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Possibilities and Advantages of Hybridization of the Domestic Car "Sens"

Growing amount of cars in the cities has had a massive negative impact on the environment. So, the technologies of hybridization of budget front-wheel-drive cars with an internal-combustion engine have been of interest for the last few years.

It is known that the car is a massive and most widespread vehicle and, at the same time, one of the main sources of environmental pollution. Fuel cost represents a significant proportion of the total cost of the average family, which owns a car. The efficiency of businesses whose main area of activity is transport services is also significantly dependent on fuel costs. Thus, even a small reduction in fuel consumption by vehicles significantly improves the economic performance of enterprises and individual citizens.

Meanwhile, the conventional cars technology based on internal combustion engines is developed, in fact, completely. The modern internal combustion engine has a useful efficiency ratio of 25-35%, which is in the theoretical maximum zone. Further improvement cannot lead to a significant increase in the efficiency factor. At the same time, the use of an electric vehicle is economically unjustified. This is due to the lack of infrastructure for charging batteries, and, in fact, most batteries are of insufficient capacity [1].

Thus, the solution of economic and environmental issues in the field of motor transport requires a fundamentally new approach. Namely, the use of a combined power plant (hybrid drive) is one of the solutions to this problem [2]. First, the tendency to switch to a hybrid type of cars is due to the efforts of the leading countries of the world to reduce their own dependence on suppliers of petroleum products. Secondly, environmental aspects are becoming more and more critical with the increasing number of cars in the world.

However, while hybrid cars combine the benefits of cars with internal combustion engine and electric vehicles, they have a high cost.

We have developed a new hybridization technology for budget front-wheel drive cars with an internal combustion engine. At the initial stage of the study, we made changes to the design of the rear suspension of the car. Next, we investigated the dynamic processes taking place in the suspension of a hybrid car, and determined the rational parameters. It has been established that the optimal structure of a hybrid vehicle is a parallel configuration in which the vehicle is simultaneously driven by an internal combustion engine and an electric motor. From a technical point of view the most rational use of motor-wheels is with synchronous motors with permanent magnets. We conducted an experiment that consisted in measuring the amount of emissions of harmful substances into the atmosphere at different speeds of a hybridized car "Sens".

We assumed that a hybridized car pollutes the environment less than a car with an internal combustion engine. The experiment included the following steps. First we installed a gas analyzer in the car's interior and put a sampling tube of the exhaust pipe for the gas analyzer. Then we connected the gas analyzer to the power supply of the car. Then we connected the personal computer to the gas analyzer and turned it on. After that, we warmed up the gas analyzer and launched the software for the personal computer. We measured the amount of harmful substances released into the atmosphere when the hybrid car was moving at different speeds.

The experiment showed that the content of substances is not harmful to the environment, increases with the speed of the vehicle. While the amount of harmful substances decreases.

Also, studies have been carried out to determine the fuel consumption of the hybridized vehicle "Sens" at various speed modes.

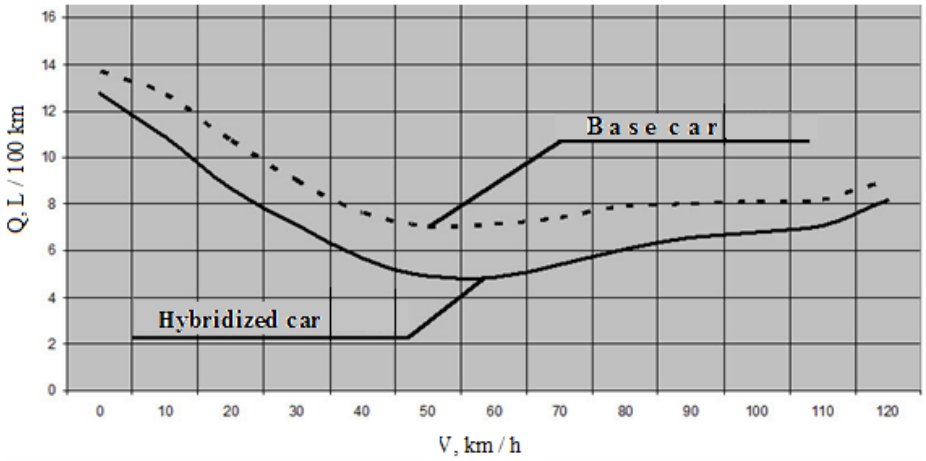

Fig. 1. Graph of the fuel consumption dependence by the hybridized car on the speed.

After processing the data obtained during the experiment on the measurement of fuel consumption at different speeds, the average fuel consumption was 7.3 L/100 km, which is 20.9% less than the fuel consumption of the base car (9.0 L/100 km). The fuel consumption graph is presented in Fig. 1.

The forms of the curve of the fuel consumption dependence graph on the hybridized and base car differ not significantly in qualitative terms. However, the quantitative difference reaches 27% at a speed of 55-60 km/h.

Thus, we received a full-drive, relatively inexpensive vehicle, which is less fuel consuming and not so damaging to the environment.

References

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2. Hasser H. (2014) Vehicle Dynamics Conversion into Power (Dynapower): AASRI Conference on Power end Energy Systems, pp 32-37.