Tires and Tire Safety

Prepared for

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Dear Dr. Brucker:

The following research report was written to fulfill the requirements for your Technical Communications course. The topic of my report is tires and tire safety, by completing this task I am served two-fold. First, I have fulfilled the requirements for the research report to pass your class. Second, I have gained knowledge that will be useful in my area of study. Public safety is the main focus of Emergency Administration Management.

The information included in this paper is am attempt to explain the manufacture process of tires and the evolution of changes to increase tire safety, performance, and handling. By providing this information, the use and operating safety of tires may be increased.

Sincerely,

Kathy R. Reynolds

Table of Contents

Table of Figures and Tables

Abstract

Many people believe that poor quality tires are the reason for numerous deaths and injuries associated with “blow outs”. Even though the federal government and tire manufactures have set stringent guidelines for the manufacturing and use of tires, these incidents still occur. According to the 2000 U. S. Census the population if the U. S. is 281.4 million. Statistics also show that there were 216 million vehicles registered in the U. S. in 1999. Understanding that almost all Americans ride in vehicles that have tires, the problem puts numerous people at risk and is a matter of public safety.

INTRODUCTION

History of Tires

Before the discovery of rubber, wheels were made of metal or wood and the closest thing resembling a tire was a metal hoop. The invention of the automobile brought on a need for durable tires. In the mid-19th century Charles Goodyear discovered the process for vulcanization of rubber (Tires 1999). This heating process turned the gummy rubber tree sap into a firm pliable material that could be formed into many different items. In 1889, John Dunlop patented the idea for the first pneumatic tire, a tire filled with air (Olcott 1998). From there the idea of the rubber tire boomed. André Michelin was the first to make and use the air filled tires on automobiles. It took over sixteen years to get the process right (Olcott 1998). By 1910, B. F. Goodrich added carbon to the rubber to manufacture a more durable tire (Olcott 1998). These men gave us the basis for the tire of today. Tires have evolved to become an integral part of all automobiles and they play a role in everyone's lives either directly or indirectly.

Purpose

The intent of this report is to present information on tire maintenance and safety. To properly understand the topic, an overview of the history, use, and safety precautions for tires, is presented.

Target Audience

The primary audience for this report is Dr. Carl Brucker. The secondary audience is anyone interested in tire safety.

WHAT GOES INTO A TIRE

Materials Used in the Tire Making Process

Most tires are made out of the same materials; the only difference is the amount of each item used. The one common item that is in all tires is **rubber**. Rubber comes in natural or synthetic forms; there are hundreds of synthetic polymer types of rubber (Basic 2001).

Fabric is used as the inner layers or plies of a tire, between the tread and the innerliner. Nylon, steel, aramid fiber, rayon, fiberglass, or polyester is used in combination with one another. The right combination of these materials makes for a smooth, gas efficient ride. The plies and the layers of steel belts in a radial tire allow it to flex and absorb the irregularities of the road surface. Plies that are arranged radially also produce much less friction, resulting in longer tread life and increased fuel economy (Lesson 1997).

Reinforcing chemicals, like carbon black, silica, and resins are used to make the tires stronger and more durable. By adding these chemicals to the rubber, wear is reduced and life expectancy is increased (Basic 2001).

Curatives such as cure accelerators, activators, and sulfur are added to the rubber to aid the vulcanization process. They make the rubber firm and pliable after being exposed to the heat curing process (How 2001).

Other chemicals used in the process are:

- **anti-degradants** such as antioxidants/ozonants and paraffin waxes
- **adhesion promoters** like cobalt salts, brass on wire, and resins on fabrics

- **Processing aids** include oils, tackifiers, peptizers, and softeners (Basic 2001).

According to Goodyear Tire and Rubber, the most common size of all-season passenger tire is P195/75R14, and it weighs approximately 21 pounds. The components of a tire, broken down by weight:

- 4 lbs. of 8 types of natural rubber
- 5 lbs. of 8 types of carbon black
- 1 lb. of steel cord for belts
- 1 lb. of polyester and nylon
- 1 lb. of steel bead wire
- 3 lbs. of 40 different kinds of chemicals, waxes, oils, pigments, etc.
- 6 lbs. of 5 different types of synthetic rubber

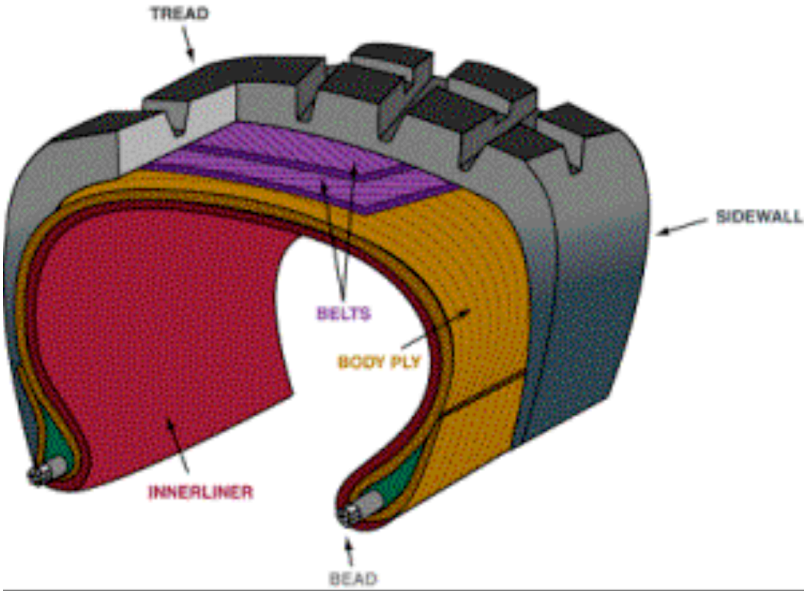

Figure 1: What's Inside A Tire?
Source: Rubber Manufactures Association (2001). Retrieved March 15 2000, from the World Wide Web: http://www.rma.org/tiresafety/whats_in_tire.html.

