DOI:https: //doi.org/10.32353/khrife.1.2019.031
UDC343.98: 629. 016

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ISSUES OF DETERMINING CHARACTERISTICS OF WHEELS WITH HYBRID ENGINES ACCORDING TO UKRAINIAN CLASSIFIER OF GOODS OF FOREIGN ECONOMIC ACTIVITY

This article discusses the problematic issues of the study of the characteristics of wheeled plug-in hybrid electric vehicles (PHEVs) in accordance with the requirements of the Ukrainian classification of goods of foreign economic activity. Existing types of hybrid power plants are considered. We consider the problems that are solved by experts in automotive industry in the study of wheeled vehicles with hybrid power plants. Problems of determining the type of hybrid power plant of a wheeled vehicle, the principle of its operation, and, consequently, the influence of this on the determination of the code according to the UKT ZED (Ukrainian Classification of Goods for Foreign Economic Activity) are considered. Currently, in expert practice, there is no single approach in carrying out research to determine which characteristics the wheeled vehicle meets according to the Ukrainian Classifier of Goods of Foreign Economic Activity. In this article the main types and types of hybrid power units, the principles of their operation and the effect on the definition of the code under the UKT ZED are given.

In relation to wheeled vehicles to one or another code under the UKT ZED it is necessary to determine the scheme of the operation of the hybrid power plant. In this case, hybrid power units operating on a parallel and serially parallel circuit should be classified in the code of code 8703 2 «Other vehicles with spark ignition internal combustion engine and crankshaft coupling» or 8703 3 «Other vehicles from an internal combustion engine with compression ignition (diesel or semi-diesel), and hybrid power plants that operate in a sequential scheme to the code number 8703 90 90 00 «other» as not falling under the requirements of the other the position of the booty on the principle of its work.

Keywords: Ukrainian classifier of goods of foreign economic activity, plug-in hybrid, wheeled vehicles, internal combustion engines (ICE) with spark-ignition engine (SI engine), slider-crank linkage.

Formulation of Research Problem. Nowadays, customs clearance of wheeled vehicles with hybrid engines often causes disputes between the State Fiscal Service of Ukraine and the owners of cars regarding customs clearance.

Analysis of recent researches and publications. To date, the problem of the relationship of wheeled vehicles with hybrid engines in accordance with the requirements of the Ukrainian Classifier of Foreign Economic Activity to one or another heading has not been considered.

Research Purpose. This article discusses the problem of determining the type of hybrid power unit of a wheeled vehicle, the principle of its operation, and, accordingly, the influence of this on the definition of the code according to UKT ZED.

Main content presentation. At present, there is no single approach in expert practice in conducting studies to determine what characteristics a wheeled vehicle meets according to the Ukrainian Classifier of Goods of Foreign Economic Activity.

This article describes the main types and types of hybrid power unit, how they work, and how this will affect the definition of the UKT ZED code.

Nowadays, quite often FSI (forensic science institutions) are approached by enterprises, organizations and natural persons with the request to determine what characteristics (including type) corresponds to vehicles according to the Ukrainian Classifier of Goods of Foreign Economic Activity, since there are disputes between declarants and customs authorities.

For example, cars with hybrid power units (motors) where the electric and internal combustion engines are located are classified by the customs authorities as ordinary vehicles equipped only with a spark ignition or pressure ignition product group 8703 21

– «other vehicles with spark ignition internal combustion engine and crank« or 8703 3 «other vehicles compression-ignition internal combustion engine (diesel or semi-diesel)»,

The difference between customs payments has a very significant difference, since the tax rates for vehicles equipped with spark ignition or compression-ignition internal combustion engines depend on the engine capacity and the life of the engine and is calculated by the following formula:

$$\text{Rate} = \text{Base Rate} \times \text{Kmotor} \times \text{Quick}^{1},$$

where Base Rate is the EURO tax rate per vehicle unit:
with spark ignition internal combustion engine and crank mechanism– 50, 0;

with compression-ignition internal combustion engine (diesel or semi-diesel): 75, 0;

Kmotor is coefficient determined by the division of the volume of cylinders of the internal combustion engine of the respective vehicle into the cube. cm per 1000 cubic meters. cm;

Quick is the coefficient equal to the number of full calendar years from the year following the year of manufacture of the respective vehicle to the year of determining the tax rate (for new vehicles and vehicles used up to one full calendar year, the coefficient is 1)[1].

