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Design, Fabrication and Analysis of Fault Diagnosis in Spur Gear

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Abstract: ***Gear roll tester is used to measure and analyse accuracy and errors in spur gears. Gear testing is a technique that has been used in the gear industry to identify possible manufacturing defects in the design of the gear. It is a practical, fast, and effective screening tool that can identify when the gear manufacturing process has deviated from an targeted condition. Therefore, in the present paper it was decided to develop a gear roll tester to analyse effects of different types of defects in gear on its functional performance like run out, misalignments, profile errors, noise, vibration ,pitch errors and backlash,etc.***
This Gear tester is used to test the error in the gear. This Experimental setup Consisting of two spindles mounted on two carriages. One spindle mounted on fixed carriage and other on sliding carriage. one master gear is fixed in one spindle and another testing gear (faulty gear) is fixed in the second spindle. They can slide both side and these gears are mounted in mesh with each other by spring pressure. When the meshed gears are rotated, the moment of sliding carriage can be measured by the digital dial indicator. These values of variation are deflected by the dial indicator. The spindles can be adjusted so that axial distance is equal and scale is attached to one side. If errors occur in the tooth form moment of carriage due to the error in the pitch and tooth thickness. This moment is indicated in the dial gauge. And the vibration of this faulty gears can be shown by graphical representation using wax paper.
Keywords: Gear roll tester, run out, misalignment, backlash

I. INTRODUCTION

In the present technology operated world as everything around us is changing so rapidly, everyone needs to complete their task as fast as possible to run with competition. As we know gears are the mechanical components used for power transmission everywhere motion is present. Gears are plays a very vital role in any machine as they are used for power transmission whenever the machine is needed to be operated therefore it is very important for the gear to be in a good condition. For achieving this rapidness, man manufactures various machines and equipment are manufactured in order to keep the growth rapid. The production engineer must bring new ideas and design into reality. New machines, equipment and the methods are being developed continuously for production of various product at low cost and precise quality. Gear testing is one of the methods used for the testing of accuracy of gears and also to determine the errors of the gear. In order to check the combined tooth error different types of gear testing machines are used. Various machines have its ability to check specified parameters only. The highly precise machine required specialized and space installation. In order to check gear in machine shop, we needed a strong and quick arrangement like this.
Different kinds of gear testing machines are used to check the combined tooth error. Only certain parameters can be checked by a number of machines. The highly precise machine required special installation and space. We required such an arrangement which is strong and rapid one for the purpose of checking gear in machine workshop. This purpose can be solved by using gear test setup. This type of gear test is helpful in manufacturing for mass production of gears of a specific gear box. Gear test is such arrangement which simplifies the measurement and saves worker time and overall production cost with higher accuracy. It works on the principle that master gear is attached to a fixed vertically oriented shaft and the gear to be tested on another identical shaft.

II. WORKING PRINCIPLE

1) A master gear is mounted on a fixed vertical spindle and the gear to be tested on another spindle.
2) These gears are maintained in mesh by spring pressure.
3) At first, the dial gauge is set to zero and then both gears are mounted on spindles.
4) The variations in the dial gauge readings are any irregularities in gar under test.
5) The pen is fixed on the testing gear and the paper is fixed above both the spindle. Pen fixed on the rotating gear will records the graph due to the improper tooth geometry provided on the paper which is fixed above Spindles.

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III. EXPERIMENTAL SETUP

To operate the testing machine manually rotate the master gear against the gear to be tested. One master gear is fixed in one spindle and another testing gear (faulty gear) is fixed in the second spindle. They can slide both side and these gears are mounted in mesh by spring pressure. When the gear is rotated, the moment of sliding carriage can be measured by the dial indicator. These values of variation are deflected by the dial indicator. The gear to be tested is installed on the sliding carriage using the spindle and the spindle is fixed using fasteners as the nut and bolts. The sliding carriage being spring loaded is in continuous close contact with the master gear. Also, the pen is fixed on the testing gear and the paper is fixed above both the spindle. Pen fixed on the Rotating gear record the graph due to the improper tooth geometry provided on the paper which is fixed above Spindles. When the pair of master gear and the gear to be tested is rotating and if there is any mis-run, run out, misalignment, backlash, etc. of the gear to be tested then the stylus and pen arrangement will deflect and the appropriate amount of variation in the graph which is recorded on the moving paper is being recorded. Thus, the operation of gear testing machine is done. A Schematic diagram of the Experimental Setup is shown in Fig.

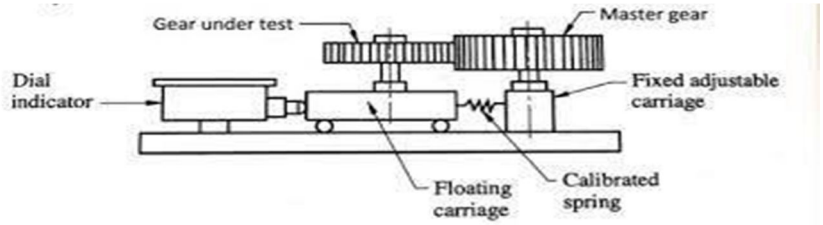


Figure 1 Experiemntal setup of :Fault Detector Gear Testing

IV. RESULTS

1) To find the various defect in gears.
2) This experimental setup of this project will help in detection of faults in gears such as run out, misalignment, backlash etc. using Ansys Software.
3) To find out gear accuracy by graphical and gear rolling test method.
4) This experimental setup will help in knowing the design of gears and making necessary changes will assure a good and perfect gear for gearbox design.

