DISPATCH CONTROL OF BUS TRANSIT

Shavyraa, Chechek Despi-oolovna, *Tuva State University, Kyzyl, Tyva Republic, Russia.*

ABSTRACT

The article is devoted to the problems of organisation of public bus transit in Tyva Republic in Russia. Currently, the management and control of public bus traffic in the region is based on the use of special technical tools. In large cities, modern dispatch systems have been working quite successfully since the beginning of the 2000s. Due to the difficult financial situation, small cities in the remote places had no opportunity to install systems of such a level immediately. The article discusses the main dispatching operational management systems (DOMS), allowing to obtain more complete information about the operation of buses in real time, to promptly respond to violation of timetables and to conduct a systematic analysis of the efficiency of public transport.

Keywords: public transport, bus, management, small town, passenger transportation, system, automation.

Background. *Small cities face an acute problem of how to increase the efficiency of passenger transport through better use of existing fleet of vehicles. On bus routes, carrier companies of various forms of ownership work, and control of their activities is a priority, because it predetermines respect of the timetable, number of buses serving a route, analysis of the quality of passenger service, etc. The implementation of operational control dispatching systems will allow to fix the situation and provide reporting on performance of transport work for a given period.*

The most important problem in the cities of Tyva, including the capital Kyzyl, is the inability of passengers to leave at 6–7 am and after 7 pm, since buses no longer serve the line. Transportation of passengers during peak hours is difficult, vehicles do not cope with passenger flows.

By studying the properties of dispatching systems, one can formulate functional control algorithms with the guarantee of error detection in controlled models. This article describes a systematic code with a number of useful features, which indicates the prospects for its use in the organization of effective control systems.

Objective. *The objective of the author is to consider dispatch administration of bus service.*

Methods. *The author uses general scientific methods, comparative analysis, evaluation approach, software analysis.*

Results.

1. Operational dispatching systems

In connection with the work of buses on an extensive road network, the effective dispatch administration of their movement is based on the use of special technical tools. Domestic systems developed from scratch starting from the simplest semi-automatic systems that provided data transmission from vehicles, generally called mobile units (MU) on the principle of inductance, then evolved into complex operational control systems using multi-phase modes in combination with satellite navigation. The emergence of dispatching operational management systems (DSOM) allows to obtain objective information about the location of buses, to quickly respond to violation of plans and schedules, to conduct a systematic analysis of the efficiency of public transport [1–3].

The main functions of DSOM can be divided into two groups.

The first is organization of control of bus schedules. The control includes preparation of technical and technological means, development of the order of their functioning, the regulatory framework and indicators, rationing of speeds and scheduling, defining the quantity of buses serving the route at a given time, measures for the necessary correction of bus work.

The second group is associated with direct control and operational management, which includes implementation of the schedule of movement of each bus, checking the compliance of actual indicators with the planned ones, putting in action corrective measures, if necessary, summing up the results of the work during the shift and assessing the regularity of movement [4–6].

In our country, the most common is DSOM NEZHAN, which, depending on the version, can serve up to 600 buses. It was developed and manufactured by SKB Transavtomatika in the city of Nalchik. The successor of this organization was LLC Tetrada [2].

