

BASIC CHARACTERISTICS OF PUBLIC PASSENGER TRANSPORT FROM THE TRANSPORT USER POINT OF VIEW

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Anotace: Uvedený článek se zabývá problematikou veřejné hromadné dopravy z pohledu uživatele dopravy. V článku jsou charakterizovány vlastnosti jednotlivých dopravních oborů a samozřejmě také veřejné hromadné dopravy.

Konkrétně jsou v článku stručně popsány následující charakteristiky: rychlost dopravních prostředků, doba pobytu vozidla na zastávce, časové ztráty a hodnoty časových úspor.

Klíčová slova: doprava, uživatel dopravy, veřejná doprava

Summary: This article deals with problems of public passenger transport from the transport user point of view. Than there are characterized properties of each mode of transport including of course also public passenger transport. Specifically there are following characteristics mentioned in the article: speed of means of transport, length of stay of means of transport in the stops and stations, waste of time and value of time savings.

Key words: transport, transport user, public passenger transport

INTRODUCTION

To most important properties of each mode of transport and so of course also the public passenger transport belong for example the speed of transport, the ability to satisfy transport users demands, regularity, readiness, safety, duality, energy consumption, labour, efficiency, productivity and capacity and many others. There will be following properties described in next part of the article: speed of means of transport, length of stay of means of transport in the stops and stations, waste of time and value of time savings.

1. SPEED

The speed of means of transport we observe by the force of speedometers, recording speedometers and recently by the force of board microcomputer technology (board computers, black boxes, etc.)

In transport practice we distinguish these speeds: (3, 4)

- driving speed – which means the immediate speed of the mean of transport in concrete place of the transport route,
- maximum operational speed – which means the maximum speed of given mean of transport permitted by the producer,

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- maximum track speed (speed limit) – which means the maximum speed of the mean of transport on given track with respect to the construction and equipment of the track (speed limits of the means of transport in the municipality given by authorized technical legislation, system of road signs, etc.),
- technical speed – is the average speed of the mean of transport on the line (part of the line) including also times of delay of the transport flow as consequence of traffic but not including the length of stay in the stops and stations. In integral conception it means cruising speed negating each phase of the process,
- travelling speed – is average speed of mean of transport on the line (part of the line) including also (unlike technical speed) also length of stay in the stops and the stations. And again in integral conception it means cruising speed negating not only each phase of the drive, but also length of stay in the stops and stations,
- velocity of circulation – in case of public passenger means of transport it represent the average speed of mean of transport during the drive from starting station including length of stay in the stops and stations, length of stay on terminal (terminal station), time of break for drivers and time for inspection of the mean of transport, times for equalization of the timetable. To the length of line we must figure in the length of terminal loops or reversing loops in the terminal stations.

2. LENGTH OF STAY IN THE STOPS AND STATIONS

The contribution of dynamics of the mean of transport for short time of removal procuration can be to considerable extent devaluated by the force of long time of dispatch in the stops and stations. Technical preconditions for minimizing of length of stay in the stops and stations should be created preferentially, before the solution of required dynamics of the mean of transport which is output-consuming.

Basic phases of the length of stay of public passenger means of transport in the stops and stations may be characterized by the force of following equation [equation no. 1]: (3, 4)

$$t_{st} = \max \{t_{vi}(n_{vi}) + t_{ni}(n_{ni})\}_{i=1}^d + t_{zp} + t_o + t_{np} + t_z + t_{zp} ; [s]$$

where:

- t_{st} is the length of stay of the mean of transport in the stop or station,
- $i = 1, \dots, d$ is the number of doors of the mean of transport (public passenger transport, vehicle combinations, trans, etc.),
- n_{vi} is number of passengers getting off by the i -th doors,
- n_{ni} is number of passengers getting in by the i -th doors,
- t_{vi} is time of passengers getting off by the i -th doors; commonly it mens the function of n_{vi}
- t_{ni} is time of passengers getting in by the i -th doors; commonly it mens the function of n_{ni}
- t_{zp} is the delay of cutting of,

- t_o is time of door opening,
- t_{np} is delay of getting in,
- t_z is time of door closing,
- t_{rp} is delay of moving on.

3. WASTE OF TIME

Waste of time in case of reflection of passable barriers and restrictions characterized probabilistically – crossings, concurrency with public passenger transport.

The case of undirected crossings (in case of public passenger means of transport it should be singular).

By the force of idle time of means of transport using neighbour transport flow we consider the quality of traffic in the crossing on different level, for example: (3, 4)

- level A – low waste of time (for example less than 10 seconds),
- level B – acceptable waste of time (for example less than 25 seconds),
- level C - unacceptable waste of time (higher than 25 seconds).

These limits will be of course different for the traffic in the crossings in the cities for rush hour and gabled hour.

In case of controlled crossings is the situation more difficult. The principal of controlled operation on crossings is alternative rationing of green signal (go on) for vehicles in main and side directions in constant period of time which is periodically repeated (cycle). But this problems is too extensive to be resolved in this article – usually we include it into the individual branch called: “Traffic engineering and road traffic management“.

