International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 05 | May - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

"IOT Based Single Leaf Spring Fatigue Testing Machine Using Pneumatic System."

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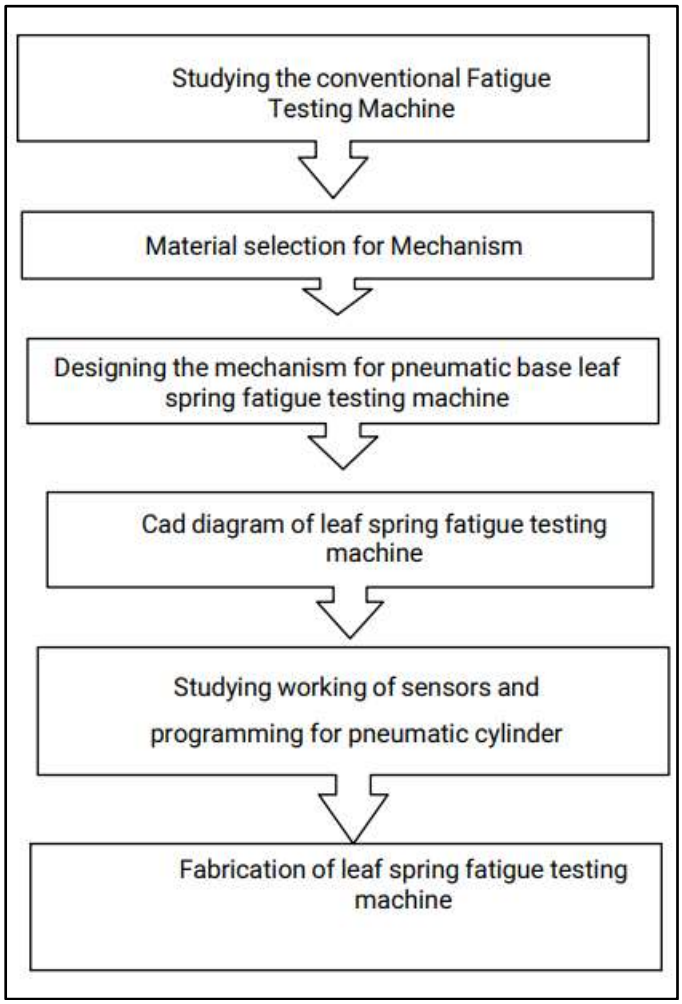
▪ **Abstract -** In today's automobile industry, leaf springs are commonly used in heavy-duty vehicles. A leaf spring is a simple form of spring commonly used as a suspension in wheeled vehicles. Fatigue is responsible for 90% of the failures that occur in an industry. Fatigue testing equipment is used to determine the fatigue life or fatigue strength of a material. Mechanical Engineering students are having a hard time visualizing how manufacturers determine the fatigue strength of a leaf spring. This is because the professors only teach the concepts and theories about leaf springs, and there is no actual represent at ion of how the testing of leaf springs works. So are tried to develop prototype leaf spring fatigue testing machine using a double acting pneumatic cylinder and ES P32microcontroller. With the help of this machine we can measure the fatigue life cycle of testing leaf springs

***Key Words*:** Leaf spring, heavy-duty vehicles, suspension, Fatigue, strength of a material, Mechanical Engineering, theories about leaf springs, life cycle.

1. INTRODUCTION

A fatigue test helps determine a material's ability to withstand cyclic fatigue loading conditions. By design, a material is selected to meet or exceed the anticipated service loads in fatigue testing applications. Cyclic fatigue tests produce repeated loading and unloading in tension, compression, bending, torsion or combinations of these stresses. Fatigue tests are commonly loaded in tension – tension, compression – compression and tension into compression and reverse. Usually, the purpose of a fatigue test is to determine the lifespan that may be expected from a material subjected to cyclic loading, however fatigue strength and crack resistance are commonly sought values as well. The fatigue life of a material is the total number of cycles that a material can be subjected to under a single loading scheme. A fatigue test is also used for the determination of the maximum load that a sample can withstand for a specified number of cycles. All of these characteristics are extremely important in any industry where material is subject to fluctuating instead of constant forces. To perform a fatigue, test a sample is loaded into a fatigue tester or fatigue test machine and loaded using the pre-determined test stress, then unloaded to either zero load or an opposite load. This cycle of loading and unloading is then repeated until the end of the test is reached. The test may be run to a pre-determined number of cycles or until the sample has failed depending on the parameters of the test there are several common types of fatigue testing as well as two common forms: load controlled high cycle and strain controlled low cycle fatigue. A high cycle test tends to be associated with loads in the elastic regime and low cycle fatigue tests generally involve plastic deformations. Nearly all materials may experience fatigue in one way or another during the lifespan of their application. However, in applications where fatigue is a factor it is common to find components made from metals or composites. These materials have a higher fatigue limit than others because of the rigidity and ductility, which are characteristics that tend to increase fatigue strength. Other materials, such as polymers, ceramics, and wood may experience fatigue and also need to be tested to understand how they will respond to these unique stress combinations

2. METHODOLOGY:



3. PROBLEM STATEMENT:

Failure by fatigue fracture is the most common failure in automotive components such as crankshafts and springs on trucks. In addition to, leaf springs especially as automotive components often experience over load and vibration that occur due to the unevenness of the road. So, this work develops a prototype leaf spring fatigue testing machine using pneumatic cylinder and microcontroller. With the help of this machine, we can measure the fatigue life cycle of testing leaf springs may measure.

4. CONCLUSIONS

This development contributes to the advancement of fatigue testing methodologies for leaf springs, which are critical components in automotive and other industries. • The IoT-enabled smart testing machine offers a more efficient and reliable approach to evaluating the fatigue performance of leaf springs.

ACKNOWLEDGEMENT

This acknowledges my sincere thanks to my project guide Prof. Swapnil Dumbre, who helped me in selecting the project topic, understanding of the subject, whose valuable guidance and continuous encouragement throughout this work made it possible to complete this project work well in advance.

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