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Design and Analysis of Gear Based Locking System for Fixing Two-Wheeler Wheels with Minimal Human Effort

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ABSTRECT

In this paper, we present a comprehensive overview of a vehicle security system called MATS. This anti-theft system aims to address the issue of more secure security products in the market. NX Unigraphics software used to design the anti-theft system. Furthermore, automation has been done to operate the locking system. The system is designed to attach to the shock absorbers and prevent the rotation of the alloy wheels when the vehicle is parked. It is accomplished through the use of a linear actuator, which converts rotary motion into linear motion using a motor and gears. The press key, which is located on the handle, activates the system. With its simple operation and improved security, MATS offers a better solution to vehicle security. Furthermore, finite element analysis has been done by using Ansys Software. The deformation and stress of locking system have been identified.

Keywords: *Design locking system deformation, stress.*

INTRODUCTION:

Mechanised Anti-Theft System (MATS) is an electric anti-lock system which is designed for the two-wheeler bikes. MATS blocks the front wheel of two-wheeler (Bike) with mechanized system. MATS works on the principle of converting rotary motion into linear motion with help of motor and gears. In this system the new modernized actuator is used to hold front end of the wheel. It gets attached to the front shock absorber of the bike. MATS gets electric power from battery which is already present in the bike and with this feature makes MATS less complex system, By which overall cost deceases. As an important part of vehicle security there are many solutions are available in the present market but there are many limitations like high

LITRETURE REVIEW:

Deepak, S. Vikranth, et al. [1]: This essay compares the wheels made of aluminum, magnesium, and zinc alloys. The wheel specs were derived from an existing model.Calculated analysis tests include total life, damage factor, and load factor. After comparing the findings, it is established that aluminum alloy is the best suited alloy for making wheels out of the three. N Satyanaryana and other. [2[: In this research, FEA was used to do a static and fatigue analysis of an aluminum alloy wheel (A356.2). Ansys receives a newly generated 3D model. Pressure is first applied to the rim before the PCD and hub part are restricted. We established the full distortion.Stress and shear strain alternate. Additionally, employing the S-N curve might damage an alloy wheel and endanger life.S-N curve is the input for P Meghashyam et al.'s A356.2 material. [3]: In this study, the model was created in NX Unigraphics, and it was examined using ANSYS software. Following a comparison between aluminum and forged wheels, calculations for stress, bending moments, and other variables were then completed. Additionally, the vibration study of the rim is performed as part of the dynamic analysis, and the results are calculated, with forged steel being recommended as the best material. Sanjay Chowdary and colleagues [4]: In this paper, the weight reduction of the MATS is presented. The aluminum wheel is changed out for PEEK (polyether ether ketone) of four different specifications. After that, examination of overall deformation and equal stress is done. The material peak 90 hmf 20 is used in place of aluminum alloy as a result of the findings.

Material selection & properties

first, we take a hollow rod Mild Steel after that we checked the properties of that material and when it's comes to the properties of that material Physical Properties of Mild Steel

- High Tensile Strength.
- High impact Strength.

- Good ductility and weldability.
- A magnetic metal due to its ferrite content.
- Good malleability with cold-forming possibility.

Table 1 Chemical composition of Steel

Steel Designation	Constituent percentage in weight							
	C	MN	Si	S	P	Cr	Ni	Fe
Mild Steel Fe 415D	0.23	0.60	0.30	0.040	0.040	-	-	Rest
SS 304	0.08	2	1	0.03	0.045	18	8	Rest

Table 2 Mechanical properties of raw Material

S.NO	Material	Density (*1000 kg/m3)	Polsson's Ratio	Elastic Modulus (GPa)	Tensile Strength (MPa)	Yield Strength (MPa)
01	Mild Steel rod (Fe 415D, IS 1786:2008)	7.7-8.03	0.27-0.30	190-210	400-550	300-450
02	Stainless steel rod (SS304)	8.03	0.27-0.30	190-210	500-827	207-522

1. *DESIGN & 3D- MODEL*: We made a Design of Mechanized anti-theft system on NX Unigraphics. We made all components separately after that all parts has been assembled and we get MATS.

1.1 *Assembly*: MATS has been Assembled on NX Unigraphics. For this assembly we had to design all components. after that finally we get it.

