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DESIGN AND FEA ANALYSIS OF WARM AND WARM WHEEL GEAR BOX FOR AUTOMATION IN HAND BRAKE OF LMV

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ABSTRACT :- Hand brake is one of the most important components in vehicles. In general the hand brake is operated manually. In this undertaking we are creating Ignition Switch Operated Automatic Parking Brake System for wellbeing reason. The hand brake engagement and disengagement is done with the help of contact type limit switches operates the motor.

Key Point - Hand brake, ANSYS, Warm gear box.

I. INTRODUCTION

In cars, the parking brake, additionally known as emergency brake, hand brake, or e-brake, is a latching brake sometimes used to keep the vehicle stationary. It's generally additionally accustomed prevent a vehicle from rolling once the operator desires each feet to work the clutch and throttle pedals. Automobile hand brakes sometimes contain a cable directly connected to the brake mechanism on one finish and to a lever or pedal at the driver's position. The mechanism is usually a non- programmed switch (subsequently the crisis brake name), on the ground on one or the other part of the rationale power, or a force handle arranged beneath and near the wheel section, or a (foot-worked) pedal arranged way except for the contrary pedals. Albeit by and large called a hand brake, utilizing it in any crisis any place the footbrake keeps on being functional is most likely going to severely resentful the brake equilibrium of the auto and monstrously increment the likelihood of loss of the executives of the vehicle, for example by starting a back tire slide. For sure, the guide in halting the vehicle. The hand brake operates totally on the rear wheels that have reduced traction whereas braking however in some cases, hand brake operates on front wheel, as wiped out most Citroens manufactured since the tip of World War II. The emergency brake is instead supposed to be used just in case of mechanical failure wherever the regular footbrake is inoperable or compromised. Trendy brake systems square measure usually terribly reliable and equipped with dual circuit hydraulics and low-brake-

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fluid sensing element systems, which means the handbrake is never accustomed stop a moving vehicle.

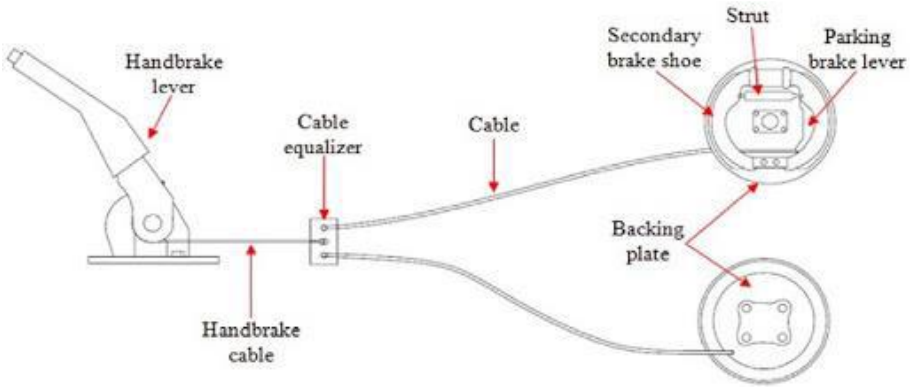

Fig. 1 Show Basic Layout of Parking Brake

1.1 Working of hand brake

1. When the handbrake is applied, the brake cable passes through an intermediate lever, to increase the force of your pull; this force is then split evenly between your brakes by an equalizer.
2. Hand brake only works on the rear wheels, so you're not getting four wheel braking. On drum-brakes, the handbrake is connected to a small lever that pivots against the end of one of the brake actuating pistons. When you pull the handbrake, the lever gets pulled and the brake shoes are pressed out against the inside of the drum. Due to this break will apply.
3. To develop an automatic handbrake for engaging and disengaging handbrake automatically. This also acts as a park assist thus reduce the driver error. Automation is done by using ignition switch position and self locking achieve by using warm n warm wheel gear box.
4. By automating the handbrake, it reduces the chance for the driver drive the vehicle with handbrake engaged. This will increase the life of brake pads and shoes. This also help in engaging the handbrake automatically thus reduce the accidents caused by rolling of vehicle when parked.

