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PROBLEMS AND ANALYSIS OF CAR BRAKES

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Abstract: This article will focus on improving the efficiency of the braking systems used in passenger cars, the processes of comparing the effective mechanisms of the braking system, methods of improvement, as well as highlighting the advantages and disadvantages. The analysis of the problems of applying brakes in cars is given. The main theoretical parts of the article fully cover the solution to each problem. The main defects found in brake systems are technical and technological defects, malfunctions during operation, and recommendations for the prevention of malfunctions are given.

Key words: brake, speed, brake mechanism, tread, caliper piston, caliper, disc, pad, brake hoses, brake pedal.

1. Introduction.

Currently, the main urgent direction of transport development is to ensure the high security of its movement, as well as to make effective use of the introduction of innovative technologies into the process of use.

In the process of freight and passenger transportation, there are the need to ensure the effective use of brake system spare parts and melt the working brake systems into proper operation, as well as to find solutions that allow you to solve both tasks at the same time. The study of brake processes, a comparative assessment of existing brake systems, the identification of their advantages and disadvantages makes it possible to identify the most promising directions for further analysis in the field of brake equipment in the event of a change. Eliminating the existing shortcomings of the brake systems in use at the moment, as well as the use of advantages, makes it possible to increase the safety of motor traffic several times, while increasing economic indicators through the effective use of brakes when driving.

2. Relevance.

It is necessary to analyze the main aspects of the operation of brake systems and find measures to eliminate problems. It is the main issue in the process of finding optimal solutions to improve the optimal efficiency of braking systems for a long time.

We note that the importance of the brake system is at a very high level, and only problems increase the risk of overcoming the control several times.

The brake does not stop working at once, we can indicate this process through the following problems.

1. Increase in the path of the free movement of the pedal
2. Pressing the brake pedal hard
3. Alarm of incorrect operation of the brake system
4. Leakage of fluid in the brake system pipes

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5. ABS tzimi performance disorders
6. Loss of brake stability
7. Significant vibration generation during braking
8. Overheating the brakes very quickly
9. Wear of brake discs
10. External noise or whistle formation when braking
11. Failure to fully stop or slow stop when braking
12. The Pedal can brake the wheel when released and x.k.

Let's look at some of the above problems one by one. We will conduct studies on the work of vehicle exploitation and remonti for the analysis of its vehicles.

3. Literature review.

Jianqiang Gong, Yaping Luo, Zhaowen Qiu, Xiangdong Wang's Determination of key components in automobile braking systems based on ABC classification and FMECA. This article cited the value, criticality and safety, reliability and impact maintenance costs from the three classification indicators in accordance with the standard of repair work obtained on the basis of Labor and material costs for the cost of maintenance of each part of the brake system as determining the performance of the brake system. The components of the brake system are classified and in case of failure, the parameters of which have been measured [1].

Shoaib Munir Mulani, Ashwani Kumar, Haris Naiyer, Azam Shaikh, Ashish Saurabh, Pravin Kumar Singh, Piyush Chandra Varma's A review on recent development and challenges in automotive brake pad-disc system. This article about ofThe negative impact of non-exhaust emissions on humans and the environment has been the subject of the whole review. Researchers have also looked at its negative impact on the ecosystem. The review articles analyses the outcome of brake pads made with different formulations. Several researchers use compression moulding and powder metallurgy to make brake pads.

The wear rate and friction coefficient is determined using a pin on disc. A dynamometer is used to analyse the brake pad's performance. The anatomy of brake pad specimens is studied using the SEM method. Following conclusions can be drawn from the above analysis [2].