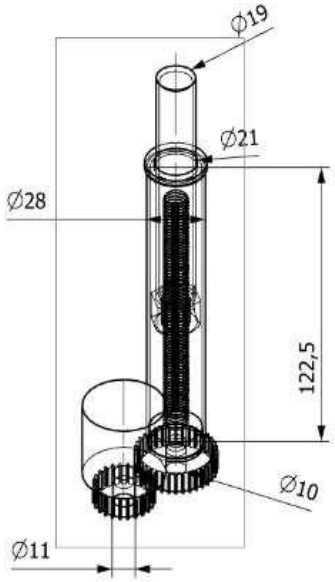

Figure 1 2 Dimensional and its specification of MATS

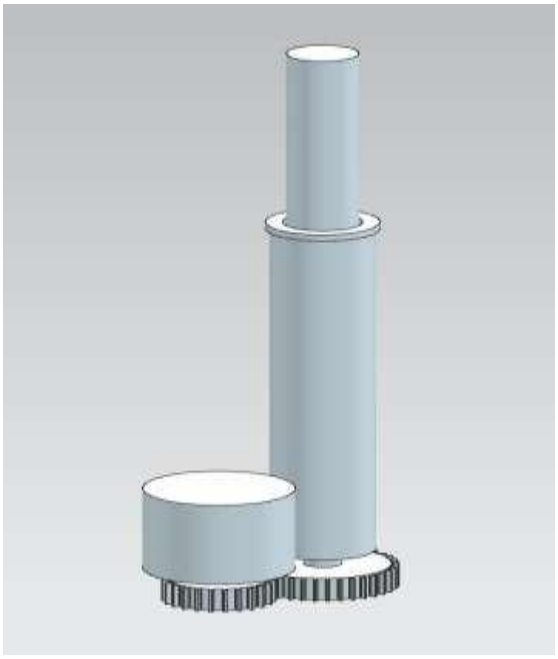

Figure 2 3-dimensional assembly of MATS

ANALYSIS OF ASSEMBLY PART

For conducting the analysis on the MATS ANSYS Software is used. Materials used are Stainless Steel is used for Inner Hollow Shaft is used for the Locking mechanism.

Meshing 3D Model

Analysis of the MATS Part Analysis such as Total Deformation, force is conducted on the assembly part by applying all the constraints.

