CAR BODY TUNING, ITS EFFECT ON THE PROCESS OF MOVEMENT AND ECONOMIC EFFICIENCY

Ibragimov BD - Head of the Department of Automotive and Production Engineering, Tashkent State Transport University, PhD

Ismatov Sh.A - Tashkent State Transport University, 4th year student of the direction of Automobile service

Abstract. The article analyzes the use of aerodynamic body kits, profiled front and rear bumpers, spoilers, anti-wings, protective films and lights in cars, which are widely used for aerodynamic and decorative purposes in car body tuning. At the same time, the impact of tuning the appearance of the car body on car safety, aerodynamic properties and fuel economy is analyzed and conclusions are drawn.

Key words: Car tuning, aerodynamic the body collection, profiled bumpers, spoilers, anti-wing, protection films, ornaments

Introduction

Car tuning is aimed at changing the characteristics of a traditional car from the factory, it is a process of changing the car (increasing the power and efficiency of the engine, increasing the efficiency of the brakes, improving the running gear, multimedia system, as well as completely reworking the car, for example, a pickup or conversion to a convertible body) [1,2,5].

Tuning the appearance of the car body is mainly carried out by improving the aerodynamic and safety characteristics of the car, installing bright lights, protecting the body with protective films and decorating it with various other decorations.

Tuning of the car body improves the aerodynamic properties of the car, while also saving fuel consumption to a certain extent due to overcoming air resistance and is considered economically effective [4].

Aerodynamic body kits are used to improve the aerodynamic characteristics of the car. The aerodynamic body kit is designed to give the car a sporty-aggressive look and improve handling at high speeds.

Spoilers are a set of elements that change the aerodynamic characteristics of a car.

They perform tasks such as changing the direction of air flow and improving the appearance of the car.

Spoilers can be installed under the front bumper, rear trunk lid or roof.

Anti-wing - unlike the wings of an airplane, creates a downward force on the car.

There are several secondary elements that affect the overall aerodynamics of a vehicle. These are deflectors, an open sunroof, an open window, rear-view side mirrors, additional lighting equipment installed on the roof of the car.

Aerodynamic obves is a set of decorative elements of the body, which serve to reduce air resistance, that is, they improve the handling of the car (**Fig. 1.**).

Hood deflectors and window deflectors are of particular importance, the

deflectors are designed individually for each car and improve aerodynamics by reducing air resistance.

Headlights - currently, modern manufacturers and car owners are using special LED lights that provide a very bright stream of light. Such lights are also important for road safety, that is, they are clearly visible to other participants even during the day.

Method and results

During the movement of the car, the air flow passes from above, from the sides and from below (in the lower part along the entire car) with folds formed in collision with the parts protruding from the car. In this case, excess air pressure is created in the compartment where the car engine is located. This pressure raises the car, the downforce decreases, which naturally reduces the level of contact of the wheels with the road, as a result, the controllability of the car deteriorates [3,4,6].

Fig. 1. The appearance of a car equipped with aerodynamic obves (photo taken from the site https://partsboutique.ru/).

The effectiveness of the aerodynamic fronts is evident in the stabilization of the inter-axle distribution of the car's weight when moving at a speed of 120 km per hour.

When the car moves at a speed of 140-150 km/h and above, a turbulent zone is formed behind it.

To prevent such situations, aerodynamic tuning details made of different types of plastics are used. The advantage of plastic parts is their lightness, because the extra weight makes the car's handling worse. These types of details include: spoilers, anti-wings, profiled bumpers under the body, panels, etc.

Fig. 2. A small truck (based on Gazel NN) designed in the Blender program, with additional profile front and rear bumpers installed on the body.

Profiled front and rear bumpers create additional downforce for the car at high speeds. In this case, the correct installation and correct use of the bumper is of great importance. If the aerodynamic suspension is installed incorrectly, it can reduce the car's handling even at low speeds by overloading one axle and underloading the other axle (Fig. 2.).

The front spoiler is a detail of car tuning that directs the air upwards with a spoiler placed under the front bumper. Some spoilers don't just direct the air upwards, but direct it to ventilate the brake discs or radiator. This "effect" is called "sticking" in racing cars. The use of spoilers greatly improves the handling of the car, but if the car bounces a little, it can also cause loss of control and other unexpected problems. Racers call this negative condition Ground-effect.