S.P. Jadhav, S.H. Sawant Development of novel friction material for vehicle brake pad application to minimize environmental and health issues. This literature review focuses on bad effect of non exhaust emission on human health and environment. The researchers are also, studied its adverse effect on plants. Review papers shows that brake pads are manufactured by different natural ingredients and compares their results with traditional one. Some of researchers manufacture brake pad by the compression moldings and powder metallurgy method. Wear rate and coefficient of friction are found using Pin on disc apparatus. Performance of brake pad is tested using chase dynamometer. SEM Method is used to study morphology of brake pad specimen. There is wide scope to replace the metals by studying and characterizing natural materials and its ingredients. To minimize health and environment issues, novel material is developed with highest percentage of natural ingredients and the brake pad manufacturer must follow the regulations which are made by different countries in accordance with the percentage of metallic elements while manufacturing brake pad [3].

Babai,M.Z., Ladhari, T., Lajili, I., 2015. On the inventory performance of multi-criteria classification methods: empirical investigation [7], H.A.C. Denier van der Gon, M.E. Gerlofs-Nijland, R. Gehrig, M. Gustafsson, N. Janssen, R.M. Harrison, J. Hulskotte, C. Johansson, M.

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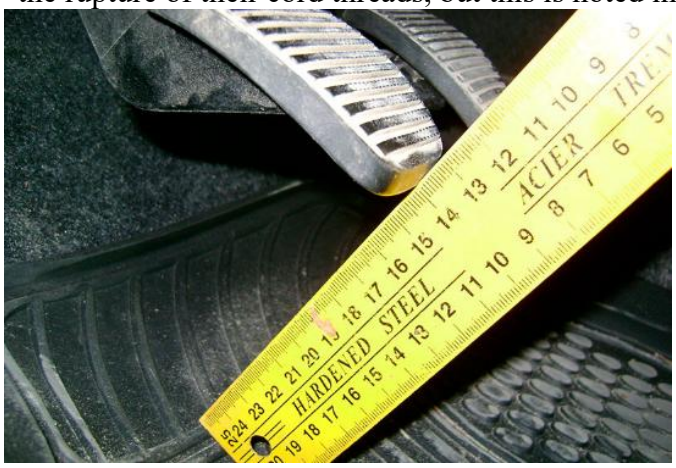
H. Hagino, M. Oyama, S. Sasaki, Laboratory testing of airborne brake wear particle emissions using a dynamometer system under urban city driving cycles [11], M. Alemani, O. Nosko, I. Metinoz, U. Olofsson, A study on emission of airborne wear particles from car brake friction pairs [12],

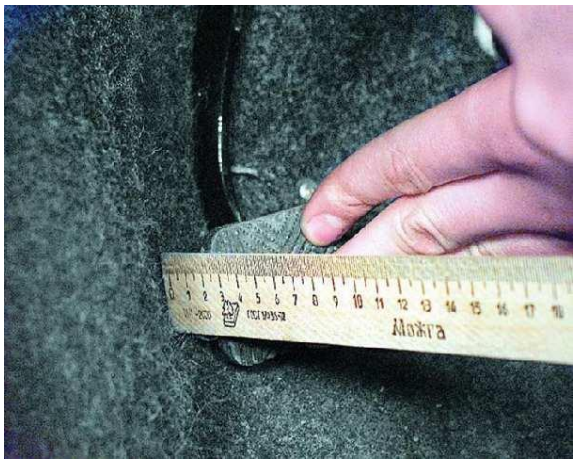
RESULTS.

Analysis 1. Increase the path of the free movement of the pedal. The main reason for the appearance of this problem is called air accumulation in the system. This malfunction is eliminated by re-tapping the system brake pedal and identifying points where the working fluid can leak.

An increase in the Free Walking of the pedal can also occur due to swelling of the brake hoses or the rupture of their cord threads, but this is noted in cases where it becomes much less.



Picture-1. a) the size before pressing the brake tray



Picture - 1. b) the size of the brake tray when pressing to the end

The free movement of the brake pedal is based on the parameters established by design engineers when developing a car. If the foot touches the pedal slightly (Picture-1. a) and the braking process itself is smooth and predictable, it is necessary to avoid accidental braking.

