Analysis Of Factors Which Define Time Losses In Traffic Flow

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Abstract – Reviewed geometric and planning road network parameters which impact on delays of movement in traffic flows, and also organizational questions, connected with them. Analyzed factors, which reduce vehicular speeds and encourages traffic jams generation.

Keywords – time losses, traffic delays, road network, speed of movement, traffic flow.

I. Introduction

Currently in large and especially large cities quite critically appears problem of traffic flow delays. The main reason is essential increase of motorization level, which enlarges traffic intensity, demands provision of urban space for temporary and permanent car storage (parking), decreasing amount of road lanes, and, therefore, capacity. This problem especially complicates because, despite of intensity growth, movement conditions practically do not change, especially in cities, where existing buildings do not allow to broaden width of existing roadways and build new streets and roads. Increasing of delays in movement comes from periphery to the center and also strongly depends from road network configuration and parameters, fraction of transit flows and specificity of building public transport lines.

II. Definition of traffic flow delays

Traffic flow delays are time losses on intersections, and also on areas between intersections, which are caused by different factors [4]. In general, for one vehicle movement delay is difference between actual and calculated speed of movement [1-3]:

\[ t_\Delta = \int \frac{1}{v_a(l)} - \frac{1}{v_p(l)} \, dl, \]  

where \( v_a \) and \( v_p \) – accordingly actual and accepted calculated speed of movement, m/sec; \( dl \) – elementary road section, m.

General delay for traffic flow will make [1-3]:

\[ T_\Delta = N_a \cdot t_\Delta \cdot T, \]

where \( N_a \) – traffic flow intensity, units/hour; \( T \) – duration of observation, hours.

III. Analysis of geometric and planning road network parameters

Let’s consider geometric and planning parameters which have significant impact on traffic flow delays. To geometric parameters belong horizontal and vertical curves, type, configuration and crossing angle of intersections, from which depends distance of visibility, as insufficient visibility encourages reduce in speed of movement; insufficient roadway width and number of lanes complicates or makes impossible performance of overtake maneuvers at all. Negative phenomenon is abrupt narrowing of roadway, which also encourages formation of traffic jams. To the planning belongs scheme of city road network: optimal scheme is rectangular-diagonal, but in majority of old cities exists free scheme, which complicates choose of optimal route of movement, thus enlarging load on certain city streets, and during generation of traffic jams emerges problem in implementation of detour.

Great problem is that majority of cities have existing buildings and very often it is impossible to affect the factors which were mentioned before. Often the generation of delays in traffic flows contributes their dissimilarity, presence of public transport in them, especially trams and trolley-buses, as their average technical speeds are inconspicuous (15-20 km/hour), and public transport stops are unequipped.

One more factor, which impacts on traffic flow delays, is type and condition of road surface, and also its quality. Unsatisfactory road surface condition reduces speed of movement, especially in rainy or snowy weather, because tire-to-surface friction coefficient in such conditions is much lower. The most dangerous in this regard are streets, which are covered with block stone, which, despite of low tire-to-surface friction coefficient, can be laid improperly, which significantly lowers speed of vehicle movement. As for the roads with bituminous-concrete surface, then existence of road unevenness and potted surface also forces drivers to maneuver, with reducing speed of movement.

IV. Reviewing of organizational approaches

As for organizational questions, there are exist factors which impacts traffic flow delays, that can appear on intersections and on areas between intersections.

If the intersection is unregulated, then there are in general appear movement delays in minor direction because of absent or insufficient intervals between vehicles, which move in the main direction, that are necessary for performance of maneuver.

In case when the intersection is regulated, delays appear because of insufficient duration of permission signal in certain direction. Especially acute this problem appears in peak periods.

As for areas between intersections, then on them delays most frequently appear in the presence of unregulated pedestrian crossings and high intensity of transport and...
pedestrian flows, presence of parked vehicles on the edge and in the middle of roadway.

Unlike the geometrical and planning factors, actions for traffic organization can be and must be optimized, because in existing conditions this is one of the main ways for reducing traffic flow delays.

**Conclusion**

In consequence, going out of analyzed factors, which cause time losses of vehicles, it is expedient to carry out field research for definition the amount of traffic flow delays and basing on the research develop actions for traffic organization for reduce of these delays.

**References**


