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Professional paper

ELECTRIC VEHICLES FOR URBAN LOGISTICS

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Abstract

Increased trade development affects traffic. The need to deliver goods to stores or to visit customers in the trade, greatly affects the city's logistics system and the proposed ways of managing them should be analyzed. A modern way of distributing goods is to achieve positive effects on the overall traffic system, but by using them on a very small scale. The introduction of electric vans in retail chains is being used to demonstrate the possibility of introducing electric vehicles into the delivery of consumer goods ordered through online stores. With the growing development of technology, consumers have the opportunity to buy products from home.

EVs use an electric motor for traction, and chemical batteries, fuel cells, ultra-capacitors, and/or fly wheels for their corresponding energy sources. The EV has many advantages over the conventional internal combustion engine vehicle (ICEV), such as absence of emissions, high efficiency, independence from petroleum, and quiet and smooth operation.

The use of electric vehicles still accounts for a very small share of the total number of vehicles delivered, both in Europe and around the world. There is a growing number of vehicles on the roads that an increase in atmospheric pollution that reduces the quality of life for citizens. The desire and need for the introduction of electric vehicles is growing, as a reason for preserving the environment, but also for sustainable urban development. Urban logistics can be considered developed in only a few European countries, while some have not developed proposals or management systems at all.

However, most still decide to visit shopping malls. The result of the usage of personal vehicles for this purpose has a very negative effect on the environment and the quality of life for residents. The paper explores customer habits, their influence on the entire system, and the possibility of introducing qualitative and sustainable ways to purchase and deliver goods. Based on the research, the main goal is to propose a method of distributing consumer goods, starting from a small city and around the country by electric vehicles.

In order to propose an optimal solution, the terms urban and retail logistics will be presented, as well as the ways of modern organization of the distribution of goods for retail.

Keywords: Vehicle, urban, logistic, city, electric

1 Introduction

Traders were once passive recipients of products that manufacturers gave to stores in anticipation of demand. Recently, retailers have been controlling products in response to known customer needs. They control, organize and manage supply chains from production to consumption. This is the essence of the transformation of retail logistics and supply chain that has occurred in the last 20 to 30 years. In 1996, McKinnon reviewed and summarized the key components needed to transform retail logistics. He identified six closely related and mutually reinforcing trends:

1) Increased control over secondary distribution -Traders have increased control over secondary distribution (ex. from warehouse to store) by channeling an increased portion of their inventory through distribution centers (DCs). In some sectors such as food, this process is almost complete. Retailers that use this type of management have much more control over supply chains than others.

Their logistics operation is highly dependent on information technology (IT), especially the large integrated complementary inventory systems that control the movement and storage of a number of individual products.

2) Reorganized Logistics Systems - Traders have reduced inventory and generally improve efficiency through the development of "composite distribution" (distribution of products from different temperature regimes through the same DC and the same vehicle) and centralization in specialized storage for slower consumption. In the case of mixed retail operations, "joint stock locations" are established where the shares are divided into multiple places based on a decision on the needs of stocks of individual products in a particular place.
3) Introducing a Quick Response System (QR2) - The goal was to reduce inventory levels and improve product flow rates. This includes reducing the time to order and transferring more frequent deliveries of smaller shipments between DC and stores, as well as between suppliers and DC. This greatly increased the rate of trade in goods and the amount of products passing through the port instead of storage in the DC. The Rapid Reaction System (QR) is made possible by the development of electronic data exchange and electronic sales outlets. The order-based sales systems were installed by most retailers. For example, when scanning a store item in a store, the data is used to inform the system for recharging and redirection, which quickly responds to demand. Sharing such data with key suppliers further integrates production with customer function.
4) Rationalization primary distribution (from manufacturer to DC) –partly as a result of QR pressures and partly as a result of intensifying competition, retailers are expanding their control over the DC flow of manufacturers. In order to improve the use of their logistics infrastructure, many have integrated their secondary and primary distribution operations and established them as a single network system. This has helped reduce losses and improve efficiency.
5) Increasing product returns - Traders are increasingly involved in the reverse logistics operation. This trend is reinforced by the introduction of the European Union's Packaging Directive. In this area, there are opportunities to develop new forms of packaging that can be reused and these new reverse logistics systems to manage their circulation.

