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Comparative Approach to the Application of Tires for Two-Wheeled Vehicles

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ABSTRACT: Tires are the most important component of any vehicle; the mobility of the two-wheeler is determined by the motion of the wheels. Tires are generally comprised of rubber, and the composition of the rubber keeps it soft, therefore new tires with various compositions are utilized nowadays. Much research is carried out using various design tools for different tire materials, but the readily applicable research is limited, hence this research on the actual vehicle is required to understand how tires operate. The study is carried out to assess the qualities of tube tires and tubeless tires based on real-world testing in various places and roads as actual two-wheeler riding is carried out to evaluate their performance. As a result, utilizing a tubeless tire is the most effective and cost-effective option for a bike rider. The usage of tubeless tires is expanding because they have additional advantages, among which is that they are less likely to puncture. As various sorts of studies are to be conducted, tubeless tires will be utilized in most cars in the next years, and the advanced material tube will be produced to minimize punctures in tube tires.

KEYWORDS: Spokes, Rim, Rubber, Tube, Tubeless, Tire, Vehicle.

1. INTRODUCTION

Transportation was changed with the invention of the wheel in history, after which the use of the wheel become obvious for all transportation mechanisms. The shape, size, and several wheel changes with the material used for manufacturing wheels. Vehicles are used for a century as a mode of transportation have two wheels to eight wheels. The tires are the considered main element of the automobile as the running or working is done by a wheel of a vehicle. The tires usually are made up of rubber with having air filling cavity for filling the air inside. The wheels are the main alignment of the vehicle and have main parts tube, tire, and spokes. Tires are the main component in any vehicle as they give the required traction to the vehicle. The wheels carry the weight of all vehicle embodiment and the passengers within it while running on the road. The wheels of the vehicle also support the passenger within it on irregular roads and also help in reducing the noise of the vehicle to a certain level [1][2].

The wheel alignments are now modified based on the different wheel types available in the market which are depending on wheel design, tube presence, and spoke wheel alignment. The use of wheels is different for different vehicles based on their design and application. The tire of the wheel is observed in two types, they are available with tube and tubeless as well. All the tires of the vehicle are made from the same material, the peripheral design of wheels changes according to the company design that is manufacturing the wheel tires for the vehicles. There are two types of tires in the market on which all the vehicles run tube tires and tubeless tires. Tube tires are

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having a cavity that is used for putting the air-filled rubber tube inside the cavity of the tire. Tubeless tires are no-tube tires that are thick and hard and are used in most vehicles [3]–[5].

The tubed tire are used since history in the vehicle's wheel alignment. The tubed tire has one tube placed within the tire and covered with a spokes rim over it having multiple metallic spokes. There are cycles and bikes where spokes and wheel arrangement is seen mostly and are known examples of tube tires. The rims are used in the vehicle wheel where tubes are used in the tire alignment. Many bike models still have traditional look and are on the list of the costlier bike like Avenger, Royal Enfield, etc., and classic models of old cars like Maruti have the wheel tire-tube arrangement. The wheel embodiment is of the tube, tire, rim, and spokes, which are moving on track with rolling friction to maintain the traction of the vehicle. The tubes are air holding circular apparatus made of synthetic rubber placed inside the tire, to get the toughness in the wheel [6], [7].

The tubeless tires are now used in vehicles that can sustain high load working depending on their application. The tubeless tires are hard than tube tires and there is no need for an air tube to install within them. The spoke wheel is a metallic ring having metallic spoke alignment and is used for vehicles that are huge in weight to get less rolling resistance in smooth road conditions. The tubeless tire is hard than tube tires as there is no tube installed within it. The tubeless tire has low rolling resistance, as the air is directly placed within the tire and rim so there are no frictional losses, and stability of the vehicle is maintained which is seen in a sport bike [8].

