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Experimental analysis of Vehicle frame

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ABSTRACT : *In this experimental work, find out stress induced in vehicle by strain gauge method after application of load under static loading condition. When load is applied on frame then stress is generated frame we measure this stress by strain gauge. It is observed that experimental results are more correct than analytical because correct boundary conditions.*
Keywords *– Boundary Condition ,Strain gauge Analysis.*

I. INTRODUCTION

Strain gauges are devices whose resistance changes under the application of force or strain. They can be used for measurement of force, strain, stress, pressure, displacement, acceleration etc. While there are several methods of measuring strain, the most common is with a strain gauge, a device whose electrical resistance varies in proportion to the amount of strain in the device. The metallic strain gauge consists of a very fine wire or, more commonly, metallic foil arranged in a grid pattern. The grid pattern maximizes the amount of metallic wire or foil subject to strain in the parallel direction.The cross sectional area of the grid is minimized to reduce the effect of shear strain and Poisson Strain. The grid is bonded to a thin backing, called the carrier, which is attached directly to the test specimen. Therefore, the strain experienced by the test specimen is transferred directly to the strain gauge, which responds with a linear change in electrical resistance. Strain gauges are available commercially with nominal resistance values from 30 to 3000 Ω, with 120, 350, and 1000 Ω being the most common values. When load is applied on frame then stress is generated frame we measure this stress by strain gauge. It is observed that experimental results are more correct than analytical because correct boundary conditions

II. EXPERIMENTATION OF VEHICLE FRAME

Experiment can be carried out in go kart frame by using wire type strain gauge

Procedure

1. To clean the area of frame for placing wires type strain gauge.
2. Wire type strain gauge can be place in a go kart frame.
3. Placing strain gauge by used in fevi quick.
4. wire type strain gauge can used to connect wire used in bridge by soldering process
5. Bridge placed in neared the to the strain gauge
6. Another wire used in strain gauge to reading purpose in strain indicator.
7. Applied load for 130 kg and to indicate the strain and stress of go kart frame

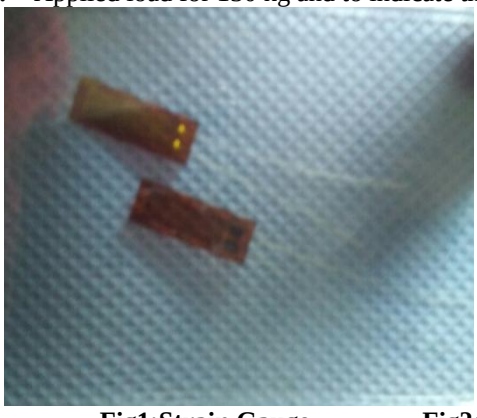

Fig1:Strain Gauge

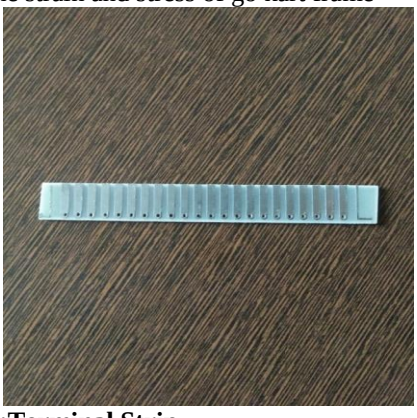

Fig2:Terminal Strip

In this Project I have used quarter bridge circuit for strain measurement purpose and wire type strain gauge is used the gauge factor for strain gauge is
1000 ohm

III. EXPERIMENTATAL ANALYSIS FRAME READING

Load applied in a vehicle	Strain generated at location 1	Stress generated at location 1
130	14	2.940
130	15	3.150
130	14	2.940

Calculation
Load applied in a vehicle 130 kg
Stress = Strain × Young modulus
= $14x10^{-6}$ x $210x10^{3}$
= 2.940 N/mm
E= 210GPA for mild steel

TABLE NO 2

Load applied in a vehicle	Strain generated at location 2	Stress generated at location 2
130	9	1.89
130	1	0.210
130	1	0.210

Calculation
Load applied in a vehicle 130 kg
Stress = Strain × Young modulus
= $9\times10^{-6} \times 210\times10^{3}$
= 1.89 N/mm
E= 210GPA for mild steel

TABLE NO 3

Load applied in a vehicle	Bending Strain generated at location 3	Bending Stress generated at location 3
130	79	16.590
130	81	17.010
130	82	17.220

Calculation
Load applied in a vehicle 130 kg
Stress = Strain ×Young modulus
= $79\times10^{-6} \times 210\times10^{3}$
= 16.590 N/mm
E= 210GPA for mild steel

Photos of project

Fig3:Vehicle Photograph Before Strain Gauge Mounting

Fig4: Vehicle Photograph after 3 Strain Gauge Mounting

IV. CONCLUSION

1. It is observed that reading obtained by experimental measurements are more correct than analytical and FEA Methods because correct location of gauge.
2. Experimental results clearly shows the vehicle is safe for a load of 130 kg and maximum stress produced is 17 N/mm^2 , which is far below than yield Strength of material.
3. Finally it would be conclude that the frame is safe and its cost is very low as compare to other frame due to its Hollow cross section.

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