Depending on the car model, the free path of movement should usually be from 3 to 14 mm. Over time, the distance increases or decreases. Adjustment can be carried out independently (Picture - 1. b).

In cars, the free movement of the pedal is called the distance between the top point of the pedal to the point where the brakes are activated. When the Pedal is in the upper position, the replacement of the brake lights is limited. The free ride of the car brake pedal is located in the range from 25-35 millimeters.

Adjusting the free movement of the brake pedal starts with the movement at the back of the brake light. This highlighter performs a stop function.

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This means that the Free Path of the brake movement can be reached by tapping the car brake tray and taking the interval until the rear brake light burns out.

Analysis. 2. Pressing the brake pedal hard. A hard-working brake tray, a small movement when pressed against it is another reason for malfunction. In this case, when we press the brake pedal, as well as release, the car will slide to the side.

A very tight brake pedal indicates that, in addition to the inconvenience of driving a car, it can be the result of a number of failures of the brake system and other related systems.

We determine the causes of the malfunction of the working brake system of the car and try to figure out what needs to be done to eliminate it. The vacuum brake booster tube is caused by shrinkage or compression.

The brake system of cars and their modifications use a vacuum brake amplifier to relieve the force of pressing the brake pedal. In the case of using the power of the engine, the vacuum is supplied to it through the Collector hose which sends the oil pressure. The hose will be mounted with clamps on the collector and amplifier device. It is in this place that a blockage occurs in the hoses. However, sometimes, for various reasons, liquids can leak out of this hose or, as a result of poor installation, the fluid can be pinched. In this case, vacuum loss occurs and the vacuum brake amplifier fails.

It can also be caused by a defect in the main brake cylinder. The rubber rings inside the cylinder may be swollen (because the rubber is not of high quality or the brake fluid is considered too aggressive), or due to improper Assembly after repair.

Analysis. 3. Alarm of incorrect operation of the brake system.

The signal on the dashboard, which indicates the presence of problems with the braking system, burns red (depending on the car model), which indicates the presence of a direct threat to the safety of the car. This cannot be ignored.

There are several reasons why the brake system alarms burn. The difficulty is that, according to the results of the study below, almost half of the drivers do not fully understand the level of danger and therefore do not respond adequately to the signal.

The level of brake fluid falls below the minimum – in this case, a leak of brake fluid from some small slits occurs, and the risk of braking increases.

It threatens to move when the thickness of the brake pads is less than the minimum. This can cause the last layer of the colodka friction coating with the brake disc to rub hard with the brake disc, and as a result, in the worst case, two metal surfaces can cause the brake disc and the colodka to eat one very quickly. Even a complete failure of the brake system is possible.

Analysis. 4. Leakage of fluid in the brake system pipes.

The braking system of modern vehicles is characterized by high reliability. Its individual elements, over time, can somehow be associated with the wear of the car brake system pipes, as well as the consumption of spare parts and the deadlines of materials. Spare parts do not serve as long as the drivers want, it requires replacement by the resource deadlines set by the manufacturers [5]. Buying and replacing them does not require a lot of money and time. But drivers are often not replaced in time, even if they have passed the deadline. The problem of brake fluid leakage is caused by spare parts that have not been replaced in time. It is possible to continue driving with small leaks, but the brake does not work well due to the reduction in brake fluid. It is possible to determine the malfunction of fluid leakage in the brake system pipes:

✓ The integrity of the liquid container is broken;

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- ✓ Key brake cylinder failure;
- ✓ The presence of cracks in one or more brake hoses;
- ✓ The integrity of one or more of the wheeled brake shaft cylinders is broken.

In the main cases, the accumulation of coolant in the vacuum amplifier. Most often this happens with the failure of the main brake cylinder.

