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TYPES OF CHARGING STATIONS FOR CHARGING ELECTRIC VEHICLES

A. Tereshenko

*National Technical University of Ukraine "Igor Sikorsky Kyiv
Polytechnic Institute", 37, Peremohy Ave., Kyiv, 03056,
Ukraine, e-mail: tktereshenko@gmail.com*

The types of charging power stations for charging electric vehicles are described. Technologies that can bring the charging time of an electric vehicle closer to the time of refueling a car with an internal combustion engine.

Keywords: *electric cars, chargers for electric vehicles.*

ТИПИ ЗАРЯДНИХ СТАНЦІЙ ДЛЯ ЗАРЯДКИ ЕЛЕКТРОМОБІЛІВ

A. Терешенко

*Національний технічний університет України "Київський
політехнічний інститут імені Ігоря Сікорського",
проспект Перемоги, 37, Київ, 03056, Україна,
e-mail: tktereshenko@gmail.com*

Описано типи зарядних електростанцій для зарядки електромобілів. Технології, які можуть наблизити час зарядки електромобіля до часу заправки автомобіля з двигуном внутрішнього згорання.

Keywords: *електромобілі, зарядні станції для електромобілів.*

ORCID: 10000-0002-0627-688X.

More and more electric vehicles can be seen on the roads today. The rise in fuel prices, active policies of countries, environmental problems, ease of maintenance and an ever-

lower price - make electric transport super popular. No one doubts that the whole world will switch to electric transport in the coming decade. Most developed countries, as well as automakers, plan to completely abandon internal combustion engines by 2030. Despite the large number of advantages of electric vehicles, one of its main problems is the speed of battery charging.

Almost any electric vehicle can be charged from a household outlet. A single-phase 220V AC outlet can charge a Tesla Model S 75D in about 21 hours, allowing you to drive 500 km. This charging method is not practical and is a backup, so that it can be recharged in any electrified place. It can also be charged using a 380V AC 3-phase socket and will take 7 hours to charge. This is a good option for overnight charging. But this is not enough, because due to the charging time, electric cars cannot compete with diesel or gasoline cars, in which the refueling time is 10-15 minutes. Therefore, manufacturers are developing fast chargers. There are AC and DC fast chargers.

The most common type 2 AC charging connector. Most charging stations with this connector have a power of 22 kW and a maximum charging current of 32 A. The batteries themselves are charged with direct current, so the electric vehicle has a built-in charger that converts the alternating current coming from charging into direct current and adjusts the charging parameters. Placing the main charger assemblies on board an electric vehicle limits the AC charging speed. The higher the charging speed, the higher the amperage. In turn, this entails an increase in the mass and dimensions of the electronic components responsible for charging. Also, increasing the charging speed will require better heat dissipation from electronic components. Restrictions on weight, dimensions and heat dissipation capabilities in a passenger electric vehicle have determined the charging current limit of 32 A. It is typical for most mass-produced electric vehicles. The design of the AC station is extremely simple. It has systems for protecting both the electric vehicle

and the electrical network from emergency situations, and, if necessary, a billing system that allows you to sell the charging service.

Direct current charging is much more efficient when the charging station is connected directly to the battery. All components of the charger are located outside the vehicle. For DC charging, CHAdeMO, CCS and Tesla Type 2 connectors are used. Charging stations with CHAdeMO and CCS connectors have a power of 50 kW. This power allows you to charge an electric car for a run of 500 km in 1.5 hours. The Tesla Type 2 connector has Tesla Supercharger charging stations specially designed for electric vehicles of this brand. The operating voltage of such a station is 480 V, the power can reach 150 kW. The Tesla Model S 75D electric car, already mentioned as an example, is charged from a similar station at 80% in half an hour. Disadvantages of DC charging stations: the high cost of the charging station (from \$ 5,000, the price of an AC charging station from \$ 1,500), like any fast charging, reduces the battery life, for this fast charging is limited to 80% of the battery capacity.

Every year, the charging speed of electric vehicles is rapidly approaching the speed of refueling conventional cars, as technology is actively developing. In the future, it is planned to increase the standard battery voltage from 450V to 900V, and the use of supercapacitors is also expected. Therefore, the development of AC and DC charging stations is promising.

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