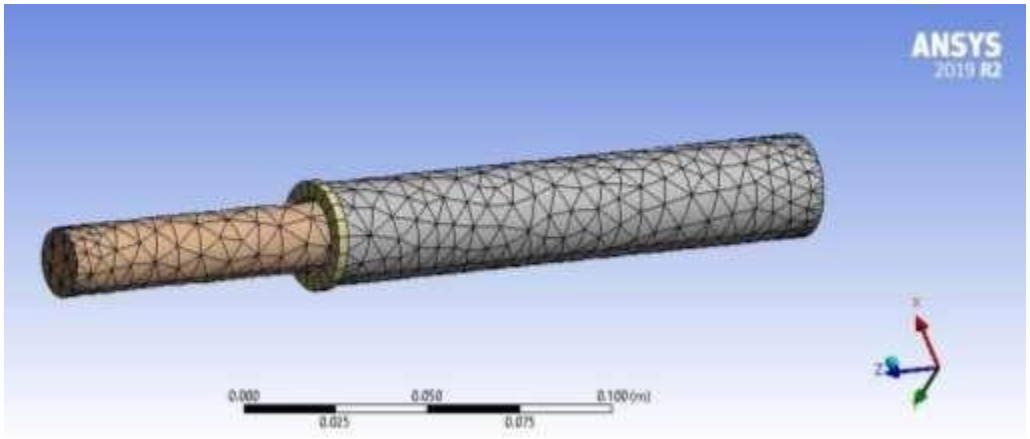

Figure 3 Meshing of MATS

Modelling & Simulation

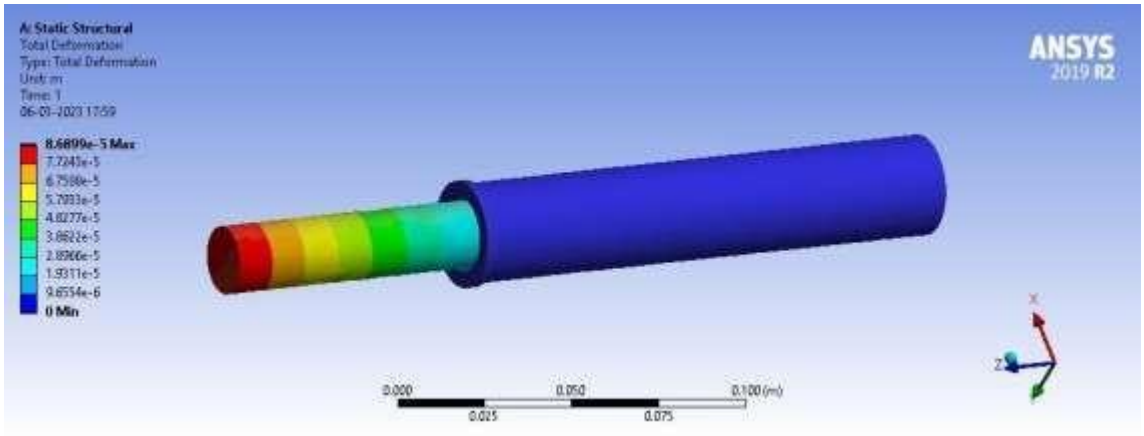

Figure 4

Total deformation max = 8.6899e-5max

Min = 0

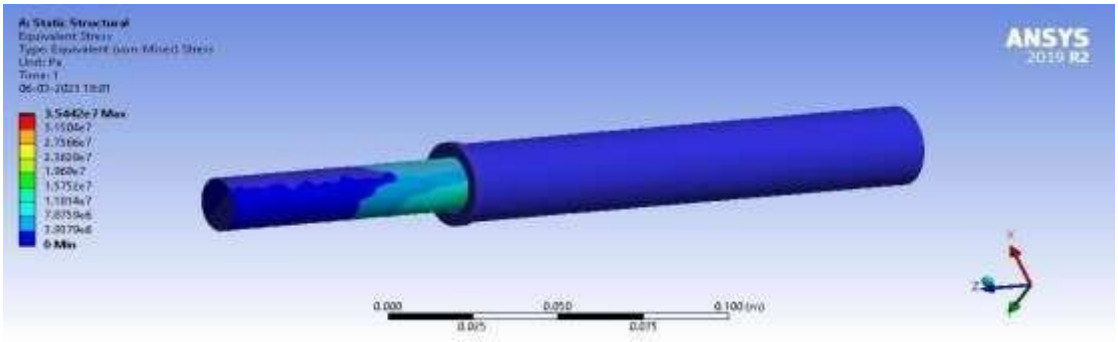

Figure 5

Total Equivalent Stress = 3.5442e7Max

Min = 0

ANALYSIS OF ASSEMBLY PART

For conducting the analysis on the MATS ANSYS Software is used. Materials used are Stainless Steel is used for Inner Hollow Shaft is used for the Locking mechanism.

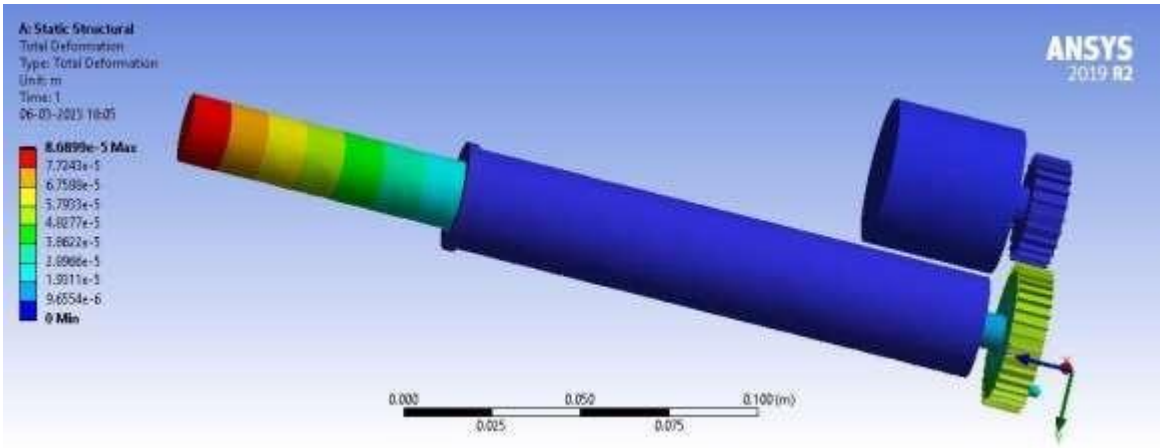

Figure 6

Total deformation max = 8.6899e-5max

Min = 0

CONCLUSION

Mats is a ground-breaking system that is enhancing bike safety. It is a straightforward system, but there are many upgrades that can be made to it while it is still in the development phase, such as a GPS tracker that will track the real-time location of the vehicle, a sos system that can sense an impact and alert the appropriate parties in an emergency, and a proximity sensor that can detect the presence of an alloy rim so that the shaft won't be damaged. Our vision is to make it an additional accessory for the new or existing bike and this system will cost under 1000 making it more project friendly for the user.

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