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A REVIEW ON AUTOMOBILE TYRE

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Abstract: The tyres are required to carry the load of the automobile. The tyres may be with tube or tubeless. In the former, the tube is inside the tyre and contains air at high pressure. In tubeless tyre there is no tube and tyre itself contains air at high pressure. They also transfer the braking and driving torque to the road. The motion of the automobile becomes possible only when the friction acts between the tyre surface and the road surface. This friction is required for the stability of the moving automobile. The friction must not go beyond a particular limit as it will cause wastage of power o utput from the engine and loss of money in the form of wastage of fuel. The tyres also absorb the vibrations due to the uneven road surface. The road may be dry or wet, it may be a concrete road, or may be paved with gravel or asphalt. Sometimes automobile may be required to move on a ' rough' road. The tyres must be capable of providing stability to the automobile in all these varying conditions..This paper gives the information related to tyre.

Keywords: -tyres, automobile, tubeless tyre, tyre specifications, tyre materials

I. INTRODUCTION

The materials of modern pneumatic tires are synthetic rubber, natural rubber, fabric and wire, along with carbon black and other chemical compounds. They consist of a tread and a body. The tread provides traction while the body provides containment for a quantity of compressed air. Before rubber was developed, the first versions of tires were simply bands of metal fitted around wooden wheels to prevent wear and tear. Early rubber tires were solid (not pneumatic). Today, the majority of tires are pneumatic inflatable structures, comprising a doughnut-shaped body of cords and wires encased in rubber and generally filled with compressed air to form an inflatable cushion. Pneumatic tires are used on many types of vehicles, including cars, bicycles, motorcycles, buses, trucks, heavy equipment, and aircraft. Metal tires are still used on locomotives and railcars, and solid rubber (or other polymer) tires are still used in various non-automotive applications, such as some casters, carts, lawnmowers, and wheelbarrows.

Synthetic rubbers were invented in The laboratories of Bayer in the 1920s46, Michelin developed the radial tire method of construction. Michelin had bought the bankrupt Citroën automobile company in 1934, so it was able to fit this new technology immediately. Because of its superiority in handling and fuel economy,

Tyres of this technology quickly spread throughout Europe and Asia. In the U.S., the outdated bias-ply tire construction persisted, with market share of 87% as late as 1967 Delay was caused by tire and automobile manufacturers in America "concerned about transition costs. "in1968, Consumer Reports, an influential American magazine, acknowledged the superiority of radial construction, setting off a rapid decline in Michelin's competitor technology. Even in the U.S., the radial tire now has a market share of 100%.

II. TYRE MATERIAL

Rubber is the main raw material used in manufacturing tires, and both natural and synthetic rubber are used. Natural rubber is found as a milky liquid in the bark of the rubber tree, HeveaBrasiliensis. To produce the raw rubber used in tire manufacturing, the liquid latex is mixed with acids that cause the rubber to solidify. Presses squeeze out excess water and form the rubber into sheets, and then the sheets are dried in tall smokehouses, pressed into enormous bales, and shipped to tire factories around the world. Synthetic rubber is produced from the polymers found in crude oil. The other primary in

Gradient in tire rubber is carbon black. Carbon black is a fine, soft powder created when crude oil or natural gas is burned with a limited amount of oxygen, causing incomplete combustion and creating a large amount of fine soot. So much carbon black is required for manufacturing tires that rail cars transport it and huge silos store the carbon black at the tire factory until it is needed.

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Sulfur and other chemicals are also used in tires. Specific chemicals, when mixed with rubber and then heated, produce specific tire characteristics such as high friction (but low mileage) for a racing tire or high mileage (but lower friction) for a passenger car tire. Some chemicals keep the rubber flexible while it is being shaped into a tire while other chemicals protect the rubber from the ultraviolet radiation in sunshine.

A passenger car tire is manufactured by wrapping multiple layers of specially formulated rubber around a metal drum in a tire-forming machine. The different components of the tire are carried to the forming machine, where a skilled assembler cuts and positions the strips to form the different parts of the tire, called a "green tire" at this point. When a green tire is finished, the metal drum collapses, allowing the tire assembler to remove the tire. The green tire is then taken to a mold for curing.