Introducing Supply Chain Management and Effective Customer Response (ECR) - Once they improve the efficiency of their own logistics operations, many retailers will start working with suppliers to increase the efficiency of the retail supply chain as a whole. Supply Chain Management (SCM) provides a management framework within which traders and suppliers can effectively coordinate their activities.

2 City logistics

Urban logistics is a process of optimizing urban logistics activities, including the social, environmental, economic, and financial and energy impacts of urban transport movements. The goal of urban logistics is to optimize the logistics system within the boundaries of a particular urban area, while taking into account the interests.

Some social groups use both the public and private sectors. The goals of various stakeholders, such as producers, distributors, traders and carriers, are to reduce transportation costs, while the public sector wants to reduce traffic congestion and environmental pollution problems, which allows for good organization of the city's logistics system.

The main features and objectives of the application of the city logistics system are:

• Selection and application of spatial criteria and directing the work of the city logistics system in the central and historical parts of the city;

• To direct the action towards the central city zones due to the high density of construction, population and often inadequate transport infrastructure;

• To direct the action towards the centers of the cities as places for conducting various activities and concentrations of business activities: trade, catering, administration and today rarely industry;

• To harmonize the interests of the various stakeholders, such as business entities, citizens and administration, in order to solve the problems in the delivery of goods.

An increasing number of logistics provider requirements are emerging in the future.

The rapid development of technology in the last decade has led to a situation in which all logistics service providers must adapt their business to the market and invest in new ideas and technologies to keep pace with the times. With the introduction of new technologies, the users of the mentioned services can easily get all the desired information, which is an additional effort in exceeding the requirements of the users. With the increase in urban migration, by 4.25 billion people are expected to live in urban areas by 2025, an increase of about 50% compared to the number of people living in cities in 2010.

Freight transport is extremely important for the development of cities and their inhabitants. The growth and development of cities depends on an efficient and sustainable freight transport system to ensure their attractiveness, economic power and quality of life.

Logistic providers often operate in the vicinity of new cities and are exposed to a variety of challenges arising from future market developments, increasing environmental demand, new technologies and the evolution of complex supply chains. In the future, the expectation of increasing the importance of logistics costs and the quality of logistics performance increases. The challenges facing logistics providers come from the market with increasing e-commerce; growing assortment and complexity of goods and increasing customer demand. Urban movements and traffic jams and environmental requirements, local laws and regulations require the operator to make further adjustments.

The availability of informatics and new technology in logistics is leading service providers to modernize infrastructure and upgrade. This leads to increased logistics performance, such as shorter delivery times, greater service reliability, greater transparency and flexibility in delivery, but also causes a large financial investment and continuous customer demand for the highest quality service.

2.1 *Structure of the city logistics system*

The structure of the city logistics system is very complex and consists of several parts. The parts of the city logistics system are:

1) Logistics flow generators,

2) Logistics centers,

3) Commodity transport centers,

4) Storage systems,

5) Transport means (superstructure),

6) Transport infrastructure,

7) Information systems for logistics,

8) Operators and logistics service providers.

A logistics generator can describe an object in which an urban function is realized and which initiates logistics requirements for transport, storage, reloading, storage of goods and packaging. The generators are dispersed in various urban areas, which is an additional challenge for the organization of logistics. One of the largest generators of commodity flows in urban areas is the retail sector. The positioning of retail outlets depends on the size of the city, so today shopping malls are trying to be located on the outskirts of the city or in some strategic positions. In this way, a positive effect is achieved on the routing of commodity flows outside the urban areas, but the need for travel of the end user's increases. The positioning of retail outlets depends on the size of the city, so today shopping malls are trying to be located on the outskirts of the city or in some strategic positions. In this way, a positive effect is achieved on the routing of commodity flows outside the urban areas, but the need for travel of the end user's increases

Logistics and commodity transport centers should be based on three important elements:

• Territorial planning with infrastructure rationalization,

• Transportation quality,

• Development of inter modality.

