ANALYSIS OF OPERATIONAL FACTORS AFFECTING PASSENGER CARS BASED ON DIFFERENT ROAD-CLIMATE REGION CONDITIONS

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Abstract. This article gives the influence of road-climate conditions on the technical condition and performance of the car was studied in depth also other climate factors influence on car parts are analyzed. Deterioration of road and climatic conditions, such as the presence of oil, snow and ice, road surface damage, directly affects the vehicle's fuel consumption, wheel performance, engine and transmission system efficiency, air filters and other components. In addition, the main technical problems that arise in the operation of cars in different climatic conditions, such as negative changes in the engine, failure of batteries, wear of tires and deterioration of the four-gear system, are studied separately. The results obtained in the study can be especially useful for transport professionals, car manufacturers and users.

Key words: car, climate, road, operation, engine, unit, mechanism, temperature, friction, abrasive particle.

Annotatsiya. Ushbu maqolada yo‘l-iqlim sharoitlarining avtomobilning texnik holati va ishlashiga ta’siri chuqur o‘rganilgan, shuningdek, boshqa iqlim omillarining avtomobil qismlariga ta’siri tahlil qilingan. Yo‘l-iqlim sharoitlarining yomonlashuvi, masalan, moy, qor va muzning mavjudligi, yo‘l qoplamasining shikastlanishi transport vositasining yonilg‘i sarfiga, g‘ildiraklarning ishlashiga, dvigatel va transmissiya tizimining samaradorligiga, havo filtrlari va boshqa qismlarga bevosita ta’sir qiladi. Bundan tashqari, turli iqlim sharoitlarida avtomobillarni ekspluatatsiya qilishda yuzaga keladigan asosiy texnik muammolar, ya’ni dvigateldagi salbiy o‘zgarishlar, akkumulyatorlarning ishdan chiqishi, shinalarning yeyilishi va to‘rt uzatma tizimining yemirilishi alohida o‘rganiladi. Tadqiqotda olingan natijalar transport mutaxassislari, avtomobil ishlab chiqaruvchilari va foydalanuvchilari uchun ayniqsa foydali bo‘lishi mumkin.

Kalit so‘zlar: avtomobil, iqlim, yo‘l, ekspluatatsiya, dvigatel, agregat, mexanizm, harorat, ishqalanish, abraziv zarracha.

Аннотация. В данной статье глубоко изучено влияние дорожно-климатических условий на техническое состояние и эксплуатационные

характеристики автомобиля, а также проанализировано воздействие других климатических факторов на детали автомобиля. Ухудшение дорожно-климатических условий, таких как наличие масла, снега и льда, повреждение дорожного покрытия, непосредственно влияет на расход топлива автомобиля, работу колес, эффективность двигателя и трансмиссии, воздушные фильтры и другие компоненты. Кроме того, отдельно рассматриваются основные технические проблемы, возникающие при эксплуатации автомобилей в различных климатических условиях, такие как негативные изменения в работе двигателя, выход из строя аккумуляторов, износ шин и ухудшение работы коробки передач. Результаты, полученные в ходе исследования, могут быть особенно полезны для специалистов в области транспорта, производителей и пользователей автомобилей.

Ключевые слова: автомобиль, климат, дорога, эксплуатация, двигатель, агрегат, механизм, температура, трение, абразивная частица.

Introduction

During the operation of automobiles, the following factors affect the safety of the automobile: Road conditions represent the speed of movement, the turning radius, the flatness of the surfaces, the height and the size of the slopes, the quality of the (proper) construction of the road [1]. When the car drives on a dirt, uneven road, instead of on an asphalt road, the number of revolutions of the digital crankshaft increases, and the number of engagements of the clutch, the number of acceleration and deceleration, and the number of stops (braking) increase [2]. It costs ten times more than walking on an asphalt road. As a result, the process of car aggregate and mechanism, parts wear is accelerated [3].

Methodology

On mountain roads, as a result of frequent and long stops, the stop drum and (carrier) covers heat up to 350°C, the friction coefficient decreases, and the stopping process deteriorates. In this case, parking covers are eaten 5-10 times more. Mountain roads have a significant effect on tire wear, reducing its service life by 3-4 times. increases fuel consumption and reduces power [4]. Climate conditions are represented by air temperature, barometric pressure and humidity. More than half of the territory of the former Soviet Union is considered a cold region (the temperature is -20°C for more than half of the year), this low air temperature has a significant impact on the technical condition of the car. Operation of cars in such conditions leads to overcooling of all aggregates and mechanisms [5]. It becomes difficult to start a cold engine, the liquid in the cooling system freezes, and the electrolyte of the battery is extremely cold. The reason for the difficult running of cold carburetor engines (at low temperatures) is the low

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volatility of gasoline, the increase in oil viscosity, and the decrease in battery capacity and voltage at the poles [6]. The low temperature of the diesel engine (entering the cylinders), the temperature of the compressed air not lower than 350-380° C, as a result of which the fuel supply slows down and the quality of spray and ignition deteriorates. Experiments show that engine wear is 5-6 times higher than 30°C water temperature (water temperature is 80°C). At low air temperature, fuel consumption increases by 5-20%. An increase in ambient air temperature reduces the heat released from the radiator, causing the engine to overheat [7]. In this case, the engine works with detonation, reducing its power, economy and longevity.