Different experts and researchers have done their research on tires having different designs and properties as the tire is the main part of the automobile system. The function of a tire is to maintain the stability of the vehicle while rolling on the road with minimum rolling resistance. There are two types of tires used in automobiles tube tires and tubeless tires. There is much research that is comparing tube tires and tubeless tires, but there is very less research on the actual working of the tire, so it is needed and necessary to know all the hidden aspects of tires. Many conditions affect the working of a tire which creates an economic loss to the vehicle owner, so before buying any vehicle buyers should know the properties and work of tube and tubeless tires under different conditions [9], [10].

2. DISCUSSION

The tire is the main part of any vehicle as the tires are used to move on the road while carrying all the load present in the vehicle. The study is focused on analyzing the different properties of both the tubeless and tube tire under working conditions. The tube tires are heavy as the external air-filled rubber tube is placed in-between the tire which is enclosed by the wheel rim as shown in Figure 1. The wheel rim has several spokes that are connected to the wheel alignment through bearing. The tubeless tires are light in weight as the air-filled is placed in-between the tire which is enclosed by the wheel rim as shown in Figure 2. The tubeless tire is mostly used in vehicles that are working on smooth roads. The main function of the tire is to give more efficiency under any load condition and rolling resistance.

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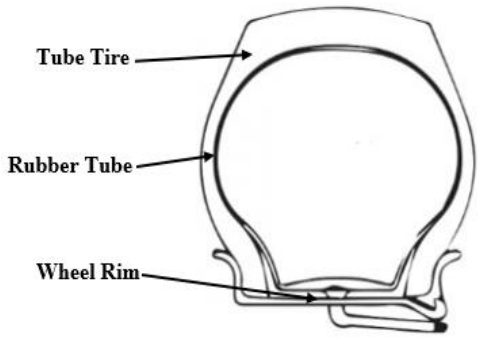

Figure 1: Illustrates the Tube Tire Arrangement of Wheel Used on Vehicle

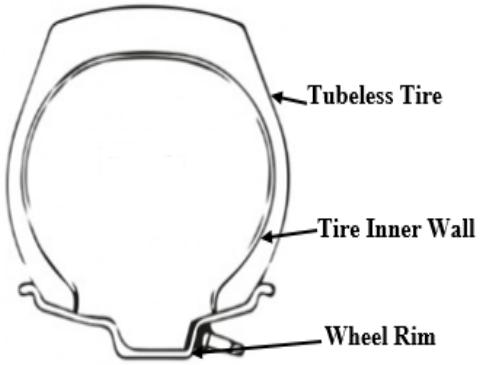

Figure 2: Illustrates the Tubeless Tire Arrangement of Wheel Used on Vehicle

The comparison of tube tires and tubeless tires is based on, Tube application in the tire, Rolling resistance, Effect of Weight of tire, Repairing of puncture in the tire, Damaging of the tire, Efficiency of the bike using the tire, Mileage of bike, Life Of Tire, Rim Design, Safety of rider, friction and Need Any Special Care While Using as shown in Table 1. The tube tires are mostly used for the vehicles which had the spoke rings in wheel alignment while the spoke wheel is used for tubeless tires as the tires are hard and difficult to fit the spoke wheel. The comparison is done to analyze the working of bikes using both types of the tire in their embodiment which is mentioned in Table 1.

Table 1: Illustrates the Comparison of Tube Tire and Tubeless Tire based on Properties, Working, and Performance

Sr. No.	Comparison of tires	Tube	Tubeless
1	Tube application in tire	The tube is filled with air	No tube air is directly filled in the tire
2	Rolling resistance	high	low

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3	Effect of Weight of tire	Heavy when the tube is filled with air	Light in weight
4	Repairing of puncture in the tire	Easy to repair tire puncture.	As they are hard there are fewer chances of punctures
5	Damaging of tire	The tired are damaged easily due to uneven loading	The spokes may get bent on the uneven road.
6	The efficiency of the bike using the tire	Fuel efficiency is maintained if the air pressure is maintained as per the standard.	Fuel efficiency is maintained when the bike is running with low rolling resistance.
7	Mileage of bike	low	high
8	Life Of Tire	Long life if bike is operated by the same person	Long life and don't need special care.
9	Rim Design	Spoke rim	Rim wheel
10	Safety of rider	Due to friction on long routes, there are chances of the tire getting busted.	The tire does not get busted, the rider can ride with less air also up to the desired location.
11	Friction	High friction	Low friction
12	Need Any Special Care While Using	The air should be checked regularly to maintain the tire condition.	The tire should not get damaged on the side edge.

