

Rate of Usage of Expired Tires and their Effect on Vehicles Performance (A Case Study: Sekondi – Takoradi Metropolis)

Mohammed Okoe Alhassan
Takoradi Technical University
Mechanical Department
Takoradi - Ghana

Joseph Sekyi-Ansah
Takoradi Technical University
Mechanical Department
Takoradi - Ghana

Stephen Eduku
Takoradi Technical University
Electrical/Electronic Department
Takoradi – Ghana

Abstract- Tires, are ring – shaped covering mounted on the rim of a wheel that serve as a cushion, and the surface for traction. Vehicle tires affect traction, braking, steering and load support to vehicle while absorbing shock and creating smooth and comfortable ride. Tires can affect the overall performance and fuel economy of a vehicle. Tires not handled properly could burst, burst tires are contributing factors to road accident. Tires have expiry date, but unfortunately vehicles users do not consider the expiry date when buying tires due to the fact that most of them are not aware or do not know how to read the date code. A survey of vehicles in Sekondi - Takoradi Township was done to ascertain whether vehicles in Sekondi - Takoradi uses expire tires or not. The survey was carried out at three places: Takoradi Township and its taxi - stations as well as the main campus of Takoradi Technical University. From the various point of observation 300 vehicles in total were sampled. The survey showed that the overall usage rate of expired tires in the Takoradi Township was 72.7% out of 110 taxis sampled, mini bus was 16.7% out of 120 vehicles, private cars 14.3% out of 70 vehicles. Overall usage of expired tires rates was consistently higher for taxis than that of the other cars. The survey carried out on tires in Sekondi – Takoradi Township revealed that, usage of expired tires rates in Sekondi – Takoradi is very alarming due to high rate of expired tire usage. It was therefore recommended that, there should be a comprehensive and sustained education on how to read expiry date code and enforcement programed in the Metropolis to increase awareness.

Keywords: Expired tires, Sekondi – Takoradi, Vehicles, Fuel Consumption, Date Code.

I. INTRODUCTION

As an automobile travels, tires add traction, braking steering and load support to the vehicles while also absorbing shocks and creating a smooth and comfortable ride. The friction between the tires and the road surfaces as the vehicle travels cause the wear which could lead to tire failure. Thus, poor wheel alignment can cause excessive wear to both the center and the edges of the tread. Gravel roads, rocky terrain and other rough terrain will cause accelerated wear. Over inflation above information on the tire side wall, can cause excessive wear to the center of the tread. Under inflation causes exces-

sive wear to the outer ribs. Unbalanced wheels can cause uneven tire wear, as the rotation may not be perfectly circular [1]. It's amazing that tires hold up as well as they do considering their vulnerability to road hazards. Many tires today are easily capable of going 60,000 to 80,000 miles or more provided they are properly installed, maintained, aligned

and inspected regularly. With proper care and "normal" use, most tires will go the distance without a problem. The development of pneumatic tires started with the patent by John Boyd Dunlop in 1888 and is still going on today. [2] The first pneumatic tires had small cross sections and high inflation pressures, mainly for bicycle applications. From the 1920s, larger tires were introduced for the upcoming vehicle industry. Two major evolutions took place in the 1960s, the tubeless tire was introduced and bias ply tires were replaced with radial ply tires, which improved the wear and handling properties significantly. The main difference between the bias and radial ply tire is the orientation of the plies. In bias ply tires, the body ply cords are laid at angles substantially less than 90° to the tread centerline, extending from bead to bead.

In radial tires, the body ply cords are laid radially from bead to bead, at 90° to the centerline of the tread. Two or more belts are laid diagonally in the tread region to obtain the required strength and stability of a tire.