Layers of a Tire

All of these layers work together to form a tire. Tires used to have bias ply fabric instead of steel belts, but today's tires have been engineered to increase their strength and durability.

- Tread – The grooved surface of the tire that provides traction and grip, otherwise known as a tire's "foot print"
- Belts – Steel plies layered with fabric and rubber to provide a smooth ride.
- Sidewall – The side of the tire that protects the plies from road and curb damage
- Body Ply – A fabric and rubber layer that gives the tire strength and flexibility
- Bead – High tensile steel hoop that makes an air tight seal against the wheel
- Innerliner – A double layer of synthetic gum rubber that helps seal the tire to make it tubeless

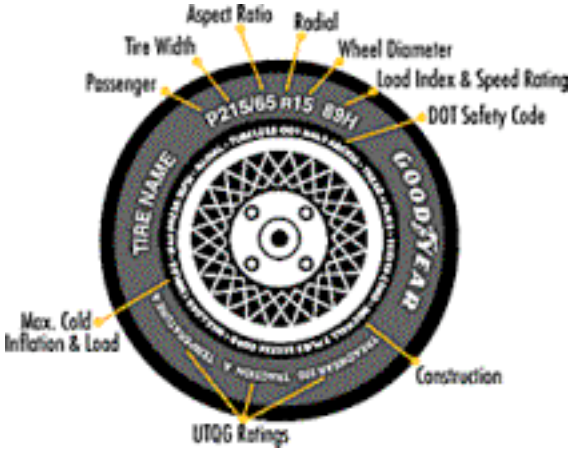

Figure 2: Sidewall of a tire
Source: Tire Specifications. (2001). Goodyear Tire & Rubber. Retrieved 1 May 2001 form the World Wide Web: http://www.goodyear.com/us/tire_school/tirespecs.html

Information on a Tire

All tires are required to have specific information molded on them. This information tells a lot about the tire, its size, whether it is tubeless or not, speed rating, maximum load, and maximum inflation. This myriad of numbers and letters gives a lot of information to those who can understand it; the following figure will take some of the mystery out of the coding.

Example: P215/65R15 89H

"P" stands for passenger tire.

"215" is the tire width in millimeters, from sidewall to sidewall.

"65" is the height to width ratio. The height is 65% of its width.

"R" stands for steel belted radial. Other alternatives are **"B"** meaning belted bias construction and **"D"** meaning diagonal bias construction.

"15" is the rim diameter in inches.

"89" is the load index.

"H" is the speed rating (Tire 2001).

The speed rating is an important piece of information; this rating is a safety limit. The letter corresponds to a maximum speed rating.

Table 1: Speed Rating

Rating	Max. Speed
Q	99mph
S	112mph
T	118mph
U	124mph
H	130mph
V	149mph
W	168mph
Y	186mph
Z	Over 149 mph

Source: Tire Specifications. (2001). Goodyear Tire & Rubber. Retrieved 1 May 2001 form the World Wide Web: http://www.goodyear.com/us/tire_school/tirespecs.html

Maximum cold inflation is another very important number on the sidewall of a tire, but to find the optimum air pressure for an automobile's tires that information will be found in the vehicle's owner's manual. Under inflation is the leading cause of tire failure (Tires 2001). According to the National Highway Traffic Safety Administration (NHTSA) in 1999 there were 647 fatalities involving "tire related factors". NHTSA also estimates that improperly inflated tires cause more than 250,000 vehicle accidents each year (Romaine 2000).

TIRE MAINTENCE

The Rubber Manufacturers Association working together with NHTSA has put together a tire maintenance checklist. They suggest for everyone to check their tires once a month and before every long trip. They are heralding the slogan, "Be Tire Smart – Play your **PART**: **P**ressure, **A**lignment, **R**otation, **T**read."

Pressure – A tire can lose up to half of its air pressure before it looks flat. Always check the air pressure with a tire gauge. Do not rely on the gauges on the air hoses at the service stations because they may have been damaged and read incorrectly. Always check the pressure when the tires are cool.

Alignment – When a vehicle is out of alignment, it "pulls" to one side or another and causes damage to the vehicle's suspension. The tires will have irregular choppy wear; it also causes a rough ride.

Rotation – Tires should be rotated at least every 6,000 miles. Proper rotation will help the tires wear evenly and can help extend their life.

Tread – Check the tire's tread, the grooves that aid in traction. When the tread is worn down, it can cause skidding and hydroplaning. Tires should be replaced when the tread is worn down to 1/16 of an inch.

CONCLUSION

Tire safety is an important concern to everyone that drives or rides. Simple routine maintenance can make a big difference in the quality of the ride of a vehicle, the life of the tires, the fuel efficiency of the vehicle, and the safety of everyone involved. An inexpensive and easy way to make a big difference in tire safety is proper tire inflation; all you need is a pressure gauge and some air.

Improvements in the engineering of tires are being made everyday. Many tire manufactures have plans on the drawing board for built-in safety features for tires. Air pressure monitors and "run-flat" technologies are what are in store for the future of the tire industry.

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