III. TYRE MANUFACTURING PROCESS

The first step in the tire manufacturing process is the mixing of raw materials to form the rubber compound. Railcars deliver large quantities of natural and synthetic rubber, carbon black, Sulfur, and other chemicals and oils, all of which are stored until needed. Computer control systems contain various recipes and can automatically measure out specific batches of rubber and chemicals for mixing. Gigantic mixers, hanging like vertical cement mixers, stir the rubber and chemicals together in batches weighing up to 1,100 pounds.

Each mix is then refilled with additional heating to soften the batch and mix the chemicals. In a third step, the batch goes through a mixer again, where additional chemicals are added to form what is known as the final mix. During all three steps of mixing, heat and friction are applied to the batch to soften the rubber and evenly distribute the chemicals. The chemical composition of each batch depends on the tire part—certain rubber formulations are used for the body, other formulas for the beads, and others for the tread, Body, beads, and tread.

once a batch of rubber has been mixed, it goes through powerful rolling mills that squeeze the batch into thick sheets. These sheets are then used to make the specific parts of the tire. The tire body, for instance, consists of strips of cloth-like fabric that are covered with rubber. Each strip of rubberized fabric is used to form a layer called a ply in the tire body. A passenger car tire may have as many as four plies in the body.

For the beads of a tire, wire bundles are formed on a wire wrapping machine. The bundles are then formed into rings, and the rings are covered with rubber.

The rubber for the tire tread and sidewalls travels from the batch mixer to another type of processing machine called an extruder. In the extruder, the batch is further mixed and heated and is then forced out through a die—a shaped orifice—to form a layer of rubber. Sidewall rubber is covered with a protective plastic sheet and rolled. Tread rubber is sliced into strips and loaded into large, flat metal cases called books.

The rolls of sidewall rubber, the books containing tread rubber, and the racks of beads are all delivered to a skilled assembler at a tire-building machine. At the centre of the machine is a collapsible rotating drum that holds the tire parts. The tire assembler starts building a tire by wrapping the rubber-covered fabric plies of the body around the machine drum. After the ends of these plies are joined with glue, the beads are added and locked into place with additional tire body plies laid over the beads.

Next, the assembler uses special power tools to shape the edges of the tire plies. Finally, the extruded rubber layers for the sidewalls and tread are glued into place, and the assembled tire—the green tire—is removed from the tire-building machine.

A green tire is placed inside a large mold for the curing process. A tire mold is shaped like a monstrous metal clam which opens to reveal a large, flexible balloon called a bladder. The green tire is placed over the bladder and, as the clamshell mold closes, the bladder fills with steam and expands to shape the tire and force the blank tread rubber against the raised interior of the mold. During this curing process, the steam heats the green tire up to 280 degrees. Time in the mold depends on the characteristics desired in the tire.

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After curing is complete, the tire is removed from the mold for cooling and then testing. Each tire is thoroughly inspected for flaws such as bubbles or voids in the rubber of the tread, sidewall, and interior of the tire. Then, the tire is placed on a test wheel, inflated, and spun. Sensors in the test wheel measure the balance of the tire and determine if the tire runs in a straight line. Because of the design and assembly of a modern tire, rarely is one rejected. Once the tire has been inspected and run on the test wheel, it is moved to a warehouse for distribution.

IV. TYRE COMPONENTS

Fig.1 Tyre Components

Tread/belt assembly consisting of:

1. Tread – high mileage good road and water expulsion.
2. joint less cap plies – enable high speeds.
3. Steel-cord belt plies – optimise directional stability and rolling resistance.

Casing, consisting of:

1. Textile cord ply – controls internal pressure and maintains the tyre ‘s shape.
2. Inner liner – makes the tyre airtight.
3. side wall – protects from external damage.
4. Bead reinforcement –promotes directional stability and precise.
5. Bead apex –promotes directional stability, and comfort level.

Bead core –ensure firm seatingonthe rim.

