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ROAD TRAFFIC SAFETY AND ITS IMPACT ON THE DEVELOPMENT OF MODERN ROAD-TRANSPORT EXPERTISE

Mizrabov Ulug'bek Boliqul o'g'li
Jizzakh Polytechnic Institute,
Master's Student of "Transportation Engineering" Department

ABSTRACT
An increase in the number of vehicles, as well as an increase in speed and intensity of traffic, makes the problem of road safety more urgent. The main indicator of good wheel contact with the road surface is the contact coefficient, which affects the stability and control of the car. The article examines the conditions and conditions that affect the value of the coefficient of adhesion of tires to the road surface. Studies were conducted for various vehicles with and without anti-lock braking system (ABS), as well as for summer and winter tires in dry and wet asphalt and concrete pavement conditions.

Keywords: car, deceleration, adhesion coefficient, road surface, road tests, pneumatic tire, climatic conditions.

Introduction

As the automobile industry is developing in our republic, the number of cars per capita is also increasing. This, in turn, causes an increase in the number of road traffic accidents [1]. According to statistics, during the 10 months of 2021, about 2,000 people were killed and about 6,900 people were injured in traffic accidents on the republic's roads. One of the most urgent problems of our time is the rate of accidents in automobile transport [2]. Road traffic injuries affect all age groups and all life activities. In addition to fatalities, accidents often result in serious injuries that are associated with disability and incapacity for work.

Therefore, the procedure for investigating traffic accidents is the most important and urgent process, along with the task of reducing the severity of the consequences of the identified socio-economic problem. With the increase in the total number of accidents, the volume and complexity of work related to the examination of motor transport also increases. In most cases, traffic accidents occur as a result of the braking process of vehicles, so it is clear that the study of this issue is very important in the analysis and investigation of the accident. The study of the braking process of the car is based on the determination of its deceleration depending on the gear ratio and the simplest physical laws. [3].

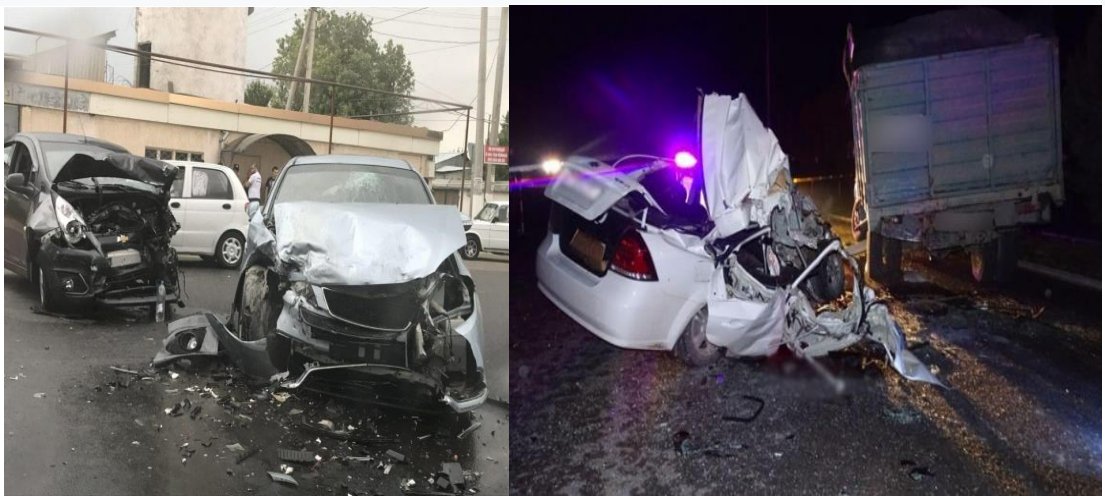
In the Republic of Uzbekistan, the traditional method of forensic road transport expertise, which appeared on the basis of the principles of theoretical mechanics, but was developed as a forensic science, is used. The deceleration of a vehicle is one of the main indicators that describe its movement, and it is currently are determined only experimentally or selected in the study of vehicle traffic parameters based on different road conditions and vehicle-oriented table values. At the same time, in the practice of modern expertise, the share of using the basis of table values is significant, which leads to serious errors in the calculation [4].

In the Russian Federation, the main generally recognized method of determining the deceleration of a car V.A. It is the method proposed by Ilarionov [5], in this method, the car tire's bite coefficient with the road is used as the basis for calculating the deceleration. The same method of determining the deceleration B.E. Also proposed by Borovsky [5]. However, this method is based on experimental tests conducted in the 80s of the last century, which raises doubts about their compatibility with the development of the automotive industry, in particular, with brake elements of cars.