A logistics center is a place where all activities related to transport, storage and distribution of goods are performed, which means that planning in the area and rationalization of the infrastructure is needed so that it can be optimally used for the purposes of environmental protection and removal of heavy transport from urban areas. The high standard of quality of transport services is certainly one of the most important elements in ensuring a high level of competitiveness, especially in the current era of increased globalization. Globalization, increasing freight traffic and increasing competition between all branches of production and trade affect the need for efficient transport and new logistics solutions. A logistics center can provide the best possible solution in terms of logistics, transport and warehousing activities. This includes controlling transportation costs and competitiveness of production. In terms of inter modality, logistics centers connect freight flows and are regulated by transport and logistics operators and their main goal is to provide efficiency and favorable services, as well as solutions that will connect the different types of transport: rail, road, sea. Transport infrastructure and superstructure significantly influence the organization of the city's logistics system. The types of vehicles, quality, efficiency, effectiveness and ways of application in different conditions contribute to an easier, economical and environmentally friendly way of planning the organization of urban logistics. Information logistics systems are inevitable today due to the large amount of data that needs to be processed in the shortest possible time and require high reliability of the data. The logistics information system should provide three basic elements: data entry, database and data.

Based on input data and well-organized databases, the logistics system must be able to issue:

Cost report and statistical data on the implementation of logistics processes;

• Cost report and statistical data on the implementation of logistics processes;

• Report on the status of procurement or orders;

• A report of changes that compare the desired performance to actual performance.

Operators and logistics service providers provide logistics services and participate in the analysis, implementation, maintenance, storage, distribution, marketing, control, insurance, management (management or management) and other services related to the logistics sector.

2.2 *Logistic outsourcing*

The characteristic of urban logistics from the 1980s is an increase in the rate of logistics outsourcing. Based on the parameters of cost and quality of service, companies decide whether to produce and sell, use logistics services or hire a particular service provider that will do the same for them. If the company with the analysis determines that it is cheaper to conduct the logistics itself, then based on the quality analysis should decide to do the same in its own engagement. This concept is called logistic incorporation. If a company considers it more profitable for the whole business to hire a third party to handle logistics services for it, then logistics outsourcing is the right choice. Logistic outsourcing can be defined as the process of purchasing services from specialized companies that provide logistics services or logistics operators. In urban logistics, various operators and logistics providers appear in the processes of organizing and conducting logistics activities. Smaller companies typically provide logistics services to their own organization that includes the process of ordering, purchasing goods, packaging, transporting their own vehicles, storing and managing inventories. Large companies with their own supply chain, such as manufacturers, wholesalers and retailers, also belong to the group of organizers and logistics providers for their own purposes. The advantages of own realization of logistics activities are: better control over sales, time and cost of performing logistics activities and easier and more efficient harmonization with other activities such as marketing. In the case of small quantities of goods, the efficiency of one's own logistics organization is debatable, especially in the field of transport and consolidation. Observing it over a long period of time, the decline in its own organization of logistics processes is evident due to the increased demand for goods and the demand for quality of service. For this reason, the company decides to leave the organization of part or full logistics of logistics companies operators. In addition to transportation services, logistics operators take over the organization of storage, sorting, parking, ordering and other related activities. In this case, companies can choose a variant of a logistics operator that will perform a certain logistics activity, which is the most common transport (2PL - Second Degree Logistics) or decide to cooperate with a logistics company that will provide more logistics services (3PL - Third Degree). Logistics).

2.3 *The impact of urban logistics on the environment and quality of life*

The dominant participation and the constant increase of the road traffic due to the realization of the flow of goods negatively affect the sustainability. The impacts relate to various aspects of city life, the most important of which are:

- Environmental impact (emissions, consumption of non-renewable energy sources, waste generation and destruction of the ecosystem);
- Impact on society (harmful effects on health, traffic accidents, noise, reduced quality of life);
- Impact on the economy (decrease in reliability and accessibility, increase in prices).

Traffic losses and traffic jams increase travel time. For this reason, the placement of the product on the market is delayed or delayed, resulting in an increase in logistics costs. Traffic conditions on certain roads are often the reason for using alternative routes that can be longer by reducing traffic safety, which directly increases logistics costs and risks. As a result, additional costs are transferred along the supply chain to the end user or buyer. Because residents are the main generators of items and transportation flows and often do not take into account the disturbances arising from market demands, an effective logistics strategy should be developed that is more resistant to external influences. Increasing the number of road vehicles reduces the level of safety leading to an increase in the number of traffic accidents. The growth trend of urban traffic leads to increased fuel consumption and thus pollution of the environment in which residents live. Exhaust emissions and noise levels are also on the rise.

Configurations of EVs

Previously, the EV was mainly converted from the existing ICEV by replacing theICengineandfueltankwithanelectricmotordriveandbatterypackwhile retaining all the other components, as shown in Figure 1. Drawbacks such as its heavy weight, lower flexibility, and performance degradation have caused the use of this type of EV to fade out. In its place, the modern EV is purposely built, based on original body and frame designs. This satisfies the structure requirements unique to EVs and makes use of the greater flexibility of electric propulsion.

