TRAFFIC ANALYSIS BY STUDYING TRAFFIC FLOW DENSITY

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Annotation: Today, the level of personal vehicle usage is rapidly increasing not only in our country, but all over the world. While this trend reflects improvements in the economic and transport conditions of the population, it has also led to several serious problems, including traffic congestion, increased noise levels, environmental degradation, and a rise in road traffic accidents.

Keywords: Traffic flow, traffic density, congestion, urban transportation, traffic management, road infrastructure, motorization level, traffic safety.

Today, the level of use of personal vehicles is rapidly increasing not only in our country, but also around the world. This factor indicates that the economic transport situation of the country, the economic situation of the population is improving, but this general transport traffic management causes a number of problems, such as traffic jams, noise, deterioration of the ecological condition of the city, an increase in road traffic accidents (ATV), and during rush hours, even the speed of movement within the city decreases to 20-35 km/h compared to the speed of movement outside the city.

The main reason for this is that the country lags behind in terms of the level of road development in relation to the level of motorization, or that traffic is not properly organized even on some roads that can meet the level of traffic.

Traffic flow - the simultaneous movement of cars of various types and other vehicles with different loads along the road; one of the most important

characteristics in studying the traffic system of the traffic flow is the traffic density of the traffic flow.

Traffic flow density - the number of cars per unit length of a road section of the same type of transport and operation, usually at an interval of 1 km; This indicator varies depending on the traffic composition, its speed and road conditions. The maximum density of a traffic flow consisting of passenger cars is qmax = 200 cars / km, at which the speed is v = 0 km / h, the optimal density of the traffic flow is qopt = 15-25 cars / km

As the density of the traffic flow increases, the distance between vehicles decreases, the speed decreases, and the mental work mode of drivers becomes more difficult, which leads to the inconvenience of general traffic. The greatest density of the traffic flow is observed when vehicles are stopped ("jammed") [2].

Traffic flow density - the number of cars per unit length of a road section of the same type of transport and operation, usually at an interval of 1 km;

The density of the traffic flow can be estimated as follows: Q=N/V (1)

Where: N- the amount of traffic in one lane, vehicles/km; V- the density of the traffic flow, km/h;

If any two indicators in the above formula are known, it is easy to find the third indicator. Such a connection is convenient when monitoring the traffic flow pattern. When describing the state of the traffic flow on road sections or the road as a whole, an assessment using the density indicator gives an objective result.

When the density of the traffic flow is high, it leads to an increase in the load on the road, while at the same time reducing the speed of the traffic flow. In these cases, naturally, this leads to an increase in the amount of excess toxic substances emitted into the environment from vehicles.

To reduce vehicle emissions, it is necessary to reduce traffic density to a minimum, maintaining a safe distance between vehicles and maintaining a speed of 40 km/h to 60 km/h [2].

For example, "A" changes as it approaches a populated area (Figure 1).

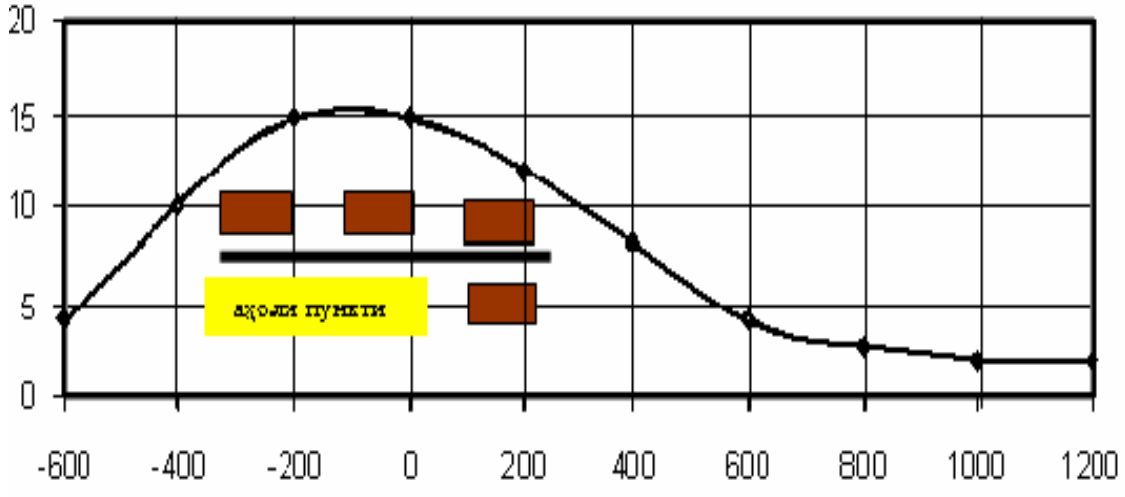

Figure 1. Changes in traffic flow density near a residential area. Knowing the density, a “traffic volume-density” graph can be constructed (Figure 1), which can be used to determine the carrying capacity and speed of a road section. It should be noted that precipitation conditions have a greater impact on traffic density, carrying capacity, and speed of traffic flow than dry weather conditions [3].

As traffic density increases, the safety factor decreases.

