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HYDRAULIC SPRING TESTING MACHINE

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Chapter 1: ABSTRACT

INTRODUCTION

- An engineer is always focused towards challenges of bringing ideas and concepts to life.
- Therefore, sophisticated machines and modern techniques have been constantly developed and implemented for economical manufacturing of products.
- At the same time, we should take care that there has been no compromise made with quality and accuracy.
- Springs isolates the drivers from road imperfections by allowing the tire to move over a bump without drastically disturbing the chassis. If the chassis remains fairly steady, then tire are better able to follow road contours automatically.

WORKING PRINCIPLE

- The working of hydraulic stiffness testing machine is based on PASCAL`S LAW which states that '' PRESSURE APPLIED AT ANY POINT ON ANY CONFINED LIQUID IS TRANSMITTED EQUALLY TO ALL OTHER POINTES''. This principle is same as that used in hydraulic press

ADVANTAGES

1. Spring (spiral or helical) of different diameters `can be checked. (Range 40 mm – 60 mm)
2. Springs can have checked without damaging the spring.
3. No skilled is required to check spring.
4. The testing process is carried out in very less time, so production rate is very high.
5. One-man effort is enough to check the spring.
6. Semi – skilled and unskilled labor can operate this machine easily.

7. The system is self-lubricating.
8. The system is noiseless.

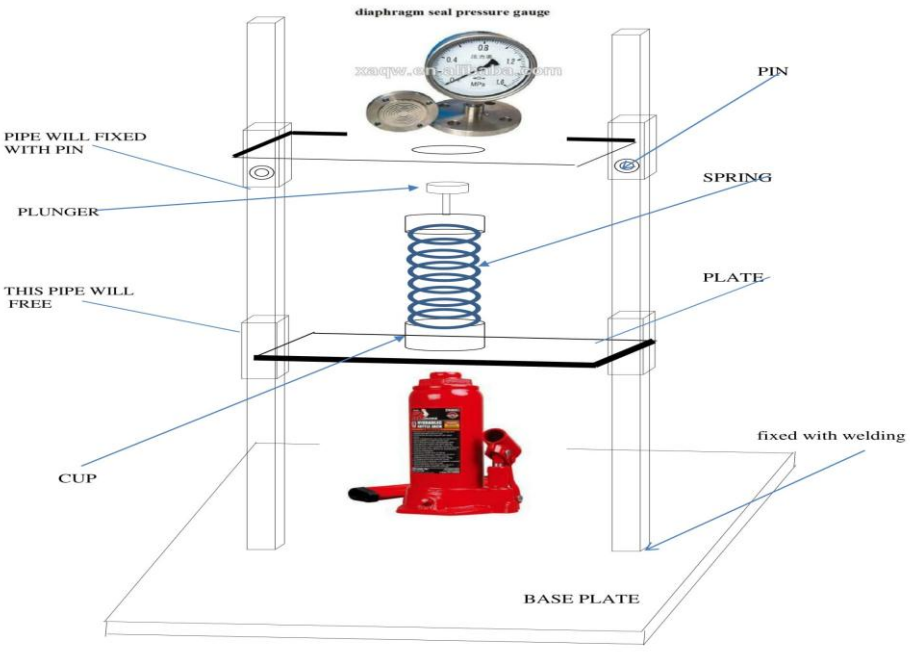
DISADVANTAGES

1. Spring wire diameter cannot be checked below 40 mm and 60 mm. (If we check the diameter of spring below 40 mm there are chances for spring to buckle)
2. As system is hydraulic, leakage may occur and hence refilling of oil is necessary.
3. Stiffness of spring like leaf spring cannot be checked.

APPLICATION

1. The machine is used for measuring spring stiffness for different spiral and helical springs in the range of 40mm to 60mm.
2. Can be used in garages where frequent inspection of suspensions of various automobiles is carried out.
3. With this help of machine, it is possible analyze when to replace the suspension by comparing the stiffness of testing suspension with that of the standard stiffness.

Chapter 2: Block Diagram.



