

ADVANTAGES OF USING AN ELECTRICAL TRANSPORT

Vinnitsia National Technical University

Анотація

У даній статті розглянуто питання ефективності використання електротранспорту в перевезенні пасажирів порівняно з традиційним транспортом.

Ключові слова: Електротранспорт, електробуси, акумуляторні батареї, бездротова передача енергії.

Abstract:

This article deals with the efficiency of using an electrical transport for passengers transporting compared to the traditional one.

Key words: Electric transport, electric buses, rechargeable batteries, wireless transmission of energy.

Transport vehicles, which use refinery oil as fuel, ranks third in sectors that significantly pollute the atmosphere with carbon dioxide emissions and accounts for 25% of the total emissions [1].

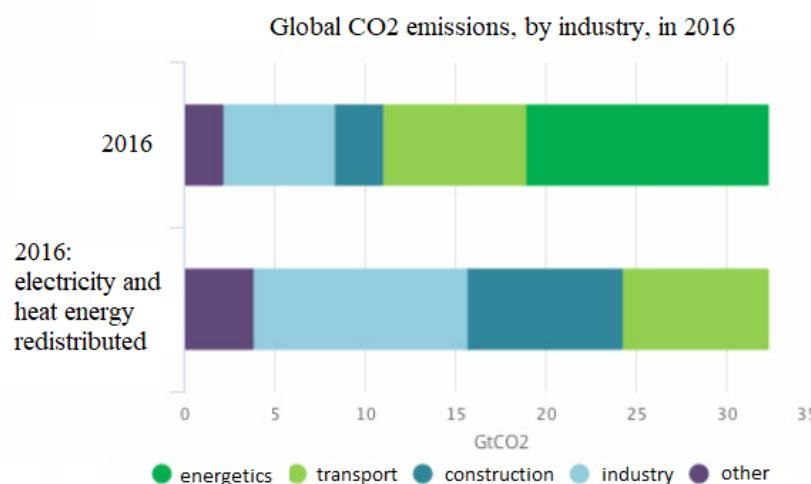


Figure 1 – Global CO₂ emissions by industry, in 2016 [2]

Therefore, a replacement of vehicles with internal combustion engines for transporting electric motors, allows to reduce the rate of pollution of the environment [1].

The use of electric buses has become very popular after the development of batteries production (traction batteries), which, due to its characteristics, are widely used in the automotive and bus industry for passenger traffic, and also become very popular for use in bicycles and motorbikes [3].

Electric buses can store the electricity on board, or can be fed continuously from an external source. Buses storing electricity are majorly battery electric buses, in which the electric motor obtains energy from an on-board battery, although examples of other storage modes do exist, such as the gyrobus which uses flywheel energy storage. In the second case, electricity is supplied by contact with outside power sources. For example, overhead wires, as in the trolleybus, or with non-contact conductors on the ground, as seen in the Online Electric Vehicle [4]. Lithium-ion batteries are currently in the most popular use (Modern lithium-ion batteries have high performance: 100-180 Wh/kg and 250-400 Wh/dm³, operating voltage is 3,5-3,7 V).

Electric buses with a battery provide zero emissions, quiet operation and better acceleration compared to traditional buses. They also eliminate the infrastructure needed for a permanent connection to the network and allow us to change routes without infrastructure changes compared to the trolley bus. They

usually restore the braking energy to improve efficiency through a recuperative brake. At energy consumption about 1,2 kWh/km the cost of ownership is lower than that of diesel buses [3].

Rechargeable buses are equipped for charging with fixed pantographs at bus stops and depots [3]. Super-capacitors can be recharged quickly, reducing the time it takes to prepare for work restoration.

Since 2016 battery buses have less range, higher weight, and higher procurement costs. The reduced infrastructure for overhead lines is partially offset by the costs of the infrastructure to recharge the batteries. Battery buses are used almost exclusively in urban areas rather than for long-haul transportation. Urban transit features relatively short intervals between charging opportunities. Sufficient recharging can take place within 4 to 5 minutes (250 to 450 kW) usually by induction or catenary [4].

According to Bloomberg, "China had about 99 percent of the 385,000 electric buses on the roads worldwide in 2017, accounting for 17 percent of the country's entire fleet." Chinese cities are adding 1900 electric buses per week [4].

The ideal solution to provide electric buses with uninterrupted work throughout the day was found by the Korean Institute of Technology (KAIST). They have developed a technology called OLEV (On Line Electric Vehicle), which allows you to charge vehicle batteries directly when driving through city streets, and the principle of the technology is simple enough [5].

The main advantage of OLEV electric buses compared with conventional electric vehicles is the possibility of wireless charging and the lack of a bulky and expensive battery. The energy transfer is carried out by induction through the coils installed in the road cloth. The system requires compliance with a gap of 17-20 centimeters between the road and the bottom of the car. The efficiency of energy transfer is estimated by developers at 85%, and peak power is 100 kW [5].

Developers note that all characteristics of the electromagnetic field are within the normal limits, and people walking on such a road, or riding in a vehicle, are in no danger.

The replacement of public diesel transport has already started in Ukraine. Due to low operating costs, the absence of harmful exhaust emissions, easy maintenance of electric buses is the most promising type of passenger transport in a modern city. In addition, unlike trams and trolleybuses, they do not require any rails or a contact network with substations [6].

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Никипорець Світлана Степанівна – викладач англійської мови, кафедра іноземних мов, Вінницький Національний Технічний Університет, м. Вінниця.

Шалагай Дмитро Олександрович – студент групи ETZ-18м, Вінницький Національний Технічний Університет, м. Вінниця.

Nykyoprets Svitlana S. – Teacher of English, a department of foreign languages, Vinnytsia National Technical University, Vinnytsia.

Shalagai Dmytro O. – student of ETZ-18m group, Vinnytsia National Technical University, Vinnytsya.