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Maly O.Yu.¹, Furmanova N.I.¹

¹ Ph.D., As. Prof. ZNTU

Maly O.Yu., Furmanova N.I.

SYSTEM FOR ANALYSIS OF THE TRAFFIC FLOW THROUGH THE BRIDGES

The correct determination of traffic intensity and traffic flow is an important task that allows to make adequate decisions at the stage of designing highways, namely to pick up a road structure capable of operating under conditions of loading from the existing traffic flow throughout the life of the service [1].

Unfortunately, the only accurate enough to establish changes depending on the intensity and composition of traffic flow for the year is impossible, as each road has its own characteristics forming traffic. Therefore, the basis for the practical determination of the characteristics for the traffic flow to assess the residual life of road constructions is the materials monitoring [2].

Despite some improvements, on the posts of the automated traffic accounting system it is impossible to obtain data on the number of axes of multi-axes vehicles on the loading of each axle. This data is an important parameter in determining the load of vehicles on the road surface.

The most advanced systems for determining the transport flow parameters are the Weigh-in-Motion (WIM) systems - devices for determining and recording axial and full loads of vehicles.

Unlike previously used static weighing stations, WIM systems do not require truck to stop, it makes their work much more efficient. The information received from posts equipped with WIM systems is informative enough.

Together with the information on the number of vehicles, they provide data about the speed of vehicles and their axle loads.

Let's consider the advantages and disadvantages of WIM stations.

Advantages of WIM:

- processing speed in comparison with stations of static weighing;
- security;
- continuity of data processing;
- increase of the volume of coverage of the traffic flow;
- low cost of operation;
- continuous monitoring of the allowable load;
- the possibility of statistical processing of data.

Disadvantages of WIM:

- WIM stations provide less accurate information on the load in relation to static weighing stations. The error in measurements can range from 6 to 15%;

- reduction of information on the freight traffic flow. At WIM stations, it is impossible to obtain information such as fuel type, state of registration, model year of the vehicle, origin and destination of the goods.

WIM systems are subdivided into permanent ones (sensors and data collection systems are in the same place), semi-permanent (sensors built into the road surface are moved from place to place), as well as portable (moving from place to place).

Foreign systems that provide information sufficient to make the right decisions at the stage of designing road surfaces (such as Weigh-in-Motion) are expensive. One of the solutions to the problem is the development of a domestic method for express estimation of transport flow parameters.

It should be noted that the presence of such a method would allow not only to make a correct calculation of the road structure, but also to monitor the compliance of carriers with the rules of cargo transportation. This issue is very relevant on loaded roads, where there is a limit on the maximum load on the axle of the vehicle (for example, the dam of the Dnieper Hydroelectric Station in Zaporizhzhia, where the road surface is damaged through the passage of overloaded machines, and it leads to the need for annual repairs).

We developed a hardware-software system flow analysis of the traffic through the bridges, intended to prevent the destruction of the road surface and engineering structures by weighing the cars during their movement and controlling the flow of vehicles on different roads.

The feature of this system is the possibility of a system without stopping the traffic flow, which is especially important on loaded sections of the road. For weighing a car it is enough to reduce the speed to 30 km/hour, which is the normal speed of movement in the right lane of the dam of the Dnieper Hydroelectric Station and on similar engineering objects.

In addition, the possibility of data about the number of machines photofixation during weighing and weight to the central server will quickly respond to overload and prevent similar violations from the owners and drivers of trucks.

The tensometric sensor is built into the road surface and structurally similar to the coating that already exists on the dam of the Dnieper Hydroelectric Station between the plates.

The developed software and hardware complex has a modular design and provides the ability to monitor and control through the Internet, which is an undeniable advantage over other systems. Also, the development of the system also offers a method for determining the optimal amount of flow of machinery through different areas of different types of freight transport and planning the optimal time of their follow-up. It will make it possible to regulate with the help of road signs the time of following trucks with a mass above specified.

The use of such a system makes it possible to significantly shorten the time for controlling the flow of trucks with a limiting mass and damaging road surfaces and engineering structures, which in turn saves costs from local budgets for their repair.

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