The group of design factors affecting the reliability of the vehicle includes: level of reliability; the level of complexity of the construction; degree of homogenization (unification). The level of reliability is estimated by the ratio of the costs of developing a vehicle and maintaining it in technical condition. The main design factors affecting the level of reliability:

a) the shape and size of the details, relative pressures and stresses on the surfaces of the details, fatigue strength of the metal;

b) the strength of the structure, the change of shape of details under the influence of operational loads;

c) precise location of the surfaces and axes of the parts working in the joint relative to each other;

g) the correct selection of transmissions (posadka) that ensure the reliable operation of movable and immovable joints;

d) equipping engines with efficient oil pumps;

e) performance of the oil pump oil suction type without bubbles;

j) use of crankcase ventilation system, oil radiators and high-quality oil cleaning to reduce oil temperature and slow down its wear;

z) use of centrifuges with hydro-reactive drive, which clean the oil a second time in engines;

i) creation of special channels for centrifugal cleaning of oil on crankshafts;

k) use of thermostats and other factors in the cooling system to maintain the optimal temperature.

The level of complexity of the construction. When designing a vehicle, reliability requirements should be taken into account during the period from the selection of the operation scheme of each node and detail to the creation of its structure. The construction of the vehicle should be relatively simple and consist of as few elements as possible. From the point of view of the reliability theory, the vehicle-elements are a complex system connected one after the other.

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If the breakdown of each element of the vehicle is considered as an independent random event, then the probability of the vehicle working without damage is determined as follows:

$$R_{TB}(L) = R_{Д}(L)xR_{u}(L)xR_{ук}(L)x.....xR_{i}(L) = \prod_{i=1}^{n} R_{i}(L)$$

where : RTV(L)- intact operation of the vehicle probability;
Rd(L) is the probability of engine operation without damage;
Ri(L) is the probability of operation of the mechanism without damage;
RUK(L) is the probability of the gearbox working without damage;
Ri(L) is the probability that the i-th aggregate will work without damage.
If all aggregates have the same reliability,
$R_D(L) = R_I(L)=R_{uk}(L)=R_i(L)= R$
in that case
$R_{TB}(L) = R^n$,
where: n is the number of aggregates.

In the same way, the probability of functioning of aggregate, system, nodes without damage is determined.

The probability of vehicle operation without damage is found as follows, taking into account

$$RTB(L) = \prod_{i=1}^{n} x\overset{m}{\underset{j=1}{C}} R(L)$$

the probability of operation of aggregate parts without damage:

So, the more complex the structure of the vehicle, the lower the level of reliability, and it is necessary to try to get the most optimal structure when designing it. It is desirable to apply the same principles of reliability and durability of the elements of the vehicle, or to achieve multiple replacements during the service life of aggregates and parts during repair.

Level of homogenization (unification). Vehicle reliability can also be increased by using unified and standardized components and parts, as they have successfully passed tests under typical operating conditions and shown their high reliability. For example, they can include bearings, seals, electrical equipment details, normals and a number of standardized details. The use of standardized parts ultimately reduces the cost of maintenance and repair processes, and the inventory of required spare parts and fasteners.

Result and discussion

The relative humidity of the air is 43-75%. The mass of dust in 1 m3 of air was taken as the relative value of dust. Depending on the operating conditions, the amount of dust can be from 0.01 to 15 g/m3. Any solid particles in the dust are

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dangerous for the car engine, especially silicon oxide, which causes rapid corrosion of the rubbing parts (Table 1).

Table 1.

Dust particles in the air,%

Height from the road, m	Particle composition			Particle size, mkm			
	SiO2	Al2O3, FeO, CaO	Other elements	5 gacha	5-10	10-50	Greater than 50
0,45	30-50	55-65	5-10	8,9	38	41,5	11,9
0,65	50-60	40-45	0-5	19	48	28,7	5,3

Atmospheric pressure is one of the main factors for engine performance. Especially on high mountain roads, it becomes difficult to supply enough air for engine work as the atmospheric pressure decreases. For example, if the altitude increases from 0 to 2000 m above sea level, atmospheric pressure decreases from 0.098 mPa to 0.077 mPa, temperature from 15 to 2, and air density decreases to 20%.

Solar radiation has a negative effect on car bodies. Sunshine is from 2690 to 2750 hours per year, and solar radiation is from 280 to 300 W/m.

Conclusion

The climatic conditions of the territory of our country consist of dry, mountainous and desert zones, changes in air pressure and, most importantly, a large amount of dust in the air. Abrasive particles in the dust accelerate the corrosion of car parts, and as a result, their operational reliability decreases. Also, abrasive particles get into the engine cylinders together with the fuel, accelerating its failure. Dust particles can get into fuel through the air, during transportation of fuel from one place to another, when it is poured into a car, and in several other conditions. Therefore, the problems of increasing the operational reliability of the manufactured cars in the climatic conditions of Central Asia, in particular, Uzbekistan, remain one of the urgent issues.

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