Picture-2. a) Chevrolet car cylinder cuffs ***Picture - 2. b) Kia car brake cylinder cuffs***

If the brake fluid is found to flow through the main or working cylinders, the driver must check the cuffs. (Picture-2. a and b) over time, they lose elasticity – this is the main reason for replacement.

Analysis. 5. ABS system performance disorders. Typically, the ABS indicator on the instrument panel will light up for a few seconds and turn off every time the engine starts. If icons are not visible at that time, the system is inactive and needs to be checked. There can be several reasons why the ABS bulb burns out:

String break;
ABS sensors are contaminated, turned off, or malfunctioned;
Toothed sprocket on the wheel stupis is damaged;
The electronic system control unit does not work.

Regardless of the reason why the ABS burns, the computer on board collects the fault data and analyzes it to generate the error code. The same warning light indicates the detection of a certain malfunction.

The problem will not be difficult to solve if the lamp does not turn on due to a lit bulb. It can be replaced with a new one with the help of service personnel. If the anti-lock system indicator is on fire when the car is moving, it is necessary to be very careful when braking suddenly.

If violations are detected in the work of the ABS, it is necessary to visually inspect the elements of the system. Inspections and corrective work are required to be performed by professionals.

Analysis. 6. Loss of brake stability. If, when the brake pedal is pressed, the car begins to deviate from the intended trajectory, this indicates a malfunction in one of the contours of the system. The main reason for this is that their fluids in the cylinder are not distributed in one norm. Also, uneven eating of discs and pads means exposure to fat, ice, rust or moisture. Bolts attached to the steering wheel may also be loose.

In its work, the brake control unit interacts with the control unit of the engine control system and the automatic transmission control unit (if the car is equipped with an automatic transmission). Loss of stagnation occurs mainly due to:

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Brake certain wheels;
Changes in the engine torque;
Changes in the angle of rotation of the front wheels (when there is an active control system);
Changes in the level of dempfers of dampers of dampers (when there is a flexible suspension).

Signs of system problems will be the following:

The turning radius "rotation" of the car is not enough;
Effect on the reaction of the path to unevenness;
Decrease in the degree of gravity when turning the clock;
To have systems of general uncertainty in the moment of moving at high speed.

Analysis. 7. The formation of significant vibration during braking. (Fig. a). There are many reasons for the light vibration of the car during braking. Their main ones include a stupitsa stroke or a disc stroke, an imbalance of the wheel (dysbalance), a Luff of the wheel bearings, clogging of the porches and supports of the cylinders, an oval of the drum, a springy tongue that holds the kolodka.

When pressing the brake pedal, pressure appears in the system. It is amplified by special hydraulic boosters and transmitted through tubes (brake hoses) to the wheel cylinders pressing the brake pads to the brake discs. Since the wheel is blocked through the disc, the wheel cannot rotate, friction appears between the tires and the road surface, and the car stops.

Disc and drum brakes differ in the principle of placing brake pads. Brake discs are placed parallel to the wheel and rotate at the same speed. The pads are mounted on the outside of the disc and pressed against it when braking. Because of this, friction occurs and the machine stops.

Vibration gives the brake pedal. The main problem can be in discs or brake pads. May indicate problems with vibration throughout the entire body of the car.

The reasons for car vibration during braking are as follows:

Eavesdropping of brake pads;
The discs can be eaten unevenly, or eaten shaken;
Eaten out of the wheel bearing;
The eating of the roll drawer of the clock;
Tire deformation during storage;
Blockage of stones in the parts of the fastening of the kolodka.

Vibration when braking a car can occur with all cars (Figure 3 is a view). The main work that the driver must do when vibration occurs is to consult a specialist.

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Picture-3. a) vibration generation when braking **b) overheating the brakes very quickly**

c) Noise in improper eating **d) Wear out brake discs.**

Analysis. 8. Overheating the brakes very quickly. (Picture-3. b). This malfunction is easy to detect using a characteristic odor or, for example, hot pads.