Currently, in our country, a number of tests related to the determination of braking systems and braking elements of vehicles are being organized, which indicates that there is an increasing interest in the problem of the selection of initial data in the study of braking of motor vehicles. The obtained results were systematized and issued by the Forensic Expertise Center of the Ministry of Internal Affairs of Russia as a manual for car experts [6]. However, these tests were conducted only for certain models of cars and tires at certain values of braking speed, as a result of which it should be noted that the methodological guide is not comprehensive and reflects only some aspects of this problem.

Expert practice shows that the development of a universal device with the ability to measure in various situations is necessary to optimize the production of expert calculations related to the coefficient of deceleration and bite.

Conducting experimental measurements is complicated in some cases, for example, when vehicles are not in motion (damaged as a result of an accident) and their technical condition after damage does not allow to conduct driving tests (Figure 1)



(Figure 1)– Examples of vehicles not suitable for mobility tests

Also, calculating the number of traffic accidents V.A. It is based on the research conducted by Ilarionov [7] and the simplest physical laws. In these studies, the movement of the car was shown as the movement of a material point, and on this basis, the speed, braking distance and other indicators of the car movement, which are necessary for the investigation of traffic accidents, were calculated. This approach to studying the braking process of a car is reasonable, and the main indicator of this process - deceleration - is carefully determined. According to Ilarionov, the car's deceleration is directly related to the gear ratio. There are many devices for

determining the road bite coefficient of car tires [8, 9], but all of them have their own shortcomings, which do not allow them to be used in all cases without exception, therefore, in expert practice, the experimental method, the relative accuracy of this method however, it is not widespread.

Currently, there is only one method for theoretically determining the gear ratio. This method based on the power balance is not complete and in some cases, depending on the selected initial data, it is very approximate, which is unacceptable in the study of traffic accident cases related to the fate of road users. These errors are due to the fact that the selected gear ratios for determining deceleration are often not an indicator of the interaction between the car wheel and the road, but a characteristic of the roadway [10] . This is due to the fact that the method of determining the gear ratio is an active element of the process of moving and braking the car, that is, the effect of its wheels and the fact that all wheels do not have the same contact with the base surface, and during braking, the load is transferred between the axles of the car. does not take into account the distribution. Taking into account the above, research is required mainly in the field of the movement of the car wheel on a hard surface during braking.

During braking, the kinetic energy of the car's motion is converted into the work of the friction between the pads and the brake drums and the friction between the tires and the road [11].

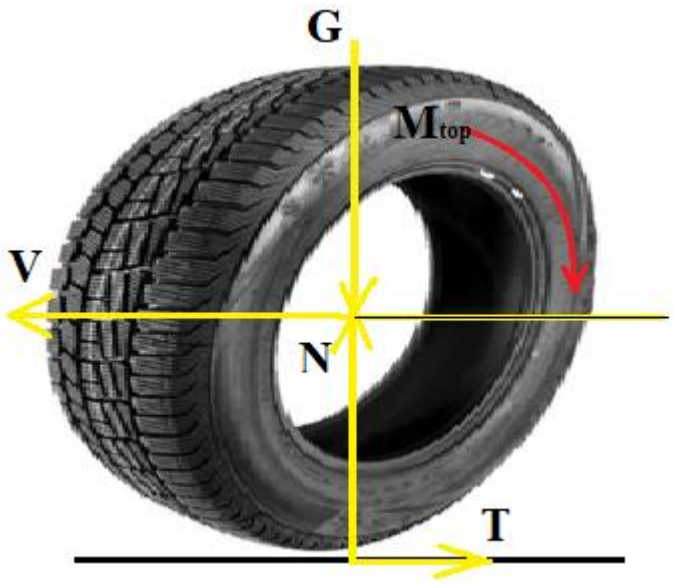


Figure 2 - Diagram of the forces acting on the brake wheel

When the wheel of the car is blocked and goes into the braking state, a tangential reaction T of the road directed in the direction opposite to the movement occurs in the zone of its contact with the base surface. This reaction is the brake force. A general diagram of the forces acting on a locked wheel is shown in Figure 2.