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V. TYRE TREAD TYPES

Fig.2 Symmetric

Fig.3 Asymmetric

Fig.4 Unidirectional

Symmetric tread:- design can be commonly seen on the tyre of many cars. As their name itself indicates, symmetrical pattern refers to treads which feature similar continuous design across the tread on either sides of tyre. Tyres with this type of pattern are normally non-directional, meaning that they can be fitted without worrying about a specific rotational direction.

Unsymmetrical Thread :- Exactly opposite to the symmetric tread pattern asymmetric tyre treads feature dissimilar designs on both the sides. This disc-repancy in their design allows better grip on flat out roads and also while making turns. Generally, the outer area of such tyre has broad design whereas the inner carries smaller independent tread blocks, as seen On symmetric design.

Unidirectional Tyre Tread Pattern:-

The unidirectional (also known as directional) tread patterns are made to as perform well when fitted on a specified direction thus direction is generally thus marked with help of an arrow on the sidewalls. This type oftyreshave 'V' shaped tread design which helps increasing aquaplaning resistance when the vehicle is running on high speeds, by efficiently cutting it through this unique pattern

VI.SPECIFICATIONS OF TYRE

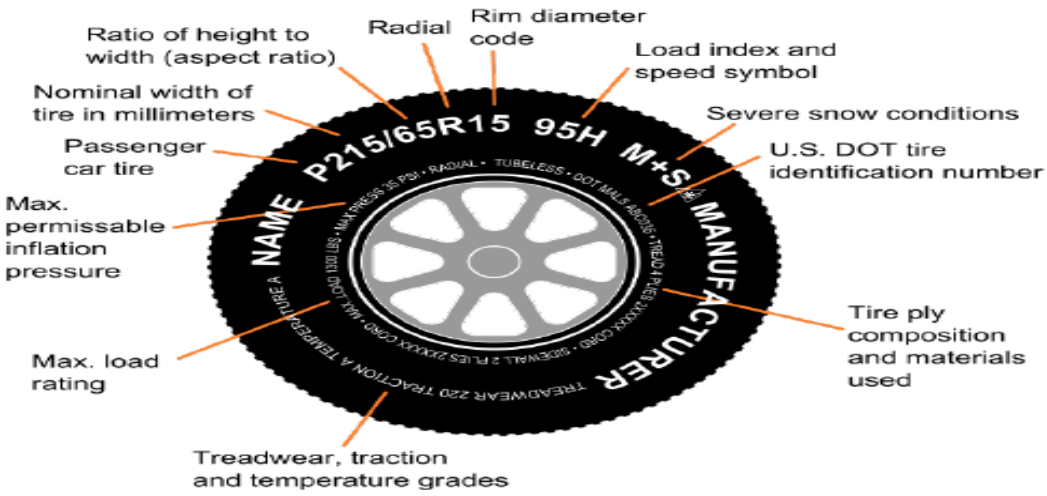

Fig.6 Specifications Of Tyre

VII. DIFFERENCE BETWEEN TUBE AND TUBELESS TYRE

Table.1 Difference between tube and tubeless tyre

Sr no	Tube tyre	Tubeless tyre
1	Tubes are present inside the tyre.	Tubes are not present inside the tyre.
2	Weight is high.	Weight is low.
3	Cost is low.	Cost is high.
4	Tyres may get puncture, suddenly may loss air pressure.	Tyres may get puncture, slowly loss may air pressure.
5	Maintenance cost is low.	Maintenance cost is high.
6	Puncture can be removed anywhere.	puncture of tubeless tyre can be removed only where they fix.
7	High efficient.	Low efficient.

VIII. ADVANTAGES of Tyre

- Easy maintenance.
- Does not puncture easily.
- In case of puncture, loses air slowly allowing to keep riding until one reaches a service area.
- Easy puncture repair.
- Longer tyre life.
- Can be combined with a tube temporarily in case of a hung puncture.
- Capable to be driven on higher speed.
- Can be used on nitrogen air.

V. CONCLUSION

Basic information related to automobile tyre is presented in this paper, the information such as tyre material tyre manufacturing process, decoding of tyre , types of tyre component, construction & types of tyre, tyres tread andtypes, difference between tube & tubeless tyre.

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