II. PROBLEM STATEMENTS

1. In lock condition if vehicle is running its cause in break drum heat and broken due to overheat.
2. Same case happen in Electrical vehicle then causes of overheating of wiring of vehicle or motor will be bust due to over loading.
3. According to hand book of Maruti 800, Hand brake need 20 Kgf force to engaged the rear wheel brake. And hand brake Pawl mechanism need to locked in between 3-6 Notches but sometimes applied of insufficient force handbrake may not engaged, due to these accident may

occurs.
4. Sometimes driver has not remembered to apply of remove the hand break.

2.1 OBJECTIVE

1. To reduce the effort of the driver that leads in conventional one.
2. To increase the comfort and safety for the driver by using modified parking brake system named as automatic handbrake for engagement and release system.
3. In this to developed a warm and warm wheel gear for self locking of system
4. As when the ignition switch turned ON, handbrake must disengage and vice versa when ignition switch is OFF, handbrake must engage.
5. System may work electro mechanically using motor, sensor and gear box.

2.3 METHODOLOGY

1. Study of existing hand brake system in vehicle with the help of actual model.
2. Calculating force and displacement of wire requirements for breaking by using hand brake.
3. Design of basic layout for hand breaking.
4. Selection of motor and calculating of gear box requirements
5. Design of Gear box and 3D
6. Analysis of gear box for loading condition
7. If possible to reduction in weight of gear box by using weight optimization then we go for weight optimization of gear box. Depends upon the FEA results.
8. Manufacturing of model as per final dimension after optimization of all.
9. Testing of final model on actual vehicle.

III. PROPOSED MODEL

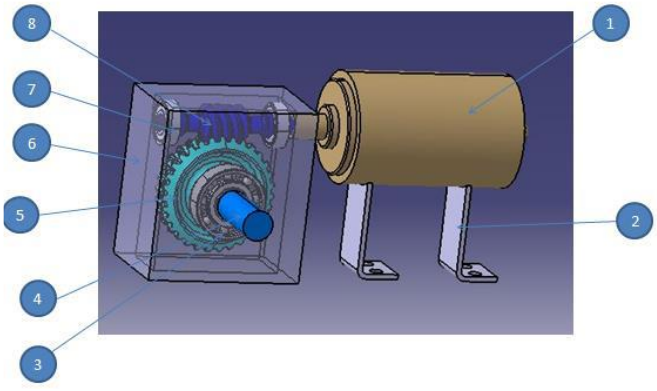

Fig. 2 Proposed 3D model of Automatic break

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Sr. No.	Name	Qyt
1	Motor	1
2	Motor Support	2
3	Bearing	2
4	Output Shaft	1
5	Worm Wheel	1
6	Gear box	1
7	Bearing	2
8	Worm	1

Table 1. BOM of Proposed Model

3.1 DESIGN

Selection of proper motor by using given data from the industry

Hand Brake should be applied in 0.5 sec & in this the cable wire travel distance should not Exceed 60 mm Consider output shaft dia =10mm

$= 2\pi r$

$= 2x\pi x5$

$= 31.4$

So we required = 240 rpm

3.2 Selection of Motor

Motor Model:- 95 to 135 cc		
1	Rated Voltage	12 v
2	Rated Power	0.35 kw
3	Assured Performance @ 10v	80A Max. 7000rpm
4	Lock Torque @ 6v	250A max
5	Application	Starter Motor

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Input (12v motor)	Output
Motor Power = 0.35 kw	Speed of out Shaft = 240 r.p.m
Speed of Motor = 7000 r.p.m	

3.3 Speed reduction gear box calculation

Therefore now we have Input speed & output speed.
Input speed = 7000 R.P.M
Output speed = 240 R.P.M
Speed Ratio = Input speed / Output speed
= 7000 / 240
= 29.16
1:30 Gear Ratio for this speed reduction is required Hence, we require warm and warm wheel gear box for large speed reduction as well as self locking mechanism.