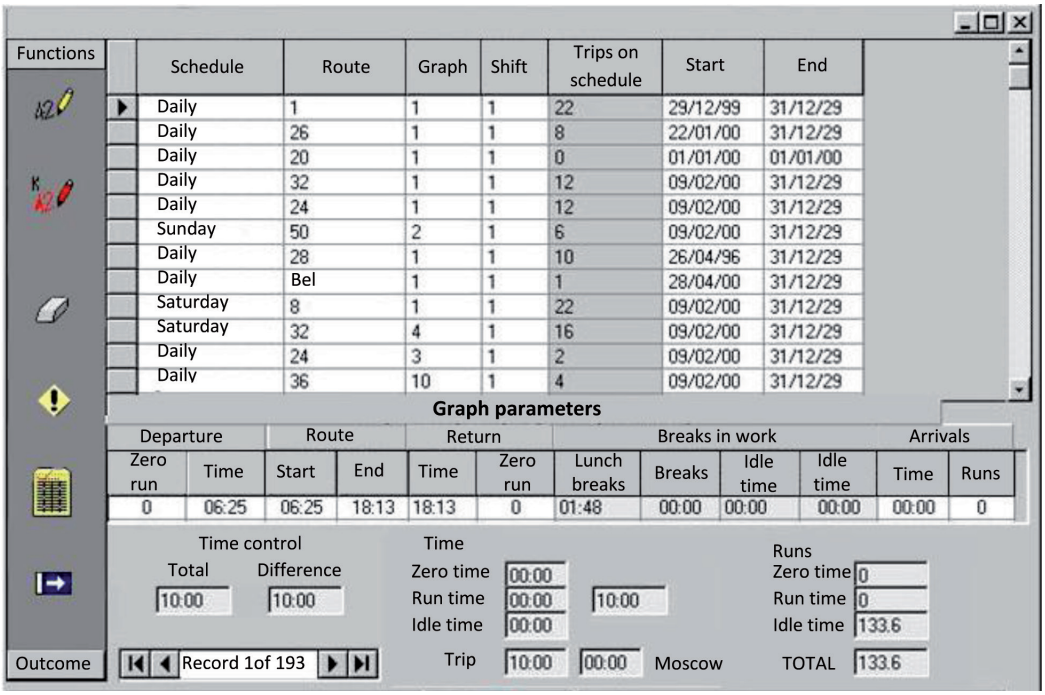
Now the most modern DSOM of this type is NEZHAN-TETRA system. It is designed to monitor movement of vehicles performing passenger transportation on urban and suburban routes, as well as transferring to drivers the driving commands to change the planned driving patterns. The system can simultaneously monitor up to 1000 buses from seven control rooms. Up to 8000 radio beacons are installed on the routes of buses.

Technological problems of traffic management, solved by the system [6–8]:

- *control of departure and return of vehicles to passenger enterprises;*
- *transfer daily planned assignments to drivers as messages on the screen of a cell phone when vehicles depart from the enterprise;*
- *control of time the drivers are on the route;*
- *identification of facts of violations by drivers of planned driving patterns;*
- *detection of vehicle failures and ensuring their timely technical maintenance;*
- *analysis of the quality of respect of schedules by drivers in real time;*
- *establishing voice communication sessions between drivers and personnel of the traffic control center;*
- *transfer (if necessary) of emergency calls initiated by drivers;*
- *analysis of the results of the transport work performed for each driver, crew, unit, company or the city as a whole, providing dispatching reporting forms for a given period (day, decade, month, etc.).*

A device is installed on the bus that receives signals from the beacon and provides cellular communication and a voice channel between MU and the controller.

The costs associated with design and implementation of the system largely depend on the parameters of the city's transport network (number of vehicles, routes, schedules, length of



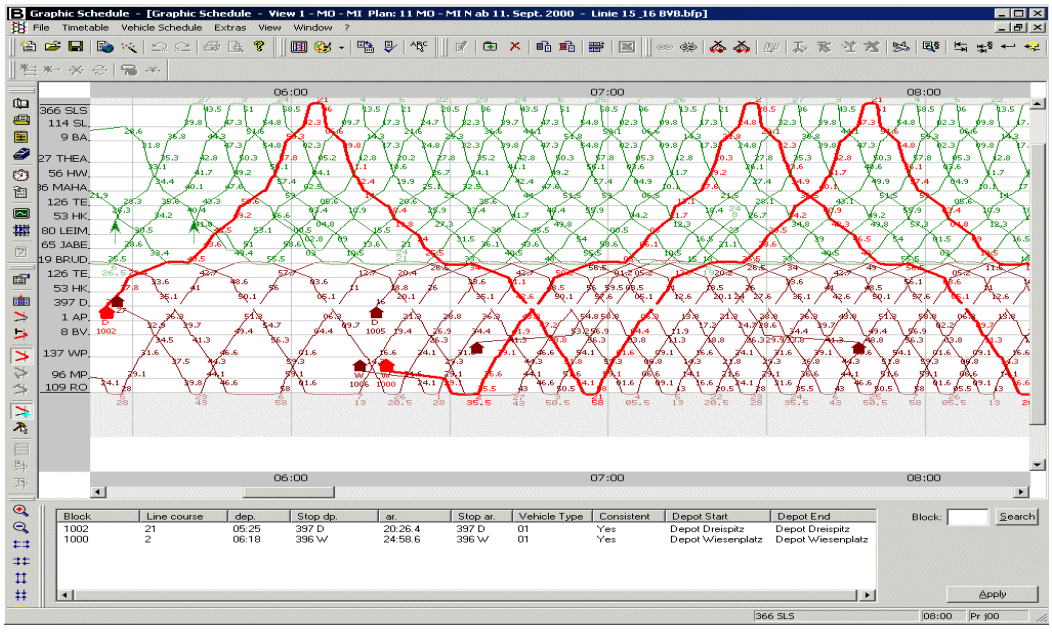
Pic. 1. Development and control of bus schedules.