As rubber on tyres ages, it increases the risk of the tread separating from the tire, causing a sudden blowout and loss of control of the vehicle. The average consumer assumes that when they buy new tires for their vehicle, they are getting new tires, not old unsold tires that may have been sitting in a warehouse for years. The date code on tyres are not obvious, and if you don't know how to read it, it is just a meaningless number on the side of the tire and because there is no expiration date on some tires, it creates a more potential hazard for consumers who buy new tires but are actually getting old tires that may be too dangerous to use. some experts are now recommending an expiration date of only 3 – 6 years from the

date of manufacture, whether a tire has been in use on a vehicle or has been sitting in a warehouse. It is said that some vehicle users are not aware of the expiry dates on tires as such do not consider the expiry date when buying tires.

There is therefore the need to carry out a research to ascertain whether drivers in Sekondi-Takoradi use expired tires. Sekondi-Takoradi, a city comprising the twin cities of Sekondi and Takoradi, is the capital of Western Region of Ghana. Sekondi-Takoradi is the region's largest city and an industrial and commercial center, with a population of **445,205 people** (2012) [3]. Our research was limited to Takoradi town, Sekondi taxi station, Anaji taxi station, Accra station and part of Takoradi Township.

II. MAIN OBJECTIVES

The study focused on the following specific objectives:
specific objectives of this study are to:

- 1.To sample or observe tires on vehicles in Sekondi – Takoradi Metropolis.
- 2.To determine whether the tires are expired or not.
- 3.To educate drivers on how to check for expired tires.

III. LITERATURE REVIEW

Pneumatic tires are used on different types of vehicles, such as bicycles, motorcycles, cars, trucks, earthmovers, and aircraft. For optimum tire life, keep the tires properly inflated, rotate them every six months or 6,000 miles (9,600 km), and have the wheel alignment checked periodically [4].

Inspect your tires frequently. Be especially careful to watch for bubbles in the tread or sidewall, deep cuts or under-inflation. Replace any tires with bubbles in the sidewall. If cuts are so deep that they penetrate to the cords, discard the tire. Any cut in the sidewall of a radial tire renders it unsafe. Also, look for uneven tread wear patterns that may indicate the front end is out of alignment, the tires are out of balance or are improperly inflated.

Since 1985, when the 27.5 mpg CAFE (Corporate Average Fuel Economy) standards took effect, there were a lot of changes in tires. Tires are very important in meeting the CAFE standards because they are responsible for 20% of a vehicle's total drag. The reduced rolling resistance of radial tires has made them the standard design. However, even with all the recent tire developments, it has to be a compromise. A tire that handles well sacrifices tread wear; a soft-riding tire sacrifices traction; a tire that reduces rolling resistance and delivers improved fuel economy sacrifices braking stability. Tire failure while driving can lead to crush and possibly injure the driver and the passengers. [5]

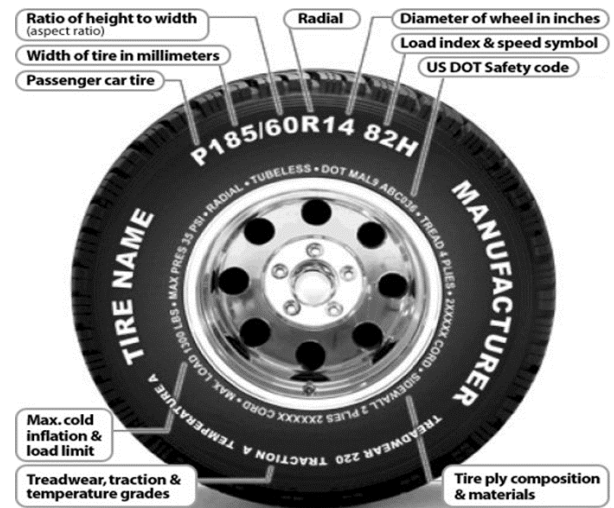


Fig. 1: Pneumatic Automobile Tire (parts)