IV. FINITE ELEMENT ANALYSIS

Warm

Model

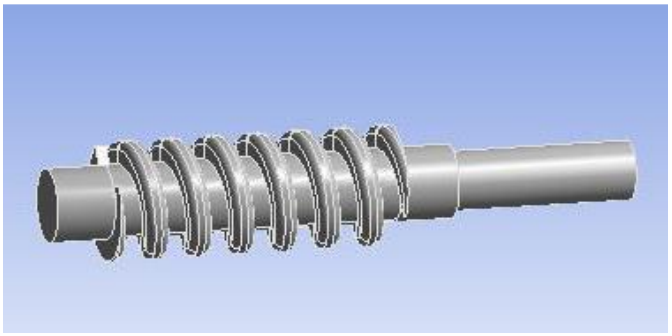

Fig.3 Geometry imported in ANSYS of Warm

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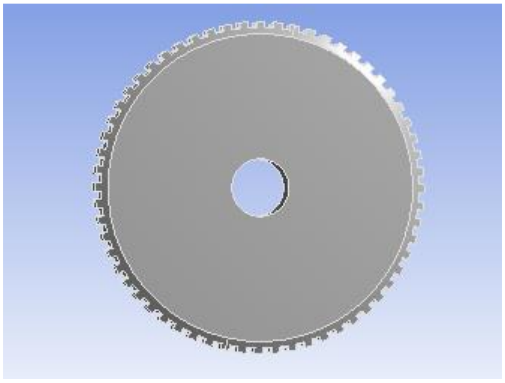

Fig.4 Geometry imported in ANSYS of

Warm wheel

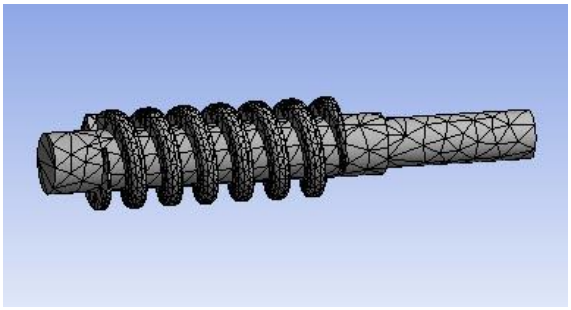

Fig.5 Meshing of Warm

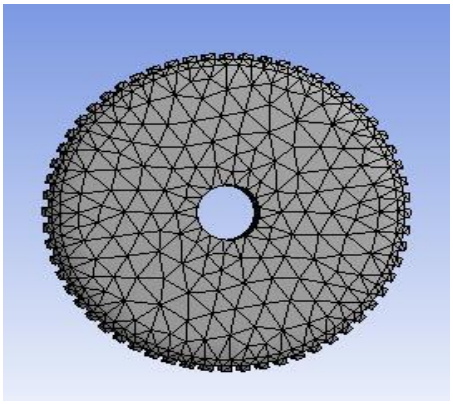

Fig.6 Meshing of Warm wheel

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V. ANSYS RESULTS

Boundary condition

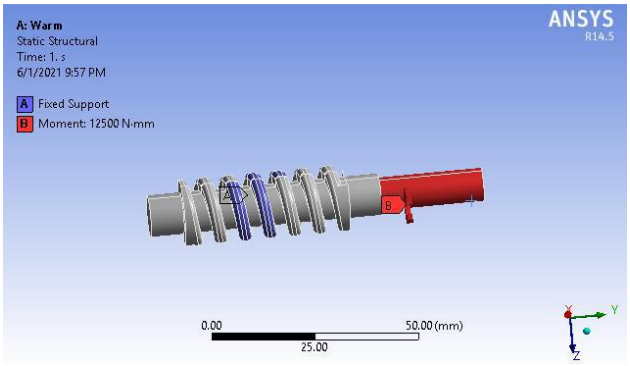

Fig.9 Show a boundary condition of applied 12500 N-mm Moment at one end of the shaft and Outer Dia. is fix in warm

Stress

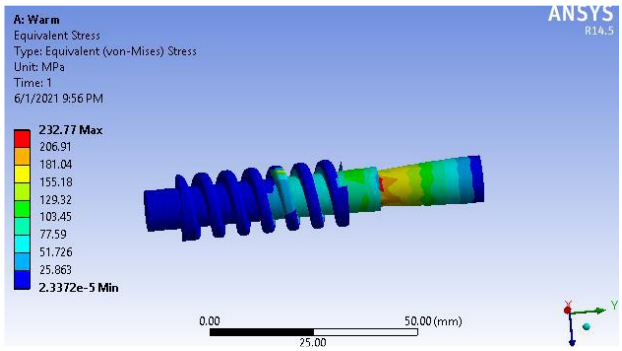

Fig.10 Show a stress in shaft after applied 12500 N-mm Moment at one end of the shaft and Outer Dia. is fix in warm