routes, etc.) and rates of the cellular operator [1, 10–12].

2. Capacities of NPP Transnavigation system

The developments of NPP Transnavigation, built on the basis of satellite navigation systems and intended for urban, suburban and intercity transportation, are more advanced. From domestic systems, only they have full-fledged specialized software integrated with hardware and the enterprise information system. It includes the following automated workplaces (AWP) [13, 14]:

- *system administrator;*
- *staff;*
- *technical department;*
- *report card;*



Pic. 2. Development of bus schedules in the DIVA system.

• *fare assessment;*
• *cashbox;*
• *planning department;*
• *salary.*

AWP of a dispatcher is one of basic positions. It provides both an on-line adjustment of operating modes on the route, and processing of waybills. It performs a number of functions [15]:

• *maintenance of reference books of types of schedules (daily, Saturday, Sunday);*
• *development and adjustment of the route network of the enterprise;*
• *development and adjustment of operating modes on the route;*
• *obtaining the required output forms.*

Pic. 1 shows one of the main screens of the dispatcher's AWP.

Of the foreign systems on the Russian market, only the integrated system for urban transport from Siemens VDO – VICOS-LIO, which belongs to the class of automatic ones, finds the location and controls the vehicles as AVLC (Automatic Vehicle Location and Control), has the capacities similar to the product of NNP Transnavigation. Its main advantage is higher reliability of technical components. The system includes [1]:

• *control center;*
• *mobile equipment on MU;*
• *digital and voice communication channels;*
• *equipment to ensure the priority of public transport;*
• *information management system of the car fleet;*
• *software for planning and analyzing the efficiency of public transport.*

The ICOS-LIO system uses the MDV DIVA software, which provides for development of coordinated bus schedules (Pic. 2), statistical processing and analysis of the results of work of vehicles and drivers.

Conclusion. *To manage the work of urban transport, a system should be used, equipped with modern technical means of control, prompt data transmission between MU and the control center, integrated into the information system of automobile enterprises and city services. The special role of modern dispatching systems is that they can be used to control transit companies of various forms of ownership, to analyze the results of the transport work performed by each driver, crew, unit, enterprise and the city as a whole. In the presence of such a system, it makes sense to talk about the quality of passenger service provided by urban public transport.*

For the city of Kyzyl, particularly, in the opinion of the author, it is recommended to introduce the NEZHAN-TETRA system, which is able to simultaneously monitor up to 1000 buses. For the enterprise of SUE Kyzylavtotrans, it is possible to introduce the system of NPP Transnavigation, which will allow for the operational adjustment of bus operation modes on the line, up to the processing of waybills. There is even the possibility of maintaining an electronic timesheet.

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Information about the author:
Shavyraa, Chechek Despi-oolovna – Ph.D. (Eng), associate professor of the department of transport-technological means of Tuva State University, Kyzyl, Tyva Republic, Russia, Shavyraa@mail.ru.

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