1. Determining Tire Date Codes

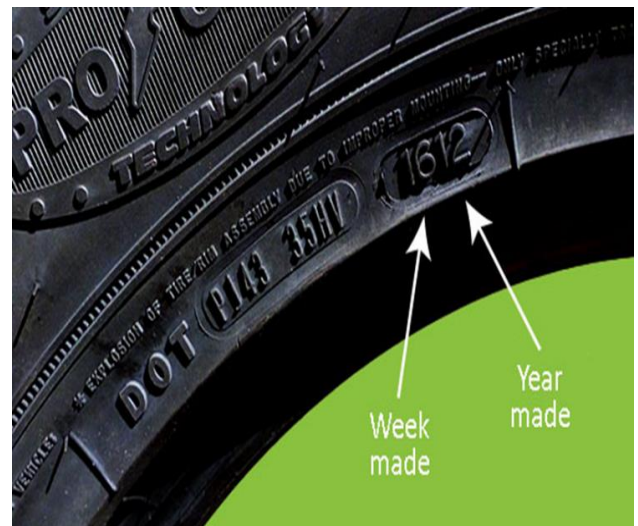


Fig. 2: Determining Tire Date Code

Tires have expiry date. To start with, vehicle tire has a 6-year validity period from their Date of Manufacture (DOM). Thereafter, the tire expires and may burst whilst in use. How to find out whether your tire has expired? First, check for a stamp like this: (*1612*). There is an asterisk at the beginning and at the end of this serial number (Some tires don't have asterisk).

The First two digits are the week so 1612 is sixteenth week in 2012. Therefore, *1612* shows that the said tire is manufactured in the 16th week of the year 2012.

Federal rules mandate that the tire's D.O.T. code be clearly branded or etched on the side of each tire. For most tires, the D.O.T. number is typically 11 digits. If the tire has only 10 digits, the tire was manufactured before the year 2000.

IV.METHODOLOGY

Sampling and Data Collection

The data used in this study were collected during a survey mounted in April 2017. By means of random observation, data were obtained from a total of 300 respondents through random sampling technique, from the various targeted point which is the Takoradi taxi stations and Takoradi-Accra station and some parts of Secondi – Takoradi Township. Attitudinal survey was also necessary because, studies have shown that it supports the observational survey in a number of ways and also enables the collection of more detailed background information than could be gathered through observational surveys.

Eligible vehicles included in the sampling were taxis, mini-buses and private cars. For all eligible vehicles, expired tires usage information was recorded for each vehicle. Sampling and observations were made in all weather conditions. If the vehicle is using expired tires, then we marked as "Expired." If the vehicle is not using expired tires, then they are marked as "Not Expired."

For each eligible vehicle observed, the following information was recorded:

- i) Vehicle type (private car, minibus /taxis,)
- ii) Driver sex (Male, Female)
- iii) Expired tires (Expire, Not expired)

Data Analysis of Survey Result

The results of both the observational and questions were analyzed upon receiving the completed data, a coding scheme was developed and each data was reviewed and coded and then entered into a computerized database using Microsoft Excel spreadsheet.

A database was also created for the results of the observational survey in Microsoft Excel spreadsheet. This was done by producing frequency figures for each question or each of the columns (variables) and examining the outliers. (i.e. frequencies, cross tabulations and charts) were generated for analysis and discussion.

V. RESULTS, FINDINGS AND DISCUSSION

1. Characteristics of observation survey

Vehicle classes in sample

From the various station point observation survey, a total of 300 vehicles, comprising 120 mini buses, 70 private cars, 110 taxis were observed in the Takoradi Township and its stations as well as the main campus of Takoradi Technical University. The data collected on vehicles for the work is tabulated.

Table 4.1 Characteristics of observation survey

Vehicle type	No. observed	Percent (%)
Mini bus	120	40%
Private car	70	23%
Taxi	110	37%
Total	300	100%

Table 4.1 shows the distribution of the eligible vehicles that were observed at the various stations and campus with their percentages and a representation of the percentages on a pie chart in figure 4.1 below.

