ADVANTAGES AND DISADVANTAGES OF USING HYBRID VEHICLES

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Abstract. The article describes the advantages and disadvantages of using hybrid vehicles, and also highlights that urban vehicles that travel long distances during their lifetime (taxis are a typical example), vehicles that are less commonly used or mainly operate outside cities, of course, hybrid technology can be useful.

Keywords. Hybrid, internal combustion engine, electric, motor, transport, battery.

Introduction. Hybrid vehicles equipped with an internal combustion engine, one or more electric motors, and an electrochemical battery are already depicted on the road and dealing with the current state of the art. They are often asked whether they represent the future of motor vehicles. There is no doubt about this:[1]

-they require smaller batteries and (in some configurations) smaller electric motors than battery electric vehicles. The difficulties associated with large volumes of production and limited supply of battery materials (lead or lithium) and engine materials (neodymium) are not so severe;

- they are more energy-efficient than conventional internal combustion engines and battery electric vehicles;

- their waste is less harmful than conventional vehicles. Although they are more polluted at the point of use than electric vehicles, the comparison in terms of global pollution and greenhouse gas emissions depends on the mixture of the latter's main energy sources, the batteries of which are charged.

- they are free from the usual drawbacks of battery electric vehicles, such as a limited range, charging time, increased electricity consumption, and increased electricity carrying capacity.

On the other hand, they are much more complex than conventional and battery-powered electric vehicles, and the energy required to build them may at least be greater than that required for conventional vehicles.

Assessment of this issue is further complicated by the variety of hybrid vehicles currently produced and offered for the future: from virtually battery-powered electric vehicles to virtually conventional vehicles with onboard charging devices to improve braking energy recovery and acceleration. In this sense, racing cars with A can become hybrid vehicles with kinetic energy recovery storage (KERS), even though the term is usually limited to vehicles with a larger amount of stored energy[1,2].

Current and even more future improvements in the battery industry have responded to the objection that batteries do not have sufficient power density for applications of this type, or at least that they operate in insufficient condition and have shorter lifespan in hybrid vehicles. To avoid this problem, mainly related to lead-acid batteries, hybrid vehicles such as supercapacitors, crankshafts, or compressed air storage were previously proposed as simple hybrids (e.g., with an internal combustion engine and a crankshaft) or tertiary hybrids (with an internal combustion engine, batteries, and a crankshaft). The latter solution seemed acceptable, since both energy storage devices work under acceptable conditions, but their complexity is greater, possibly impractical.

Most of these problems were solved with advanced batteries, and lithium batteries optimally lend for use in hybrid vehicles, although there are some safety issues[3,4].

The efficiency of the internal combustion engine is of great importance, and thereby a clear improvement is obtained with the help of a small diesel engine instead of a spark-ignition engine. Attempts were made to use small gas turbines on the basis of high efficiency. Specially developed engine-generator units are being studied for a serial hybrid, in which the equipment does not have mechanical energy output. The configurations can be used for direct control of linear generators without converting the reciprocating of pistons into rotational motion[4].

In conclusion, while it is clear that hybrid vehicles are the best solution for many applications, for example, vehicles that are mainly used in urban conditions and travel long distances during their lifetime (taxis are a typical example), vehicles that are less used or operate mainly outside cities, hybrid technology can certainly be useful. It can be assumed that improvements in battery, vehicle, and power converter technologies will lead to an increase in the number of hybrid vehicles in the future, but a complete replacement of traditional vehicles may be considered unlikely.

References.

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