In this case, the total force resulting from the torque effect of all braking wheels of the car will be equal to the following

:

$$F_{top} = \frac{M_{top}}{r} \quad (1)$$

We find as a result of changes

:

$$T_1 = -F_{top1} - N_1 \cdot \mu - \frac{I_1}{r^2} \cdot j \quad (2)$$

$$T_2 = -F_{top2} - N_2 \cdot \mu - \frac{I_2}{r^2} \cdot j - F_{xx} \quad (3)$$

Based on this, an increase in the braking torque leads to an increase in the tangential reaction of the road until it reaches the limit value - the force of the tire biting the road Rtish:

$$T \leq F_{sts} = N\mu \quad (4)$$

The braking system of modern cars develops a torque that exceeds the torque of the tires with the road. Based on this, in practice, during sharp and intensive braking, the wheels are locked and the process of sliding along the road begins with the wheels not rotating. Before the wheels are locked between the friction pads and the discs, the sliding friction force affects does; when the tire tread touches the road, the force of static friction affects it. At the final stage of wheel locking, this principle changes in the opposite direction - static friction force is established in the brake mechanisms, the contact of the tire tread with the base surface is accompanied by friction force. Heat energy consumption is also distributed between these two processes - the energy consumption of the friction between the pads and the disk is lost, and the release of heat energy is caused by the friction of the contact point with the tires.

is formed in the zone [12]

All the above studies show that the bite coefficient mainly depends on the condition of the road surface [14]. It should also be noted that it is actually a complex function of many variables.

In order to determine the bite coefficient, tests were carried out by braking the wheels of the car on the road surface by pulling it with a trailer or a special cart.

Until now, a similar method of determining the traction coefficient of a braked car on a trailer or a special cart on a hard surface using a dynamometer has been widely used and remains one of the most reliable methods [16].

Other methods of determining the coefficient of bite are not so accurate, because during braking the loads are redistributed between the wheels. In addition, the value of the gear ratio changes with the change of the deceleration rate, so these methods can only find its approximate value.

Based on the above-mentioned research data, he calculated the average values of the bite coefficient shown in Table 1

Table 1 D.P. Velikanov average values of high-pressure tire bite coefficient calculated by

The name of the road surface or its condition	The value of the bite coefficient for the road surface		
	Toza va quruq	**Toza va nam**	**Moylangan yoki ifloslangan**
Concrete	0,75	0,50	0,30
Large bruschatka	0,75	0,40	0,30
Fine bruschata, mosaic	0,65	0,40	0,30
Wooden torets	0,70	0,30	0,20
Asphalt	0,60	0,40	0,25
Stone coating	0,70	0,40	0,34
Gravel highway	0,75	0,50	0,40
Soil (profiled) the way	0,70	0,15	–
Snowy road	0,30	Do 0,20	–
Frozen road	0,24	Do 0,18	–
Melting frozen road	0,20	Do 0,15	–

The average values of the bite coefficient given in the table, obtained as a result of the analysis of many available studies, show that its value is in the range from 0.15 to 0.80, depending on the condition and type of road surface, as well as the structure and material of the tires. 'can change

Distribution of braking forces between vehicle axles and redistribution of load during braking. The equations of projections of all forces on axes parallel and perpendicular to the road and the equation of moments of all forces relative to point S are shown in Fig. 3 and V.A. According to Illarionov [15] it has the following form:

$$F_1 = \frac{G \cdot a \cdot \cos a}{L + \mu \cdot h_{ts}} \cdot \mu \qquad (17)$$

$$F_2 = \frac{G \cdot b \cdot \cos a}{L + \mu \cdot h_{ts}} \cdot \mu \qquad (18)$$

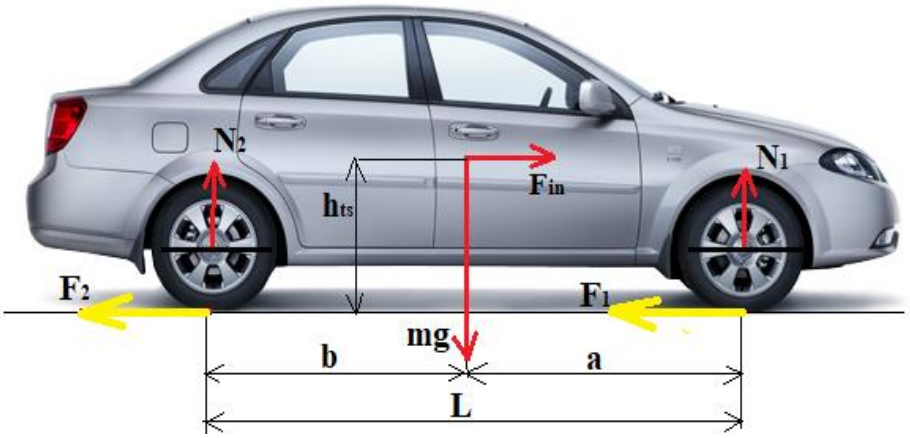


Figure 3 – The diagram of the distribution of braking forces acting on the vehicle during braking

During braking, the load is redistributed from the rear wheels to the front wheels. At the same time, the pressure of the front wheels on the road increases.