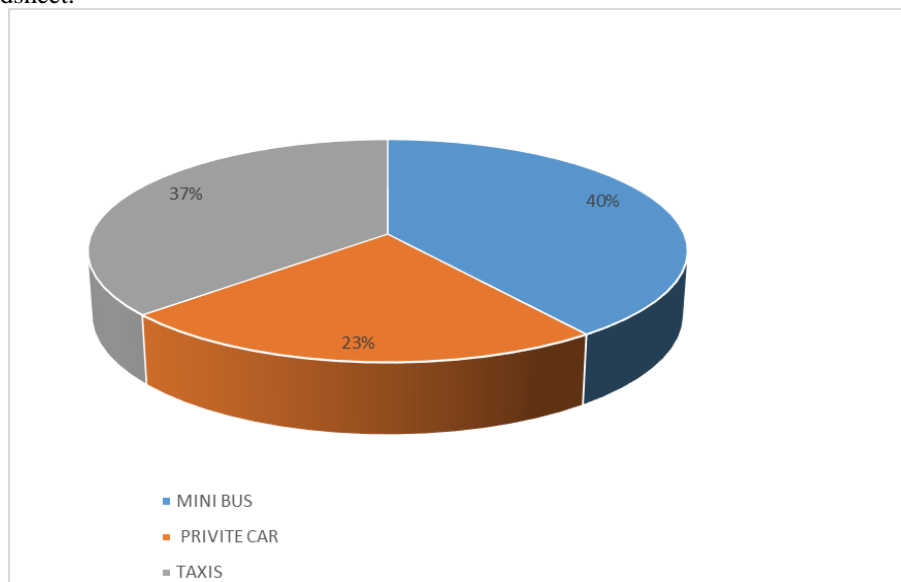


Fig. 4.1: Distribution of Vehicle types in sample

2. EXPIRED TIRES USAGE RATES

Expired Tires Rates on TTU Campus, Takoradi Township and Stations

The observation survey indicates that the overall expired tire usage rate for vehicles in the Metropolis for minibus was 16.6% and private car was 42.8% and taxis 63.6% respectively, as shown in Table 4.2.

Table 4.2: Expired tire usage rate in the Takoradi Metropolitan Area.

Vehicle type	No. observed	No. expired tires	Usage rate %
Mini bus	120	20	16.7%
Private car	70	10	14.3%
Taxis	110	80	72.7%

Source: Field Work, 2017

The observation survey revealed that, the expired tire usage rate for taxis (72.7%) as a whole was significantly higher than that of mini bus (16.6%) and private cars (14.2%) as depicted in Table 4.2.

In general, expired tires for taxis were approximately 4 times higher to that of private and mini bus. The difference in expired tire usage between taxis and both mini bus and private cars was statistically significant. This shows that majority of taxi drivers are unaware of how to check for the date codes of their tires to ascertain if they are expired or not. The disparities in expired tire usage rates according to locations were also realized across the three different points (i.e. stations as well as the main campus of Takoradi Technical University). This is vividly depicted in Table 4.3. The expired tire usage disparity between mini bus, private cars and taxis.

Table 4.3 Vehicle types and expired tires usage rate with respect to location.

Vehicle type	Location	No. observed	No. expired tires	Usage rate
Mini bus	Takoradi - Accra Station and Main Campus	120	20	16.7%
Private cars	Part of Takoradi township and Main Campus	70	10	14.3%
Taxi	Takoradi Taxi Station	110	80	72.7%

Source: Field Work, 2017

3. Sex of Vehicle Drivers and its expired tire rate.

Detailed information was collected on occupants "sex"; overall and separate estimates were generated for male and female. Male occupants were observed to have higher usage rate (96.4%) than the females (3.6%) as shown in Table 4.4. The difference is however marginal.

Table 4.4 Sex of vehicle drivers and its expired tires rate

Vehicle type	Occupant Driver	No. observed	No. expired	Usage rate
Mini bus	Male	120	20	16.7%
	Female	0	0	0%
Private cars	Male	50	5	10%
	Female	20	5	25%
Taxi	Male	110	80	72.7%
	Female	0	0	0%

4. VEHICLE TYPE AND UNEXPIRED TIRE USAGE RATE

In the observation survey, among the three target vehicles observed, mini bus occupant's drivers were more likely to use tires which were not expired compared with occupants of the other two vehicle types as shown in Table 4.5.