Chapter 3: Working

Working principle

It works on the principle of Pascal's law of transmission of pressure in a confined fluid. It states that a pressure change occurring anywhere in a confined incompressible fluid is

transmitted throughout the fluid such that the same change occurs everywhere. i.e. – PRESSURE APPLIED AT ANY POINT ON ANY CONFINED LIQUID IS TRANSMITTED EQUALLY TO ALL OTHER POINTES‘’. This principle is same as that used in hydraulic press.

Working

Using the above principle, we have designed our testing machine. It consists of a hydraulic jack or similar device, a frame with a sliding mechanism, a mounting table to mount the spring that is to be tested and a display unit that’ll give us the required output result.

When the pressure is applied through the hydraulic jack or compressor (according to the compressive strength of the spring that is to be tested) the spring that is mounted on the testing table is compressed. The spring will oppose the pressure of the fluid and calculating or recording this resistance of the spring will in turn give us its stiffness.

Pressure measurement

The most important section of this device is the component the measures the stiffness or the load of the spring.

For this we have two options one is the load cell and the other one is to use a pressure gauge. we can’t use a load cell cause it’s a risk that if the pressure applied by the jack will be more so there are chances of load cell getting broken or in the one with the gauge system the pressure gauge will be mounted on the hydraulic jack. The problem with this type is that it’ll not give us the pressure that is being applied on the spring but instead the pressure that is created inside the cylinder of the hydraulic jack. So to find out the stiffness of the spring we have to calculate the pressure using this formula.

So instead of that we are using a pressure gauge known as DIAPHRAM SEAL PRESSURE GAUGE. it’s a gauge which will be mounted at the top and when the plunger from the upper spring cups it pushes the bottom side of the gauge then we can get the reading through the pointers deflection.

Chapter 4: Advantages

1. Spring (spiral or helical) of different diameters `can be checked. (Range 40 mm – 60 mm)
2. Springs can have checked without damaging the spring.
3. No skilled is required to check spring.

4. The testing process is carried out in very less time, so production rate is very high.
5. One-man effort is enough to check the spring.
6. Semi – skilled and unskilled labor can operate this machine easily.
7. The system is self-lubricating.
8. The system is noiseless.

Chapter 5: Limitation

1. Spring wire diameter cannot be checked below 40 mm and 60 mm. (If we check the diameter of spring below 40 mm there are chances for spring to buckle)
2. As system is hydraulic, leakage may occur and hence refilling of oil is necessary.
3. Stiffness of spring like leaf spring cannot be checked.
4. Limited number of springs can be tested.
5. To test springs of higher compressive strength a compressor is needed which will increase the running and production cost.

Chapter 6: Future Expansion

- Spring is an important component in engineering so it is obvious its testing is as much important. This device is less expensive than other similar devices present in the market. It can be combined with the production line and the springs can be tested as soon as they are produced increasing efficiency and quality of the production line
- The design of this machine can be modified to test a wider range of components such as steel columns, shafts etc.
- The hydraulic spring testing machine can be modified and be automated by implementing microprocessor and controller which will improve speed and reduce human errors such as parallax error that can occur while reading the output value.

Chapter 7: Project cost estimation

COMPONENTS	***COSTS IN RS.***
1. HYDRAULIC JACK	RS - 700
2. METAL FRAMES	RS - 1800
3. DIAPHRAM PRESSURE GAUGE	RS - 2000
4. MOUNTINGS	RS - 300
5. PAINTS	RS - 500
TOTAL: -	***RS. 5300***

Chapter 8: Project planning.

At first all our group members selected their individual topics and had made their respective projects ppts in our first meeting with our project guide we have presented our ideas after some discussing we came to a conclusion that is to make a hydraulic spring stiffness testing machine.

Our project was now selected we had discussed components required their costs and also the working of the machine with our project guide.

At first it was easy but when we actual started to build a prototype then we had faced a problem i.e. load cell was a very sensitive device if hydraulic jack exerts more pressure on it then there are chances of load cell getting broken.

Hence after 2 days of discussion we had finally had gotten an idea of installing a diaphragm pressure gauge instead of using a load cell. There the pressure measurement problem was over but now a new problem came towards us that is the position for installing diaphragm pressure gauge so at last we have totally worked upon the design of the machine at after some adjustments of parts it was finally finished.

Now for further we are planning to build this machine before our 6 sem i.e. during vacation time.