A modern electric drive train is conceptually illustrated in Figure 2. The drive train consists of three major subsystems: electric motor propulsion, energy source, and auxiliary. The electric propulsion subsystem is comprised of the vehicle controller, the power electronic converter, the electric motor, mechanical transmission, and driving wheels. The energy source subsystem involves the energy source, the energy management unit, and the energy refueling unit. The auxiliary subsystem consists of the power steering unit, the hotel climate control unit, and the auxiliary supply unit.

Based on the control inputs from the accelerator and brake pedals, the vehicle controller provides proper control signals to the electronic power

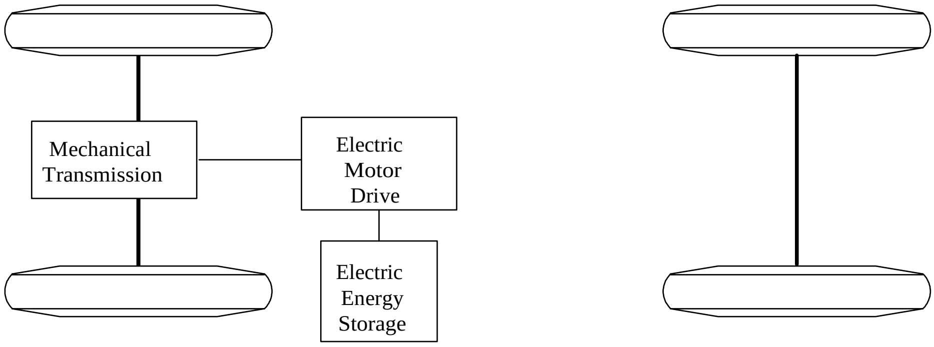

Figure 1. Primary EV power train.

converter, which functions to regulate the power flow between the electric motor and energy source. The backward power flow is due to the regenerative braking of the EV and this regenerated energy can be restored into the energy source, provided the energy source is receptive. Most EV batteries as well as ultra capacitors and flywheels readily possess the ability to accept regenerative energy. The energy management unit cooperates with the vehicle controller to control the regenerative braking and its energy recovery. It also works with the energy refueling unit to control the refueling unit and to monitor the usability of the energy source. The auxiliary power supply provides the necessary power with different voltage levels for all the EV auxiliaries, especially the hotel climate control and power steering units.

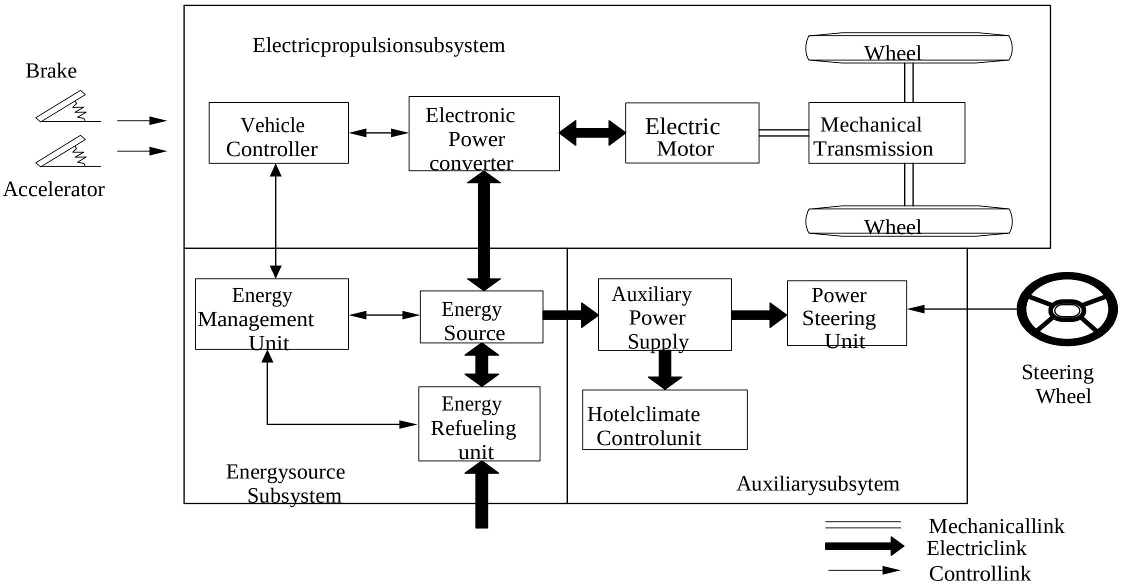

Figure 2. Conceptual illustration of a general EV configuration.