The rear trunk lid or roof spoiler acts as a “split” of the air flow. This helps prevent turbulence behind the car, facilitates air flow and reduces drag by reducing air turbulence behind the car.

Anti-wing wings significantly improved the handling of the car. But unbalanced or incorrect wing placement increases the risk of loss of control and crashes at high speeds (Fig. 3.).

Fig. 3. Anti-wing

Aesthetics also plays an important role in the aerodynamic tuning of the body. Many car enthusiasts turn to tuning from this point of view, because making any vehicle look like a sports car makes the car more attractive.

These include extended wheel arches, rear window visors, front and rear bumper skirts, side windows and hood wind deflectors, and sprinklers.

This additional tuning equipment is easy to install and gives the car an aesthetic look, while protecting the lower part of the body, the paint coating from small stones, water and sand-salt mixtures.

Positive aspects of the deflector (Fig. 4.):

- prevent windows from sweating;
- reduction of air resistance during movement;
- to protect the cabin from snow, rain, and wind.

a)

b)

Fig. 4. Side windows the wind deflectors (a) and Brizgoviks(b)

Additional trunk rails for protection and cargo are also widely used in exterior body tuning. Their main task is to enable additional cargo transportation during trips and long distances (Fig. 5.).

Fig. 5. A compact truck (based on Gazelle NN) designed in Blender with additional luggage racks for protection and cargo

Grilles are mainly used for the aesthetic design and protection of the car. Metal and plastic materials with plain and chromed surfaces are used in the production of grilles.

Discussion

When using an aerodynamic body kit, the improvement of the aerodynamic characteristics of the car is felt only when the car moves at a speed of 120 km/h and more, and at a speed of 140-160 km/h, it is clearly visible. From this we can conclude that this type of tuning can be used not in urban conditions, but on high-speed highways or racing.

The aerodynamic body kit not only improves the aerodynamic characteristics of the car, but also achieves fuel savings of up to 4%.

References

1. Skripnik I. Do-it-yourself car tuning / I. Skripnik - AST Publishing House, 2012

2. Car tuning: textbook / V.M. Vinogradov. O. V. Khramtsova. Moscow KNORUS, 2021, -194s

3. Lecture notes.MDK 3.3 Car tuning Specialty: 23.02.07 Maintenance and repair of engines, systems and units of cars. Sukhov V.I., teacher of the first qualification category GBPOU MADC named after. A.A. Nikolaev. Moscow-2020.

4. Miroshnichenko, A.N. Car tuning [Text]: M64 tutorial / A.N. Miroshnichenko. - Tomsk: Publishing House Vol. state architect.-builds. un-ta, 2015. - 340 p.

5. https://wikipedia.org

6. Хакимов, Р. , Ибрагимов, Б. и Айрапетов , Д. 2022. Возможность снижения шума и вибрации транспортно-технологических машин путем нанесения многофункционального антикоррозионного покрытия. Общество и инновации. 3, 6/S (июл. 2022), 188–194. DOI:https://doi.org/10.47689/2181-1415-vol3-iss6/S-pp188-194.

7. Таджибаев Абдунаби Абдурахмонович, Ибрагимов Ботир Дастамович ЭКОНОМИЧЕСКИЙ АСПЕКТ НАДЕЖНОСТИ ТРАНСПОРТНЫХ СРЕДСТВ, ЭКСПЛУАТИРУЕМЫХ В ГОРОДЕ ТАШКЕНТЕ (НА ПРИМЕРЕ АВТОМОБИЛЯ COBALT) // Universum: технические науки. 2022. №7-2 (100). URL: https://cyberleninka.ru/article/n/ekonomicheskiy-aspekt-nadezhnosti-transportnyh-sredstv-ekspluatiruemyh-v-gorode-tashkente-na-primere-avtomobilya-cobalt (дата обращения: 29.10.2022).

8. Ibragimov Botir Dastamovich, & Pardaboyev Ziyoviddin Adham Oglu. (2022). CAUSES OF VEHICLE BREAKDOWNS AND MODERN TECHNOLOGIES FOR PREVENTION. European International Journal of Multidisciplinary Research and Management Studies, 2(10), 101–104. https://doi.org/10.55640/eijmrms-02-10-18

9. https://partsboutique.ru/

10. http://lib.vvsu.ru/ Scientific electronic library VGUES

11. http://elibrary.ru/ Scientific electronic library

12. http://www.rsl.ru/ Russian State Library

13. http://www.nlr.ru/ National Library of Russia