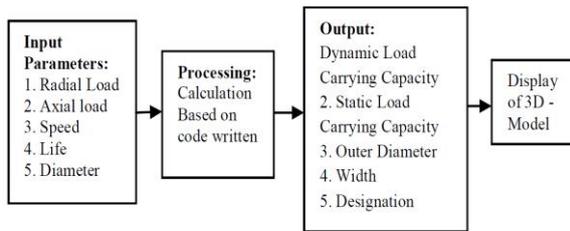


Figure 1: Flow Chart

1. Inputs Parameters

Radial Load (N)	<input type="text" value="8000"/>
Axial Load (N)	<input type="text" value="3000"/>
Expected Life (Hours)	<input type="text" value="20000"/>
Speed (RPM)	<input type="text" value="1200"/>
Diameter of Shaft (mm)	<input type="text" value="75"/>

Figure 2: Input Parameters to the Software

2. Output Parameters

Equivalent Dynamic Load (N)	<input type="text" value="8980"/>	Outer Diameter (mm)	<input type="text" value="160"/>
Life in Million Rev.	<input type="text" value="1440"/>	Width (mm)	<input type="text" value="37"/>
Dynamic Load Carrying Capacity (N)	<input type="text" value="101406.042472"/>	Dynamic Load Carrying Capacity (N)	<input type="text" value="112000"/>
		Static Load Carrying Capacity (N)	<input type="text" value="72000"/>
		Designation	<input type="text" value="6315"/>

Figure 3: Output Parameters from the Software

After entering the input data and submitting this data, the dimensions of the bearing will be calculated automatically by the code written behind the software based on the conventional method.

This data is then again used to select the suitable standard bearing from the table of standard bearings. This is also done automatically by the code written behind the software.

3. 3D – Modeling

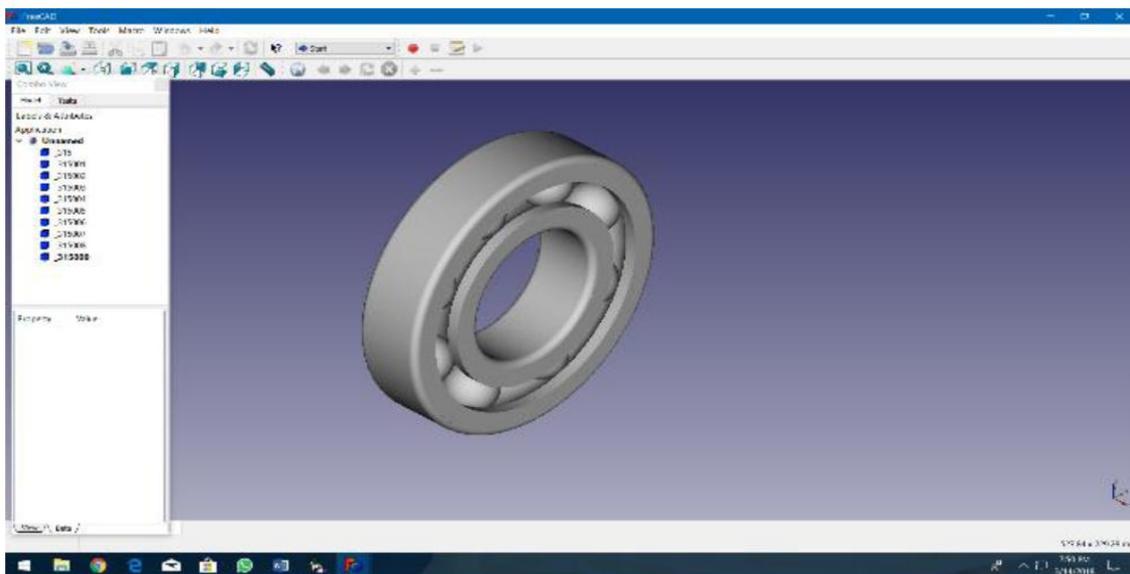


Figure 4:3D – Model of the Designed Bearing

A 3D – model of the selected standard bearing can be displayed by using the command button on the

screen. And even any CAD software can be used to display this 3D – model of ball bearing.

CONCLUSION

The conventional method of designing, selecting of bearings is replaced by automatic software in which from the calculation to the display of 3D model will be done automatically by just specifying some parameter and conditions in which the bearing is going to work. This will help industries to design bearings in minutes and even the 3D model of the same will be ready. This will also help the industries to reduce the number of errors and even a skilled person is not required, by doing this the industries will also save in employee salaries and eventually will reduce the overall cost in designing bearings. This software will also make the modification of bearings easy, there is no requirement of again calculating the final dimensions as done in conventional method, here we just need to change the initial parameter and the conditions in which the bearing is going to work, and within no time the

design along with 3D model will be ready to get displayed.

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