3 Circular elements in the organization of home research

Performance of EVs

A vehicle's driving performance is usually evaluated by its acceleration time, maximum speed, and grade ability. In EV drive train design, proper motor power rating and transmission parameters are the primary considerations to meet the performance specification. The design of all these parameters depends mostly on the speed–power (torque) characteristics of the traction motor.

When delivering, by consolidating a number of small shipments into a delivery vehicle, it is possible to achieve economy. Delivery costs are justified only if there is a high concentration of orders from consumers in the immediate vicinity or the value of the order is large enough. However, consolidating a large number of shipments also creates a problem for achieving the economy of delivery. When choosing a strategy, the following elements should be considered that affect the cost-effectiveness of domestic delivery:

- Size of the service area,
- Frequency of orders,
- Number of companies providing home delivery services,
- Internet launch,
- Average order size,
- Shipping costs,
- Population density,
- Average distance from the warehouse or point of sale to the buyer,
- Average distance between consumers,
- Delivery time,
- Loading and unloading time,
- Price per hour,
- The loading rate of the vehicle's cargo space,
- Capital investments.

Although each of the above elements can separately affect the positive or negative effect on the desired result, they can communicate with each other, which further complicate the planning and execution of delivery operations.

Traction Motor Characteristics

Variable-speed electric motor drives usually have the characteristics shown in Figure 3. At the low-speed region (less than the base speed as marked in Figure 3), the motor has a constant torque. In the high-speed region (higher than the base speed), the motor has a constant power. This characteristic is usually represented by a speed ratio x, defined as the ratio of its maximum speed to its base speed. In low-speed operation, voltage supply to the motor increases with the increase of speed through the electronic converter while the flux is kept constant. At the point of base speed, the voltage of the motor reaches the source voltage. After the base speed, the motor voltage is kept constant and the flux is weakened, dropping hyperbolically with increasing speed. Hence, its torque also drops hyperbolically with increasing speed.[2–4]

Figure 4 shows the torque–speed profiles of a 60-kW motor with different speed ratios x (x = 2, 4, and 6). It is clear that with a long constant power region, the maximum torque of the motor can be significantly increased, and hencevehicleaccelerationandgradeabilityperformancecanbeimprovedand the transmission can be simplified. However, each type of motor inherently has its limited maximum speed ratio. For example, a permanent magnet motor has a small x (<2) because of the difficulty of field weakening due to the presence of the permanent magnet. Switched reluctance motors may achieve x > 6 and induction motors about x = 4.[2,5]

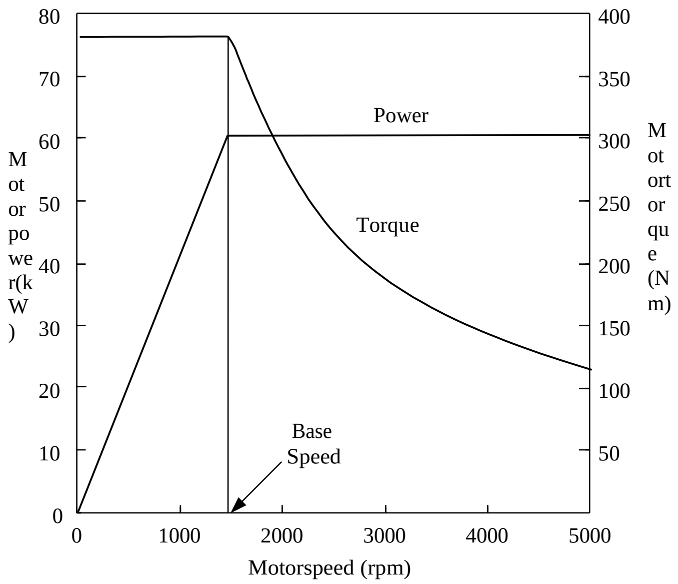

Figure 3. Typical variable-speed electric motor characteristics.