At the same time, the tax rate for vehicles specified in exclusively electric motors (one or more) is set at 1 euro per 1 kW of electric vehicle battery capacity of such vehicles.

The tax rate for other vehicles listed in heading 8703 90 10 90, 8703 90 90 00 in accordance with UKT ZED is set at EUR 100 per item.

That is, if you calculate a tax rate, such as a hybrid car equipped with an electric motor and an internal combustion engine with a displacement of 1500 cc. with a shelf life of 6 years we have the following results:

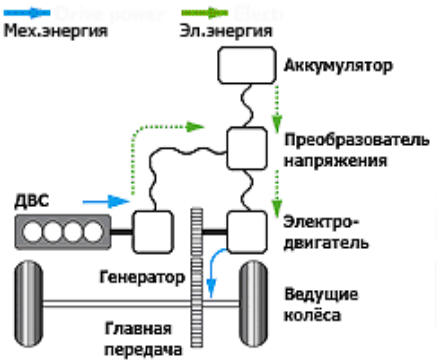
Classification of the car according to UKTZED 2	Tax amount, UAH.
8703229010: «8703 22 – equipped with a cylinder capacity exceeding 1 000 cm^3 but not exceeding 1500 cm^3: 8703 22 10 00 – – – new 8703 22 90 – – – Used: 8703 22 90 10 – – – – not more than 5 years old«	Rate = Base Rate x Kmotor x Quick. Rate = =50x1, 5x6=450, 00 EURO.
8703 90 90 00: «8703 90 10 00 – – vehicles equipped with electric motors 8703 90 90 00 – – others«	100 EUROs.

[1] Pro vnesennia zmin do Podatkovoho kodeksu Ukrainy [On Amendments to the Tax Code of Ukraine]: Zakon Ukrainy vid 8 lystopada 2018 r. № 2611–Viii. Vidomosti Verkhovnoi Rady Ukrainy. 2018. № 48. St. 379. URL : http://zakon.rada.gov.ua/laws/show/ (data zvernennia: 27.06.2019) [in Ukrainian].

As we can see the rate, the tax calculated for different product sub-categories differs 5 times.

To eliminate the differences in the approaches of classification of cars with hybrid powertrains it is necessary to dive into the specifics of the structure of the car and the principle of its operation.

According to the principle of the interaction of electric and fuel components of cars, hybrid drives are divided into three types: serial, parallel and serial-parallel.



1. *Sequential scheme.*

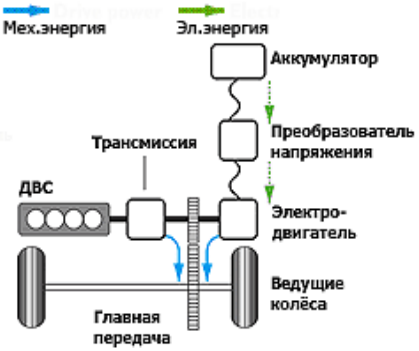
This is the simplest hybrid configuration. The internal combustion engine is used only for the drive of the generator, and the electricity produced by the latter charges the battery and feeds the motor, which rotates the drive wheels. e eliminates the need for a gearbox and clutch.

Recuperative braking is also used to charge the battery.

The circuit got its name because the power flow enters the drive wheels, undergoing a series of successive transformations.

From the mechanical energy produced by the internal combustion engine to the electric energy produced by the generator, and again into the mechanical one.

The sequential hybrid allows the use of low-power ICE, and it is constantly operating in the range of maximum efficiency, or it can be completely turned off.



When the engine is switched off, the electric motor and the battery are able to provide the necessary power for movement.

2. Parallel scheme.

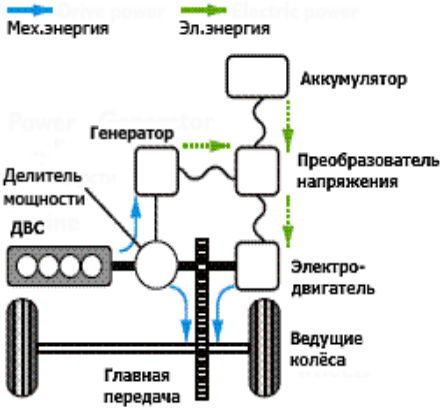
Here, the drive wheels are driven by both the engine and the motor (which must be reversible, that is, it can operate as a generator). For their coordinated parallel work computer control is used.