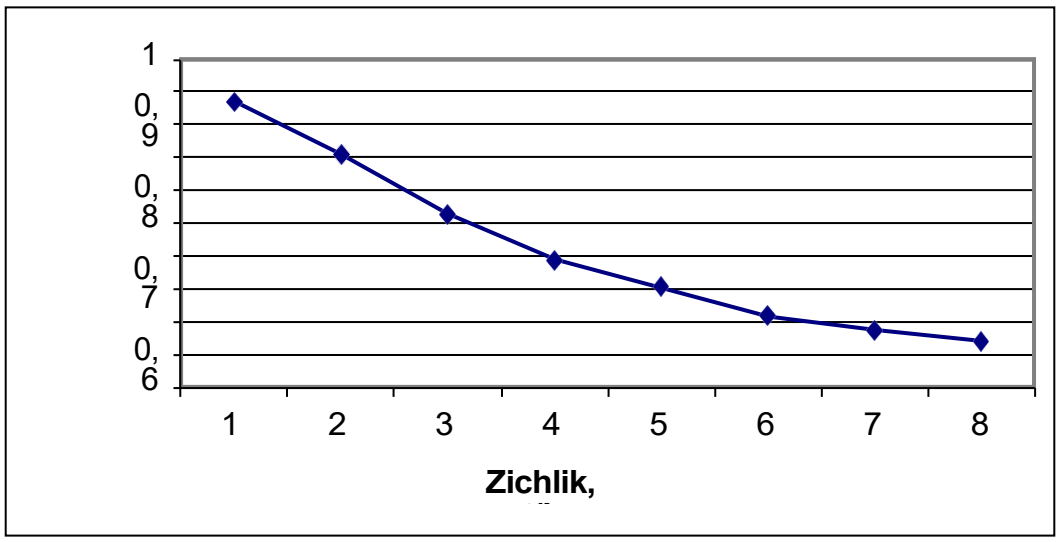

Figure 1. Dependence of traffic density on the safety factor. (N=450 vehicles/hour).

The capacity is the main calculation indicator of the road, which depends on the condition of the road and the level of traffic organization [1,6]. The components of the dynamic dimensions of vehicles are shown in Figure 2.

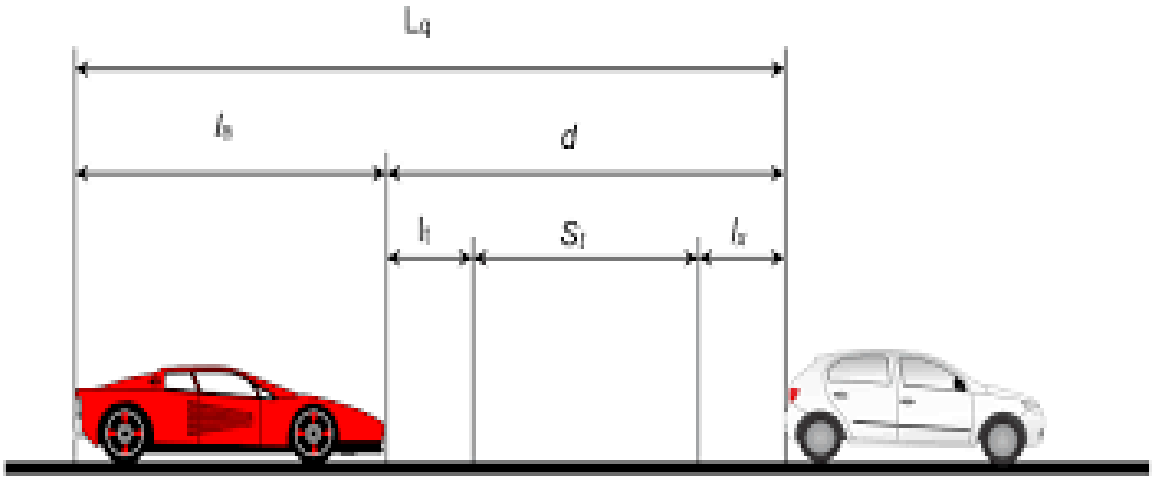

Figure 2. Dynamic gauge of cars.

Dynamic gauge is determined by the following formula:

Lq= la + lr + St + lx (2) where: la – static length of the car, m;

d – distance covered by the driver during the reaction time, m;

St – braking distance of the car, m; lx – safety distance, m.

Road capacity – the number of cars that can pass a certain section of the road in a unit of time, it is determined in cars/hour or cars/day. Road capacity largely depends on the speed of movement and the organization of traffic. One of the main characteristics in the organization of traffic on roads and its efficient use is the capacity of the road [4].

Capacity can be divided into the following types [6]:

- maximum theoretical capacity – the number of light vehicles that can pass in an idealized manner under favorable road conditions. It is determined using the dynamic formula of traffic flow;

- practical capacity - the maximum number of cars that can be transported on a specific road section in a certain traffic pattern under favorable weather conditions.

The maximum theoretical capacity of a road is determined by the following empirical formula [6]:

$$P = \frac{1000 \cdot V}{L_a}$$

car/hour(5)

where: V - speed of cars moving in the lane, km/h; Lq - dynamic clearance of cars, m.

It can be seen from the dynamic clearance of cars that this indicator depends on the longitudinal arrangement of vehicles in one lane and the types of transport. Taking this into account, for practical calculations, a coefficient is usually introduced to bring the traffic volume of different types of vehicles to that of passenger cars and their value is taken based on the regulatory document ShNQ 2.05.02-07

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