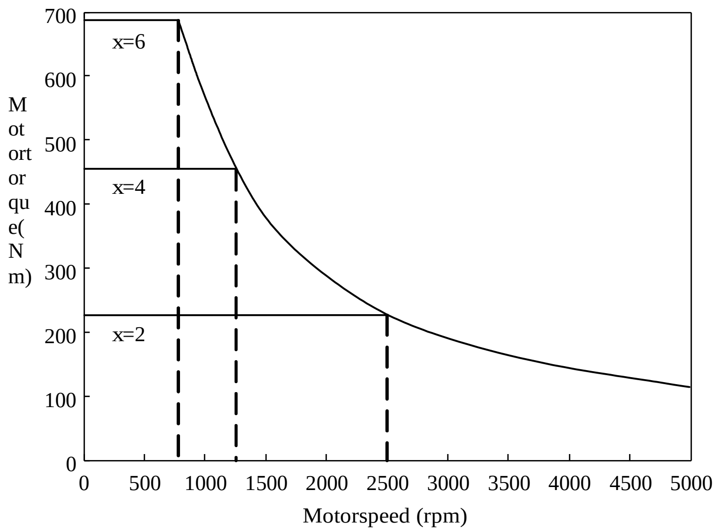

Figure 4. Speed–torque profile of a 60-kW electric motor with x = 2, 4, and 6.

4 Electrical vision for use

An electric vehicle (EV) is a vehicle that uses one or more electric motors for driving. The electric delivery vehicle is a vehicle that uses alternative energy sources to drive electric motors and propulsion engines, instead of conventional propulsion methods such as an internal combustion engine. Electricity is used as fuel for the supply of electric vehicles to batteries. Electric vehicles store electricity in an energy storage device, such as a battery. Electricity drives the vehicle's wheels via an electric motor. Electric vehicles have limited storage capacity, which must be supplemented by an electrical source.

4.1 *Types of electric vehicles*

Electric vehicles can be classified as hybrid electric vehicles (HEV), electric vehicles with batteries (BEV) and electric vehicles with fuel cells (FCEV).

The advantages of BEV and HEV vehicles are their ability to use an electric motor as an energy generator through regenerative braking, in the return of kinetic energy and through a non-freezer braking system. FCEV also provides regenerative braking in the case of using a battery with fuel cells. Considering only electric vehicles that can be charged and can be charged with a plug-in electric vehicle (PEV), the vehicles are divided into electric vehicles with batteries (BEV) and hybrid electric charging vehicles (Plug-in hybrid electric vehicle). - PHEV). Electric battery-powered (BEV) vehicles run on one or more electric motors and use power provided exclusively by the built-in battery for the drive. The battery is powered by the mains. Advantages include high energy efficiency and lower operating noise, while technical shortcomings are usually relatively low autonomy or the ability to the distance required to charge the battery due to the low energy density is exceeded. Engines for given vehicles can be created multiple times or increase the possibility of traveling over multiple times or get the opportunity to travel through which you will get the opportunity to produce internal combustion engines.BEV has far fewer moving parts than internal combustion engines and does not require regular oil changes. Regenerative braking allows less brake wear and reduces maintenance costs. Typical BEV load ranges range from 100 to 150 km on a single charge, but over time they decrease due to battery aging. Factors that can reduce the range of the vehicle are extreme temperatures, high-speed driving, high acceleration and transport in harsh conditions. Hybrid electric vehicles (HEVs) can be classified according to their drives (serial, parallel, complex), the degree of electric force and function of the electric motor (micro hybrid, light hybrid, full hybrid).In the standard configuration, the internal combustion engine is used only to drive the generator, while the electric motor with the driving component is connected to the shaft of the shaft. In parallel configuration, it is possible to connect the internal motor together combustion and electric motor on the shaft, and can be used separately or simultaneously. PHEV is basically a PEV with a larger battery that can be charged by plugging in the mains. The serial PHEV is often called an extended-range electric vehicle (EREV).

EREV usually works in such a way that the battery power of the drive is fully utilized before start an internal combustion engine used to start the generator. PHEV can be presented as a viable transitional technology, as it allows for short trips in electric mode, and alternative fuel for longer trips.