Extreme high levels of heat are generated when driving a fast or parking brake with sudden braking. Brake pads can be the cause at the expense of tightening, that is, clogging the cylinder pusher. The main signals about the overheating of discs will be:

1. The brake trigger becomes an easy-to-kick position. That is, its direction increases, it becomes more flexible. In this case, the braking efficiency decreases, it becomes necessary to press the brake harder for normal deceleration.
2. The characteristic smell of burnt kolodkas and hot metal.
3. Sometimes sounds appear that are formed when the squeaking and rubbing of the face side of the brake mechanisms (kolodka and disk).
4. Visual changes in brake discs. Overheated metal turns into a wavy appearance, and often a crack appears on the surface — indicating that it is a specific effect of dry friction.
5. The formation of vibration on the steering wheel during braking due to deformation of the disc plane. Waves are the result of very high temperature exposure.

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The operation of the brake system, in which the brake discs can overheat, is possible for the following reasons:

Fastening the brake support. As a result of the penetration of dust and particles into the working mechanisms, the support China may become clogged. As a result, even after emptying the brake pedal, the kolodka is not removed from the disc as much as necessary-constant friction and overheating appear.

Difficult movement conditions. This is one of the factors of all times. For example, when the car pulls the trailer to the shatak in the heat, and the route along with the shatakchi car goes down for a long time.

Low quality of pads or discs. In this case, the deceleration efficiency is insufficient-accordingly, the driver presses the brake harder and more often, causing overheating.

Driving style on the floor that does not fit the brake capabilities. This happens when the driver begins to mistake his car for a sports car.

For an ordinary car, it is enough to brake hard once or twice in a row with speed in the heat. Medium brakes reach the limit. If braking is continued, Everything ends with overheating, as a result of which the discs can be permanently damaged.

Analysis. 9. Wear out brake discs. Brake systems consumption of materials as a result of long-term non-use in vehicles or not keeping the car clean, tidy based on the established requirements, wear and rust of brake discs occurs, so it is important to constantly monitor their condition (Picture-3. d).

Since brake discs are an important factor in road safety, their condition directly affects the ability to quickly stop a car. However, many car owners are faced with such a problem as rust on brake discs. Such cases we can give the following recommendations::

It is important to assess how rusty the brake discs are. Light surface rust can also appear overnight at high humidity or after rain. Such rust is usually not dangerous and disappears after pressing the brake several times while driving. However, if the rust is more serious and covers a large part of the disc, measures will have to be taken to remove it.

Cleaning brake discs while driving. In most cases, if the rust is light, it can be cleaned with a simple drive. During braking, the pads rub against the discs, and this friction helps to get rid of the slight coating of rust. After a few braking, the discs are usually clean and no additional measures are required. But it should be borne in mind that if the rust could not burn, it is worth taking a more serious look.

Mechanical cleaning of brake discs. Mechanical cleaning can be done if the rust on the brake discs is more serious and does not go away after driving.

If the rust turns out to be too deep and does not respond to any cleaning methods, brake discs should be replaced. If Rust has begun to affect brake efficiency, this is especially important in the process of movement. Ignoring the replacement of the discs can lead to serious brake problems, which endanger the safety of the driver and passengers.

Analysis. 10. The formation of external noise or whistles when braking. (Picture-3. c).

One of the reasons why the brake is crumpled when the trigger is pressed may be that the quality of the production of the brake drum and clutch is not good. In this case, the whistle and sound are repeated at each braking, in addition, they can damage the disc. If such a situation occurs, it will be necessary to replace the brake disc and pads. Therefore, professional drivers strongly

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recommend buying original, that is, only branded spare parts on the recommendation of manufacturers.

And the reasons for whistling when pressing the brake trigger may not be compatible with the brake discs of the pads. Manufacturers often use additional substances when creating, which improves the strength of the coating, but they may not be compatible with brake discs. Such pads require the installation of exactly the same model for which car is made and are not suitable for older models.