3. CONCLUSION

The tubed tire and tubeless tire are mostly used in an automobile but with change in time, the tube tires are replaced by tubeless tires due to their properties. The tubed tire has a rubber tube filled with air which makes it heavy while tubeless tires are directly fixed with a rim wheel with a special tool. The conclusion obtained by using the bikes having different tire orientations is that both the tires are good in their working depending on the area where the bike rides. The tubeless tires are good on smooth roads as they cover the high distance in less time as a big wheel gives stability to the bike. The tube tires are good on uneven roads as the spoke rim arrangement adjusts the jerk obtained due to uneven track. Due to the hard material of tubeless tires, there are fewer chances of puncture and if the puncture is there it is easy to repair if it is on a flat surface but if there is a puncture on the side edge of the tire using such tire should be avoided. The tubed tire is not much

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harder as there is a rubber tube placed inside the, there are many chances of puncture in the tire but the tube puncture should not be neglected. Thus, using tubeless tires is more convenient than tube tires if the work of the bike is on highway roads for long-running. There will be more use of tubeless tires in the next few years due to their hard nature and durability.

REFERENCES:

[1] G. Hermenegildo, E. Bischoff, R. S. Mauler, M. Giovanela, L. N. Carli, and J. S. Crespo, "Development of chlorobutyl rubber/natural rubber nanocomposites with montmorillonite for use in the inner liner of tubeless ride tires," *J. Elastomers Plast.*, 2017, doi: 10.1177/0095244315627855.

[2] M. Dasgupta, S. Das Gupta, R. Mukhopadhyay, and A. Bandyopadhyay, "Derivation of a New Compounding Ingredient for Rubber from Waste Marble Powder and Study on its Suitability in an Innerliner Compound of Tubeless Tyres," *Prog. Rubber, Plast. Recycl. Technol.*, 2016, doi: 10.1177/147776061603200201.

[3] B. Costemalle, "Tire pressure loss and intracarcass pressure modeling," *Tire Sci. Technol.*, 1992, doi: 10.2346/1.2139516.

[4] M. Standards, "Standard Test Method for Static Testing of Tubeless Pneumatic Tires for Rate of Loss," *Time*, 2011.

[5] V. S. Tyurina and A. G. Shvarts, "Properties of rubbers for the sealing layer of tubeless tyres, based on the use of chlorinated butyl rubber.," *Proizv. SHIN, REZINOTEKH. ASBESTOTEKH. IZDELII*, 1976.

[6] S. A. Banks, F. Brzenk, J. A. Rae, and C. S. Hwa, "Effect of Intracarcass Pressure Buildup on Tubeless Tire Performance," *Rubber Chem. Technol.*, 1965, doi: 10.5254/1.3535623.

[7] V. G. Bantsarevich and A. N. Isaeva, "Design of joins between rims and tubeless tyres.," *INT. POLYM. SCI. TECHNOL.*, 1979.

[8] S. Taheri, C. Sandu, S. Taheri, E. Pinto, and D. Gorsich, "A technical survey on Terramechanics models for tire-terrain interaction used in modeling and simulation of wheeled vehicles," *Journal of Terramechanics*. 2015. doi: 10.1016/j.jterra.2014.08.003.

[9] I. Bianco, D. Panepinto, and M. Zanetti, "End-of-life tyres: Comparative life cycle assessment of treatment scenarios," *Appl. Sci.*, 2021, doi: 10.3390/app11083599.

[10] C. Liu *et al.*, "Design of Two-Wheeled Motorcycle Tire Crown Contour Bioinspired by Cat Paw Pads," *Appl. Bionics Biomech.*, 2020, doi: 10.1155/2020/8898413.