V. FUTURE SCOPE

1) This gear rolling test method will help to detect defects in gears such as run out, misalignment, backlash, etc.
2) Before it is too late, this method detects fault in gears so we can take early precautions.
3) It will applicable for large scale industries as well as small scale industries. It also has applications in Automotive Industries

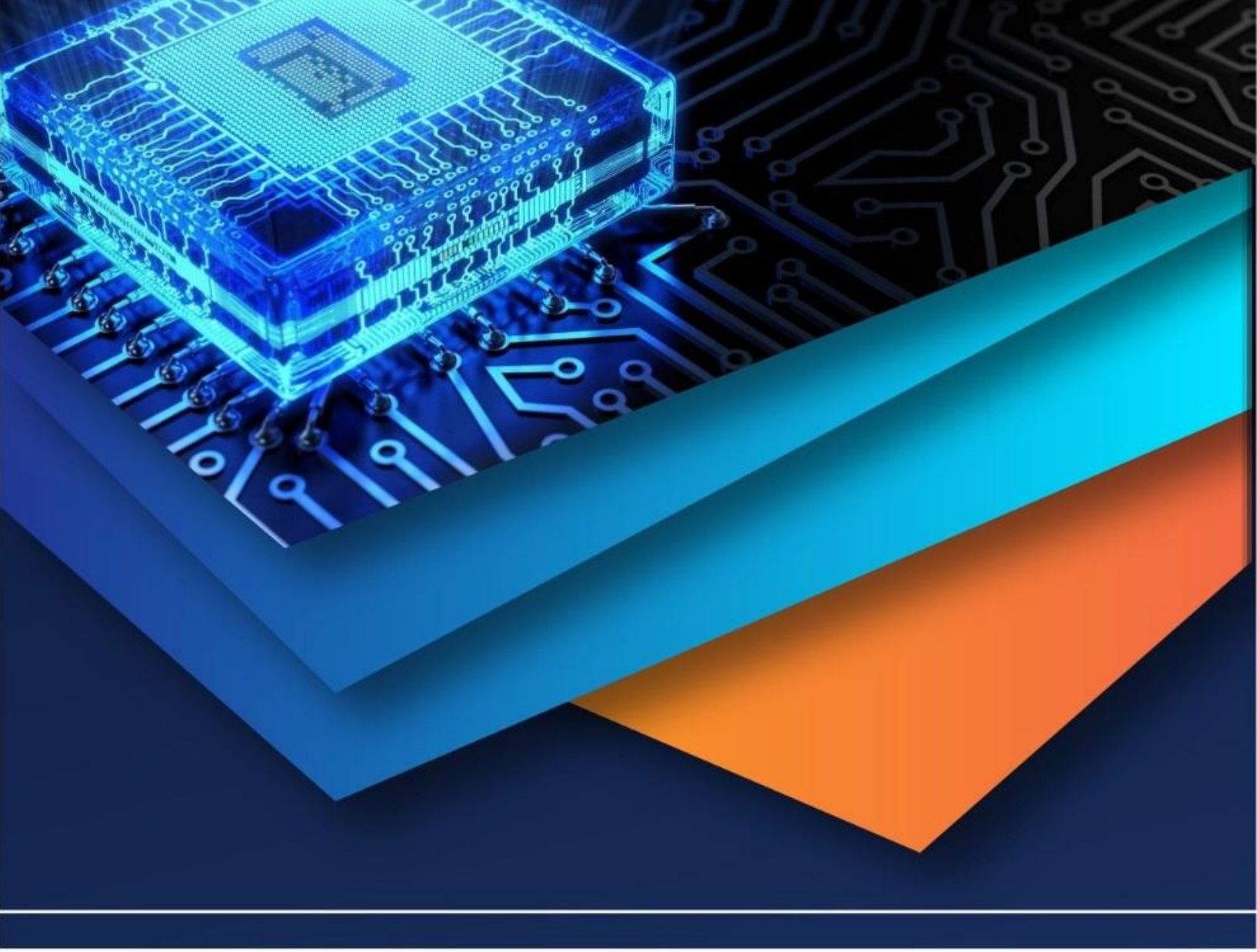
VI. CONCLUSION

Gear Roll Test Rig is designed and developed for the functional testing of spur gears. The test rig is manufactured which gives very high accuracy. Gears with different types of defects were tested on the test rig to ensure the accuracy of it. This test rig is an important tool to the gear manufacturer to test the gears for their functional performance. The test rig can be used further to analyses noise and vibrations.

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