The torque from two sources is distributed depending on the driving conditions: in transient modes (start, acceleration), an electric motor is connected to the help of an internal combustion engine, and in steady-state modes and when braking it acts as a generator, charging the battery.

Thus, in parallel hybrids most of the time the engine is running, and the motor is used to assist it.

Therefore, parallel hybrids can use a smaller battery compared to the serial ones.

Because the ICE is directly connected to the wheels, the power loss is also much smaller than in the serial hybrid.



3. *Serial-parallel scheme.*

A separate generator and power divider (planetary mechanism) is added to the parallel hybrid scheme.

As a result, the hybrid acquires the features of a consistent hybrid: the car moves and moves at low speeds only on the electric train.

At high speeds and when moving at a constant speed ICE is connected.

At high loads (acceleration, uphill movement, and the like), the motor is additionally fueled by the battery – that is, the hybrid works in parallel.

Due to the availability of a separate generator that charges the battery, the motor is only used for wheel drive and for regenerative braking.

The planetary mechanism transmits some of the power of the ICE to the wheels and the other to the generator, which either feeds the motor or charges the battery.

The computer system constantly adjusts the power supply from both power sources for optimum operation in all traffic conditions.

In this type of hybrid, the motor runs most of the time, and the engine is only used in the most efficient modes.

Therefore, its power may be lower than in a parallel hybrid.

Conclusions. Thus, in the opinion of the authors, in relation to the CTE to a particular code according to the UKT ZED, it is necessary to determine the scheme of operation of the hybrid power plant.

In this case, the hybrid power units operating in parallel and sequentially-parallel scheme must be classified under heading 8703 2

– «other vehicles with spark ignition internal combustion engine and crank« or 8703 3

– «other vehicles compression-ignition internal combustion engine (diesel or semi-diesel)« and hybrid powerplants operating in series according to heading 8703 90 90 00

– «others«, as such that do not fall under the requirements of other heading under the principle of their work.

References

On amendments to the Tax Code of Ukraine: Law of Ukraine dated November 8, 2018, № 2611–VIII. *Information from the Verkhovna Rada.* 2018. № 48. Art. 379. URL: http://zakon.rada.gov.ua/laws/show/ [in Ukrainian].

*QD Professional Pro*gram. URL: http://www.qdpro.com.ua/uktzed [in Ukrainian].

Methodology of commodity examination and evaluation of wheeled vehicles, approved by the order of the Ministry of Justice of Ukraine and the State Property Fund of Ukraine dated November 24, 2003, № 142/5/2092, registered with the Ministry of Justice of Ukraine on November 24, 2003 under № 1074/8395 [in edition Order of the Ministry of Justice of Ukraine and the State Property Fund of Ukraine dated July 24, 2009 № 1335/5/1159 [in Ukrainian].

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ПИТАННЯ ВИЗНАЧЕННЯ ХАРАКТЕРИСТИК КОЛІСНИХ ТРАНСПОРТНИХ ЗАСОБІВ З ГІБРИДНИМИ ДВИГУНАМИ У ВІДПОВІДНОСТІ З УКРАЇНСЬКИМ КЛАСИФІКАТОРОМ ТОВАРІВ ЗОВНІШНЬОЕКОНОМІЧНОЇ ДІЯЛЬНОСТІ

Розглянуто проблемні питання щодо дослідження характеристик колісних транспортних засобів з гібридними двигунами відповідно до вимог Українського класифікатора товарів зовнішньоекономічної діяльності. Розглянуто існуючі типи гібридних силових установок. Вивчено завдання, що вирішуються експертами автотоварознавцями при дослідженні колісних транспортних засобів з гібридними двигунами.

Ключові слова: Український класифікатор товарів зовнішньоекономічної діяльності, гібридна силова установка, транспортні засоби, двигуни внутрішнього згоряння з іскровим запалюванням, кривошипно-шатунний механізм

Received by the Editorial Board: 12.06.2019