Analysis. 11. Failure to fully stop or slow stop when braking. It should be noted that the deterioration of handling when repaired can be caused by the complete failure of all wheels. Usually, this significantly reduces the free movement of the pedal.

The fact that the discs are eaten more and faster than both the right or left side of the calocas, as well as those of different types of brake fluids, can be the cause.

To check the balanced operation of the system, it is necessary to carry out car diagnostics.

This malfunction can occur for the following reasons:

1. If there is no free movement of the brake pedal. Only normal (3-5 mm) free movement of the pedal provides the necessary space between the pusher and the piston of the main cylinder, which is necessary to completely stop the wheels.

2. In cars equipped with a hydraulic vacuum amplifier, the defect may be caused by the hydraulic vacuum amplifier's adjusting Bolt leaking out relative to the mounting plane of the main cylinder. The Bolt must protrude 1.25 mm relative to the fastening plane of the flange of the main cylinder.

3. One of the reasons why the wheels do not stop completely may be because the diaphragm is swollen or clogged into the salnigi body of the hydraulic vacuum booster due to the tightening of the cover seal or protective cover. The disadvantage is eliminated by replacing the hydraulic vacuum amplifier.

4. Failure of the wheels to fully stop can be caused by swelling of the Rings of the main cylinder or by clogging of the main cylinder's piston. In both cases, you need to disassemble the main cylinder and replace the parts that have failed.

Analysis. 12. Brake the wheel when the Pedal is released. This problem leads to loss of directional stability while driving. This can be caused by simple contamination of parts or tension of the parking brake, as well as deformation of the brake pipe or acidification of the piston-cylinder pair.

In this case, you can find out that the brake pedal has become too tight, it is pressed short when pressed. When the car brakes, it begins to erode, the directional stability disappears. A similar situation occurs if the cylinders are clogged in one of the contours of the system.

If it is not possible to shift the car, and the only sign of a malfunction is that the brake pedal must be pressed by force, then the problem may be in a vacuum brake booster or a rare malfunction hose.

In conclusion, it can be said that I believe that we were able to solve problems with the study of problems in the brake system and the consideration of measures to eliminate them, as well as the identification of dependencies on one element.

DISCUSSION.

Professor of Andijan Institute of Mechanical Engineering I.Z.Nasirov expressed the following points in the discussion of the article: to improve the efficiency of braking systems used in light

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vehicles, to compare processes, methods of improvement, to highlight the advantages and disadvantages of the brake system of effective operation. Analyzes of problems in the application of brakes on cars are presented. It provides extensive use of this device with the aim of maximizing braking efficiency and minimizing the braking path. Repair cracks are lit to ensure that the efficiency in car transport is of additional assistance, the stopping distance is short and stagnant in movement. Analysis of the problems is presented in the solutions and recommendations of the sickle. The information presented in the article is necessary for scientific researchers in the field of transport, specialists in the manufacturing field, as well as transport specialists. I recommend this scientific article “Problems and analyzes in car brake systems" for approval and publication.

Professor of Tashkent State transport University U.A.Ziyamukhammedova made the following comments in the discussion of the article: In this scientific article, the purpose of scientific research is aimed at highlighting the types and characteristics of brakes used in light vehicles, the mechanisms of effective operation of the brake system, the processes of operation of their brakes, their efficiency and disadvantages. In order to maximize brake efficiency and minimize the brake path, it provides ample access to the lighting of the breakdown processes. The effectiveness of the car transport brought data from the device, which was used to provide additional assistance, to ensure that the stopping distance was short and stationary when moving. The use of extensional parts that improve the reliability of movement, the use of brake systems in speed control for the purpose of their application in the automotive industry, are given recommendations that will be achieved as a result of these analyzes. The information presented in the article is necessary for scientific researchers in the field of transport, specialists in the manufacturing field, as well as transport specialists.

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