Electric Vehicles with Fuel Cells (FCEV) - Fuel Cells are defined as electro-chemical cells that can continuously convert the chemical energy of the fuel and the oxidant in electricity through a process involving a predominantly standard electrolytic system. In other words, a fuel cell is like a small factory that takes fuel and produces electricity and heat. Thermal cells are electrical generators while batteries are energy storage devices. Batteries can be used to store energy generated by regenerative braking and to assist the fuel cell during sudden load variations that the cell cannot handle. Hydrogen must be stored in a gaseous or liquid state and through physical or chemical adsorption. FCEV also achieves very quiet operation due to several moving parts. In any case, FCEV vehicles are more efficient than those that are powered by an internal combustion engine. The usability is about 50% compared to the share of hydrogen energy in electricity conversion. FCEV can be refueled in minutes, and to achieve a number of several hundred kilometers with a single tank of liquid hydrogen. Heat cells may also be an option for auxiliary units in conventional trucks. The price of FCEV is still the main market barrier for the above technology. Another important barrier to the durability of fuel cells, which at present is at best about 10,000 working hours.

4.2 *Comparative analysis of the model of electric vans*

Many European countries use different electric vans with batteries, and this section will show frequently used vehicles for the distribution of goods in urban areas and their important features. All data is taken from the official website of the manufacturer. All batteries are lithium-based unless otherwise specified. Some of the vehicles are still being tested, while some are already available on the market.

- MegaVan - a vehicle manufactured by the British company Mega has long been available on the market, the fully charged battery provides a range of 150 km, with a top speed of 60 km / h. Load capacity of 600 kg allows use for the purpose of delivery of goods. An ecofriendly vehicle that is cheap to maintain is most commonly used in the UK, but also in France, Belgium, the Netherlands and Germany.

- e-Wolf Omega 0.7 - a vehicle manufactured by the German manufacturer e-Wolf, which specializes in the production of electric vehicles. Omega 0.7 has a maximum payload of 620 kg, the engine is powered by a lithium ceramic battery, which provides a better safety standard and can be charged via a standard power outlet. The range of the vehicle is 150 km in economical driving mode up to 90 km / h, with a top speed of 110 km / h.
- Renault Kangoo Express Z.E. - Renault electric vans, available on the market since 2011. Extremely quiet operation of the vehicle, without the need to change the manual transmission, offers low operating costs and zero emissions. The load capacity of 650 kg, the rear double doors and the side sliding doors allow extremely fast and easy entry and unloading of the goods. The maximum range is 160 km and the maximum speed is 130 km / h.
- Volkswagen e-Co-Motion - an urban vehicle developed by the Volkswagen Group, equipped with one of three types of batteries. Depending on the user's needs, a basic module of 20 kWh to move from 100 km, 30 kWh allows 150 km, while the maximum range module provides40 kWh which allows a passage of 200 km. The capacity of the vehicle is 800 kg, and the maximum speed is 120 km / h.
- Mercedes Vito E-CELL - electric vehicle primarily intended for use in smaller cities. The maximum speed of the vehicle is 80 km / h, a load of 850 kg and a maximum range of130 km.

4.3 *Environmental and economic aspects of the use of electric vehicles in urban freight transport*

The use of electric vans in urban transport is directly related to the basic advantages of using an electric vehicle, which includes:

The possibility of producing and using energy from any source;

Reducing the emission of gases and solid particles into the atmosphere,

Noise reduction;

Greater energy efficiency compared to traditional vehicles;

Lower maintenance and usage costs;

Ensuring energy independence;

Low operating costs, depending on vehicle speed and price per 1 kWh;

The existing electrical infrastructure is the best developed part of the transport infrastructure.

It is important to note certain restrictions and obstacles that must be overcome in order to increase the interest in the use of electric vehicles. They can be divided into three basic groups:

1) Economic factors:
    - Cost of vehicle purchase;
    - Energy costs for battery charging;
    - Battery usage costs.
2) Concerns about safety arising from:
    - The fact that many road users do not listen to electric vehicles leads to collisions and accidents;
    - The risk of spontaneous combustion of batteries.
3) Operational obstacles:
    - It takes a long time to charge the battery;
    - . The fact that the full potential of the electric drive is not fully achieved.

Obstacles that limit the ability to use all types of electric vehicles are:
× Higher operating costs for the introduction of electric vehicles;
× Low battery capacity;
× Underdeveloped infrastructure (charging stations for electric vehicles);
Still low level of safety and a number of shortcomings in the operation of vehicles.
It is worth noting that the purchase of electric vehicles is currently mainly funded by the public. Private logistics providers will be reluctant to replace their permanent fleet with electric vehicles in case they notice the benefits for their company and in case the companies are in some way related to the protection of the environment. Many logistics service providers are forced to implement Administrative decisions banning entry to city centers for all vans and commercial vehicles that are not environmentally friendly or are on alternative drives. The key obstacles to efficient use of electric vans in urban freight traffic stem from four fundamental problems:

- High cost of vehicles and battery
- Long charging time;
- Reduced range of motion due to battery;
- Poorly developed battery charging infrastructure.