Waste of time arise also from influencing of non-uniformity of the public passenger traffic namely in CASE when subsequent time interval (line and track – between stations) decline to the value of 1 minute: for example in case when many means of transport (buses) arrive at the station (stop) in the same time and the station (stop) is not able to hold this number of buses – the travelling time usually extend from 5 to 10 % against the standard.

4. VALUES OF TIME SAVINGS

Cash value of travelling time savings is one of most important variables related to transport user.

Therefore:

- we must pay attention during the time values determination,
- where the doubt about suitable value is, it is necessary to accomplish tests of sensitivity for to assess the impact of change of value of time,
- the evaluation must be consistent.

There is understandable difference between business trips and other trips in the frames of public transport. Working time includes business trips realized on demand of employer or for the purpose of private enterprise. Non-working time includes all other trips. Generally we will need values of:

- working time savings [in Crowns per person-hour],

- non-working time savings [in Crowns per person-hour],
- time savings in freight transport [in Crowns per person-hour].

The evaluation should include time values based on local values. In optima case, the local values should be derived from local (or at least regional or national) data and from results of transport market research and should reflex the willingness of individual transport user to pay for time savings.

However in areas where we can not acquire reliable values, we should accept following expert assessments.

Working time values should be coincident with the extent of average gross wage in given country where the trip began. The extent of average gross wage is defined on employer, respectively on hour of employer's time including any income taxes, allowances, social security fee and other costs on employee. Indirectly we assume that no part of employee's travel time can be productively used and when the travel time will sink the employer will be able to reorganize his business for to fully use the additional (saved) time when the employee will be at employer's disposal.

The average gross wage can be found out from national/regional statistics. Further we will need to get calculations of the working population extent and the number of worked off hours in one year – these should be explicitly introduced in the appraising report.

In case the values of user's time of concrete mode of transport are higher (or lower) than average gross wage, the acceptable sort specific adaptations of time values will be accepted.

The example of expert assessment is the fact that working time of inland air transport user's may be estimated as 2,5 multiple of car users value of time. (2)

Values of non-working time should be on the level of 30 % of average net wage in the country where the trip began. Net wages are defined as pay purified from all taxes, pension insurance fees, social insurance fees and other employee expenses.

Values of air travelling in non-working time may be estimated on the level of 0,85 multiple of value of travelling working time. (2)

The depth of travelling time savings for the country where the trip began base in fact that travel time savings are related only to this country and not to the part of world, where the travelling trip run.

For small number of trips the changes in transport net may lead to growth of travelling time. In these cases there should be similar value used for travelling time growth and to travel time savings.

Provided that the expert assessment is used for the determination of user's benefits there will be no changes in appraising procedure needed.

Above mentioned expert assessments are related before all to the time spend in the car. For all other aspects of personal travelling time including time spent for a walk, waiting time for change to other mode of transport can be the time spent on these activities estimated differently. On the basis of last research it is recommended to use the value of 1,6 multiple of time spent in the car. (1)

At the end we can observe that the values of time in freight realized of one's own account transport will include the driver's time, because in such specific case personal costs won't be included in operating cost of the mean of transport.

5. CONCLUSION

As mentioned in introduction of the article, given enumeration of properties is not final. We could find other very important indicators of public passenger transport.

Above mentioned indicators characterize the transport system and so you can find these indicators in professional literature specified as technical – economic properties of the transport system.

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LITERATURE

- [1] BATES, J.J. Econometric issues in stated preference analysis. *Journal of Transport Economics and Policy* 23 (1), 59-69, 1988. ISSN 0022-5258.
- [2] Cost Benefit Analysis of Transport Infrastructure Projects. Economic Commission for Europe. United Nations. ISBN 92-1-116837-6.
- [3] DRDLA, Pavel. *Technologie a řízení dopravy - městská hromadná doprava*. Vyd. 1. Pardubice : Univerzita Pardubice, 2005. 136 s. ISBN 80-7194-804-7(brož.).
- [4] GRAJA, M. POLACH, J., PODOLÁK, M.: *Technologie a řízení dopravy – MHD*. Studie Univerzita Pardubice 2001.
- [5] MELICHAR, V., JEŽEK, J. *Ekonomika dopravního podniku*. Univerzita Pardubice. 2001. ISBN 80-7194-359-2.
- [6] MELICHAR, V., JEŽEK, J. *Ekonomika podniku*. Univerzita Pardubice. 2002. ISBN 80-7194-510-2.
- [7] MOLKOVÁ, T. *Dopravní obsluha v novém krajském uspořádání České republiky*. Žilinská univerzita. Sborník příspěvků, Žilina 2003. ISBN 80-8070-093-1.
- [8] ŠARADIN, P. *Marketingové a operativně řízení dopravního podniku*. Žilinská univerzita. Sborník příspěvků, Žilina 2003. ISBN 80-8070-093-1.