Deformation

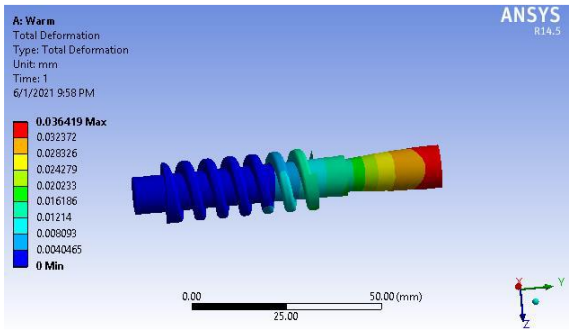

Fig.11 Show a Deformation in shaft after applied 12500 N-mm Moment at one end of the shaft and Outer Dia. is fix in warm

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Boundary condition

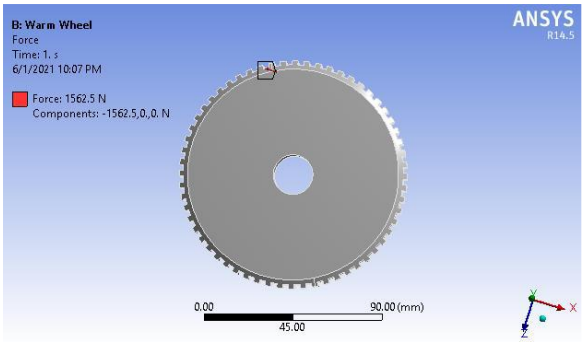

Fig.12 Show a boundary condition of applied 1562.5 N forces at one tooth and center of warm wheel is fixed

Stress

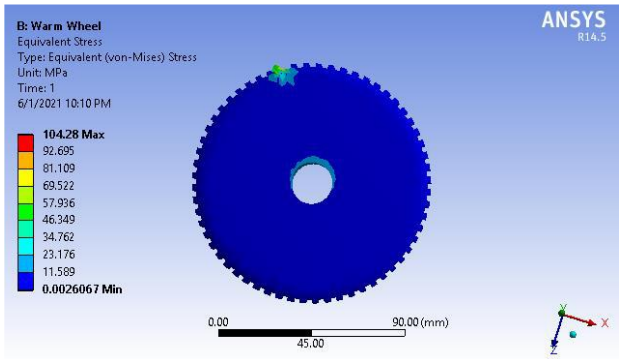

Fig.13 Show a Stress of applied 1562.5 N forces at one tooth and center of warm wheel is fixed

Deformation

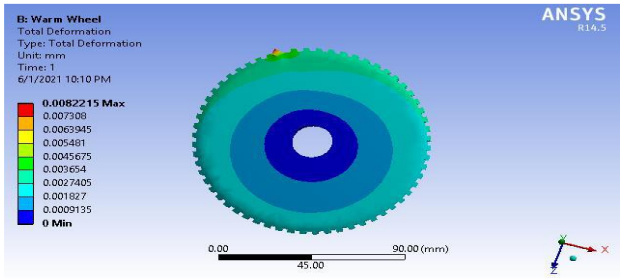

Fig.14 Show a Deformation of applied 1562.5 N force at one tooth and center of warm wheel is fixed

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RESULT TABLE

Sr. No.	Boundary Condition	Warm		Warm Wheel	
		Deformation (mm)	Stress (MPa)	Deformation (mm)	Stress (MPa)
1	1562.5 N force	NA	NA	0.00822	104.28
2	12500 N-mm Moment	0.036	232.77	NA	NA

VI. CONCLUSION

From the results obtained it is concluded that Stress occurred in the both parts are not more than allowable stress, hence both are protected. Stress happened in warm wheel is excessively not exactly passable pressure, consequently we can go for enhancement in same. Slowing down activity will be initiated and deactivated simply by utilizing start switch. Worm n worm gear acts as a locking mechanism for applying brakes. Development of new designed parking brake system has complete automatic operation for easy drivability and safety.

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