With mass production, the price of vehicles over a period of several years should be reduced. Further development of the infrastructure aims to reduce the time required to charge the vehicle.

High power battery production will be able to change. It is necessary to remove all obstacles to electric vans in order to become more used vehicles in urban delivery and distribution of goods.

5 Tractate Effort and Transmission Requirement

The tractate effort developed by a traction motor on driven wheels and the vehicle speed are expressed as

$$F_t = \frac{T_m i_g i_0 \eta_t}{r_d}$$

and

$$F_t = \frac{T_m i_g i_0 \eta_t}{r_d}$$

Where T_m and N_m are the motor torque output in N m and speed in rpm, respectively, $i_g$is the gear ratio of transmission, i_0 is the gear ratio of final drive, $\eta_t$is the efficiency of the whole driveline from the motor to the driven wheels, and $r_d$is the radius of the driven wheels.

6 Conclusion

The number of vehicles on the roads is increasing atmospheric pollution and thus reduces the quality of life of citizens. Urban logistics can be considered developed in only a few European countries, while some have not developed proposals or management systems at all. When we talk about urban logistics, the goals of urban logistics are to optimize the logistics system within the boundaries of a particular urban area while taking into account the interests. If the analytics company finds it cheaper to conduct the logistics itself, then based on quality analysis should decide to do the same in its own engagement. Achieving the goals associated with reducing global dependence on fossil fuels and developing an economy based on clean energy sources is a huge task that requires greater technological innovation. An electric vehicle is a vehicle that uses one or more electric motors for driving. The electric vehicle for delivery is a vehicle that uses alternative energy sources to drive electric motors and drive motors, instead of conventional propulsion methods such as an internal combustion engine. The electric current moves the wheels of the vehicle through the electric motor. Electric vehicles have limited storage capacity, which must be supplemented by an electrical source.

The advantages of electric vehicles are:

- Cheap to maintain - there are far fewer components than classic vehicles, do not use lubricating oils, the braking system has a longer service life, does not use straps, filters, catalysts and exhaust system, spark plugs, etc. The maintenance cost is about 10% of that of vehicles with an internal combustion engine, or according to the experience of some users of e-vehicles, the service is done at 100,000 km;
- Cheaper to drive - from 2.5 to 10 times depending on the type of vehicle with internal combustion compared;
- Reduce dependence on fossil fuels;
- No noise - these vehicles are totally quiet and do not generate noise,
- They are not direct environmental pollutants
- - these vehicles do not emit direct exhaust gases, and if they are powered by renewable sources also called green vehicles for energy, they do not use lubricating oils as in internal combustion vehicles, nor do they use antifreeze and other toxic lubricating fluids;
- Also called green vehicles for energy, they do not use lubricating oils as in internal combustion vehicles, nor do they use antifreeze and other toxic lubricating fluids wheels.

Conventional internal combustion vehicles convert about 17-21% of the energy contained in the fuel (diesel / gasoline) to the power in the wheels. Most of the energy of internal combustion engines goes into the heat of friction.;
Example: for a 100 km city ride, a Golf diesel consumes 3.8 liters, which would mean around 145 MJ (mega joules). Electric Golf in equal conditions uses 12.7 kWh or 45 MJ (mega joules).
The ratio is 1: 3 of energy efficiency in favor of e-vehicles. When the vehicle is parked on a traffic light, it simply does not consume energy (except for the basic one for the consumers involved: lamps, radio, air conditioning, etc.). Uses regenerative braking which through the braking system in the form of energy (up to 20%) returns to the battery system. From the analysis mentioned so far, it can be seen that electric vehicles are the new direction towards which the automotive industry should be more and more developed. Through better and more efficient energy sources for power supply, the consumption of fossil fuels will be reduced, and thus the exhaust gases that are harmful to the environment will be reduced. Electric and hybrid electric vehicles are not yet well-equipped.

Electric motors have a much simpler transmission than internal combustion engines. Much less moving parts, thereby reducing heat loss through heat.

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