Table 4.5: Vehicle type and unexpired tires usage rate

Vehicle type	No. observed	No. unexpired	Usage rate
Mini bus	120	100	83.3%
Private cars	70	60	85.7%
Taxi	110	30	27.3%

Thus, regardless of location, occupants of private cars had a significantly higher tire which were not expired in comparison to occupants of other vehicle types. Detailed analyses of the results revealed that private car drivers were more likely to use unexpired tires (85.7%) compared with taxi drivers (27.2%), and minibus drivers (83.3%). Additionally, the results show that drivers of private cars were more likely to use unexpired tires compared with drivers of the mini bus. Drivers of taxi were also observed to have lower usage of unexpired tires (27.2%) compared with drivers of mini bus

VI. CONCLUSION

Expired tires usage rate in the Sekondi - Takoradi Township Base on the physical observation survey carried out on tires in Sekondi - Takoradi Metropolis it revealed that, usage of expired tires rates in Takoradi is a little high.

The overall usage of expired tires rates for the Takoradi was 16.7% for minibus, private cars 14.3% with 72.7% for taxis. Overall usage of expired tires rates was consistently higher for taxis than that of the other cars and expired tires rates were higher for male drivers than for female drivers.

1. Reasons for the usage of expired tires (Interview for Drivers)
 - Eighty percent (80%) of the respondents were ignorant of the expired tires date code on the side of the tires since most of them thought that only manufactures were by law to work with the expired date code.
 - Ninety percent (90%) of the respondents were not clear on the details of the readings of the expired tire date code on the tires.
 - Again, the price of used tires is far cheaper as compared to new tires. Most used tires are expired as compared to new tires.

(83.3%). The results of expired tires usage by each vehicle type by location and drivers of private cars and mini buses had significantly lower expired tires usage rates than drivers of taxis in all locations as shown in Table 4.2.

Thus, drivers of minibuses and private cars were observed to have the lowest expired tires usage rate in all the three locations. The lower expired tires usage rates among drivers of vehicle types present an opportunity to decrease expired tires usage among drivers of other vehicles.

VII. RECOMMENDATIONS

1. There should be a comprehensive and sustained education on how to read expiry date code and enforcement programed in the municipality to increase awareness.
2. Drivers must be educated and drafted in as co-partners (of road safety), to constantly remind vehicle owners to use brand new and unexpired tires.
3. There should be a comprehensive and sustained education on how to read expiry date code and enforcement programed in the municipality to increase awareness.
4. Drivers must be educated and drafted in as co-partners (of road safety), to constantly remind vehicle owners to use brand new and unexpired tires.

[Sample of Data Sheet]

Data sheet for observation survey

SITE LOCATION:			START TIME:			
DATE:			ENDTIME:			
DAY OF THE WEEK:						
VEHICLE TYPE			DRIVER		EXPIRED TIRES	
TAXI	MINIBUSES	PRIVATE CARS	MALE	FEMALE	EXPIRED	NOT EXPIRED
Total No. of target vehicles:						
Total No. of expired tires:						
Total No. of not expired tires:						

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AUTHOR'S PROFILE



Mohammed Okoe Alhassan

I am currently a Lecturer at the Department of Mechanical Engineering at Takoradi Technical University (TTU). I hold BSc Mechanical Engineering from the University of Mines and Technology, Tarkwa and M. Tech Degree in Mechanical Technology from the University of Education, Winneba Kumasi Campus, Ghana.



Joseph Sekyi-Ansah

I am currently a Lecturer at the Department of Mechanical Engineering at Takoradi Technical University (TTU). I hold BSc and MTech Degree in Mechanical Technology from the University of Education Winneba, Kumasi Campus, Ghana and PhD Candidate (Mechanical Engineering) Jiangsu University College, Xuefu China.



Stephen Eduku

I am currently a Lecturer at the Department of Electrical & Electronics Engineering at Takoradi Technical University (TTU). I hold Diploma in Instrumentation Engineering, UK, BSc and MTech Degree in Electrical & Electronics from the University of Education Winneba, Kumasi Campus, Ghana.