

ABSTRACT

The helical compression spring used in two wheelers is belonging to the medium segment of the Indian automotive market. The detailed assessment of the problem of two wheeler suspension spring is studied. Most of time springs were failed due to raw material defects, surface imperfection, improper heat treatment, corrosion and decarburization and high weight of suspension. These problems can be solved by applied thick layer of paint as adhesive, proper heat treatment, change in shape and material of helical compression spring. In this work, the failure of helical compression spring can be reduced by change in structure i.e. change in number of active coils of spring

KEYWORDS: helical compression spring, two wheeler, raw material, paint, active coils.

INTRODUCTION

A spring is defined as an elastic machine element that deflects under the action of the load and returns to its original shape when the load is removed. It can take any shape and form depending upon the application. The helical springs are made up of a wire coiled in the form of helix and are primarily intended for compressive or tensile loads. The cross-section of wire from which the spring is made may be circular, square or rectangular. The two forms of helical springs are compression helical spring and tension helical spring.

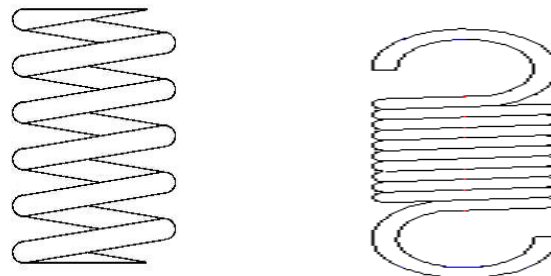


Fig.1.1 helical compression and tension spring

The most popular type of spring is helical compression spring. There are two basic types of helical compression spring Compression spring and Extension spring. In helical compression spring, the external force tends to shorten the spring. The external force acts along the axis of the spring and induces torsional shear stress in the spring wire. It should be noted that although the spring is under compression, the wire of helical compression spring is not subjected to compression stress. Also the wire is not subjected to tensile stress although the spring is under tension. In both cases, torsional shear stresses are induced in the spring wire.

LITERATURE REVIEW

B. Ravi Kumar (2002)

The failure of a helical compression spring employed in coke oven batteries was analyzed in the form of visual examination of general physics features, surface examination metallography mechanical properties (Hardness, Residual stress analysis). Chemical analysis of spring was also done.

Liano-Vizcaya (2007)

Studied the manufacturing process of mechanical spring and observed that tensile residual stresses induces on the inner coil surface while compressive residual stresses were generated on outer coil surface which reduces considerably the spring strength and service life.

Youli Zhu, Yanli Wang (2014)

analyzed why a compressive coil spring fractured at the transition position from the bearing coil to the first active coil in service. While the nominal stress should always much less than at the insides coil position of a fully active coil. Visual observation indicated that a wear scar was formed on the first active coil. Scanning electron microscopy examination showed crescent shaped region and bench marks. Zinc phosphate layer and painting around the contact zone were worn out due to contact and friction and Resulted into corrosion.

R. Puff (2014)

investigated the effect of the presence of non-metallic inclusions in the early failure of a helical spring subjected to regular design loads during its operation. To understanding the reduction in fatigue strength, an analytical model was used. A two – dimensional (2D) finite element method analysis was developed to evaluate the residual stresses originated around an inclusion located near the material surface, by the application of a shot peening process. A three dimensional (3D) FEM model was developed to study the stress concentration around the inclusion that appears under design loads.

EXISTING SPRING DATA

The existing suspension spring having wire diameter 8 mm, outside diameter 50mm, inside diameter 35mm, free length 230mm, number of total coil 19, and spring material is En 42 spring steel

BASIC CALCULATION

1) Mean Coil Diameter

2) Spring Index

$$C = 5.3125$$

C is in between 5 to 9 so it is suitable for cyclic loading. Also it is suitable for manufacturing.

3) Wahl Factor (K)

Exiting Design

Total number of coils = 19

Number of active coils = 17

a) Stiffness

$$K_1 = 33.3482 \text{ N/mm}$$

$$K_1 = 3.3994 \text{ Kg/mm}$$

b) Now calculating load for deflection is 10mm

Deflection (δ)

10

$$P_1 = 33.994 \text{ Kg}$$

New spring design I

Total number of coils = 18

Number of active coils = 16

a) Stiffness

$$K_2 = 35.4325 \text{ N/mm}$$

$$K_2 = 3.6118 \text{ Kg/mm}$$

b) Now calculating load for deflection is 10mm
Deflection (δ)
10
 $P_2 = 36.1187 \text{ Kg}$

New Spring design II

Total number of coils = 17
Number of active coils = 15

a) Stiffness
 $K_3 = 37.7946 \text{ N/mm}$
 $K_3 = 3.8526 \text{ Kg/mm}$

b) Now calculating load for deflection is 10mm
Deflection (δ)
10
 $P_3 = 38.526 \text{ Kg}$

CONCLUSION

The load for different deflection was calculated with reference to above calculated stiffness for various springs. It is observed that the new design II has greater stiffness than remaining designs. It can be concluded that if number of turns of helical compression spring reduces then stiffness increases.

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