When the car brakes, the braking force (F1 + F2) caused by the friction between the tires and the road is applied to the front and rear wheels (Fig. 4).

The General Department of Road Safety of the Ministry of Internal Affairs has published statistical information on traffic accidents that occurred on the roads of the republic until November 2021.

According to him, a total of 7,681 accidents occurred during the last 10 months of the year. 1964 people lost their lives, 6886 people were injured in various degrees.

If we look at regions, the most traffic accidents occurred in Fergana region - 1173 [16].

There are 1,023 registered emergency shelters in Tashkent region and 842 registered emergency shelters in Tashkent city. There were 830 accidents in Namangan region, and 825 in Samarkand region.

If traffic accidents are analyzed according to the age of the drivers, it can be seen that most of them, i.e. 1613, were committed by drivers aged 23-27. In general, most accidents were caused by drivers under 37 years of age. 4370 out of 7681 accidents are caused by drivers of the same age. Drivers older than 47 years have committed 1106 accidents in 10 years.

For comparison, since the beginning of 2020, the number of people who have died from Covid-19 in our republic is 1312. The number of people who died from accidents in 10 months of 2021 is about 2 thousand. It can be seen from the figures that accidents have a higher level of danger to life [13].

At the same time, if other participants in accidents are analyzed, pedestrians are in the leading position - they were directly involved in 3441 cases. 1268 incidents occurred with the participation of children (Fig. 5).

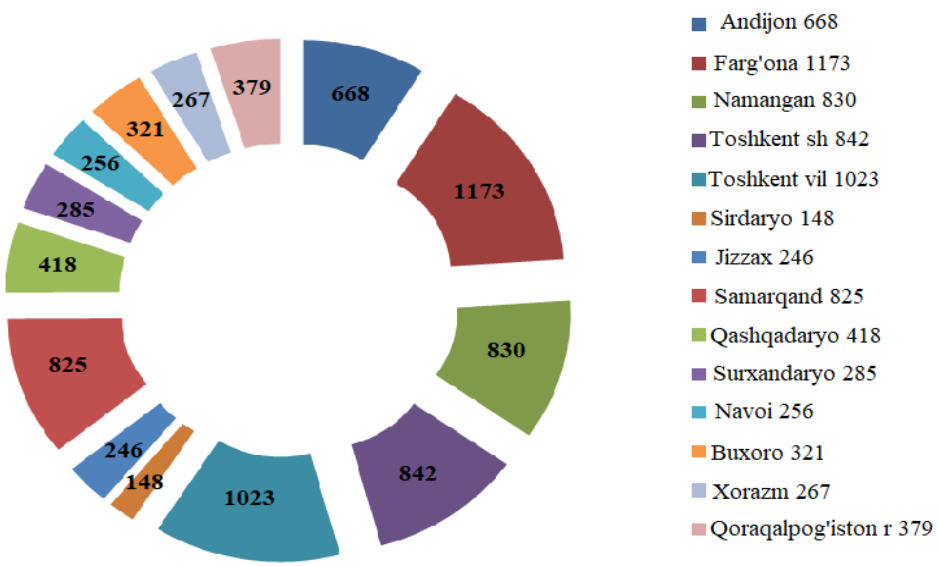


Figure 5. The accident occurred during the 10th month of 2021

Analyzing traffic accident statistics, it is possible to conclude as follows:
- In general, a positive trend of reducing the main indicators of road traffic accidents is planned for the country, the value of the severity of the consequences caused by accidents is 8.0 on average;
- The most common types of road traffic accidents include: vehicle collisions (42.7%), hitting pedestrians (28.0%), overturning cars (8.0%);
- Accidents caused by technical malfunctions of cars
the number is twice as much as in 2016 and is 3.2% (in 2016 it was 1.4%), the main part of which is on one axle of the vehicle with different designs, models and sizes, with different treads installation of tires, as well as simultaneous installation of winter and summer tires (comparative share 29.8%), as well as installation of tires with worn tread patterns (12.1%).
On the basis of the opinions offered above and on the basis of the proposed theoretical, methodological and practical rules, methods and mathematical models, it was possible to solve the important scientific and practical problem of increasing the efficiency of motor transport expertise.
- As a result of the analysis of the existing methods of measuring the bite coefficient, it was found that all of them have the same type of shortcomings and do not allow to serve as a complete and comprehensive source of initial data for the implementation of expertise related to the study of car braking . However, dynamometric testing has been found to be the most accurate method available, limited only by device error (±0.1% of the largest measurement limit).
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