

From Internal Combustion Engine to Hybrid Propulsion

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Some of the challenges of our time in the area of mobility are fuel price, environmental pollution and cost of transportation in all forms of mobility. Thus, from the past decade, the society is experiencing a gradual shift from the conventional Internal Combustion Engines (ICE) to various forms of energy producing devices in response to these needs. The observed trend is a step towards what will be the widely accepted power systems of the future for mobility. After one hundred and thirty years, the impacts of ICE combustion on our lives, health and environment have been carefully evaluated. The decision to diversify to other forms of energy is based on modern economic factors; need to use renewable resources that are environmentally friendly and to meet the societal energy needs by using sustainable and renewable resources. Other approaches include the use of hybrid power systems.

Way back to 1875 when gasoline was first introduced into commerce, citizens of United States of America petitioned the U.S. Congress to set up a Horseless Carriage Commission to ban the use of gasoline in commerce because the new technology would impact their lives and make the use of horses and carriages obsolete [1]. That was then, now automobiles are household names, they are equipped with GPS, hand-free phones, a/c systems, DVDs, CD players and digital displays of weather information and road conditions. The early challenges for the automobiles were acceptability into commerce, technology, reliability and safety. Now, the challenges are cost, environment, national security, independence from imported oil and harnessing other sources of energy without compromising freedom of movement-the factor that all cherish.

The pathway to diversification hinges on the use of alternative fuels (alcohol fuels, biodiesels), fumigation, dual fuels and fuel cells, all in an attempt to reduce dependence on the barrel of crude oil. Another pathway is the use of hybrids. Hybrid electric vehicle (HEV) – is a vehicle that uses both an auxiliary electrical power source, such as, fuel cell or battery along with an internal combustion engine for propulsion [2]. Over the past 100 years, efforts have been made to improve the efficiency of ICE. Only in the past 25 years have significant improvements been made. Carburetors were reliable and lasted throughout the life of the engine but cylinder to cylinder distribution of air/fuel ratio was poor in multi-cylinder engines. Throttle body injectors did not last long before the adoption of port injection as the industry standard. This happened at a time when micro-computers (electronic control modules-ECU) were widely introduced into automobiles towards the late 1980s. With all these tweaking, the efficiency of ICE has not improved significantly. Hence, the focus is now on the development of HEVs and electric vehicles (EV).

One of the challenges of an HEV or EV is its limited energy storage device (battery). The key requirement for this new technology is high-power, high-energy and low-cost battery. Other challenges are: limited driving distance, a well trained technical staff to maintain the vehicle, non-availability of recharging infrastructure or receptacles at public and private parking lots, development of efficient electric motors, inverters, DC-DC converters for the transportation industry. The introduction of EVs came at a time when the conventional ICE is at the peak of its development. Internal combustion engine is a mature technology as against HEVs and EVs; hence, the choice is clear. Market penetration

of HEVs and EVs can be achieved though a broad range of government incentives to the first time users. Tax incentives up to 40 percent of the cost of the vehicle can attract a great segment of the population to acquire HEVs. Secondly, all teenagers who obtain for the first time driving permits should be mandated to use hybrids instead of getting clunkers that pollute the streets. The advantages are savings on gas as they do not travel beyond 65 kilometers round trip each day. To protect them from reckless road users, their cars should carry warning signs similar to that of a Learner Driver's vehicle. The idea is to keep reckless road users at bay and protect less experienced drivers or risk a huge fine. The rational here is to usher in a generation of HEV or EV users who ultimately will be the proponents of this technology.

In conclusion, the hurdle between the well matured internal combustion engine technology and hybrid electric vehicle and electric vehicles to take its rightful place as a successor is a high-energy, high-density storage system. Within the next decade, the research community and the manufacturers of optimized electrical devices will perfect this technology and ICE will gradually give way to hybrids. The Journal of Advances in Automobile Engineering published by OMICS Group has made it flexible to discuss broader topics regarding various issues in this field. These include new energy technologies and supporting infrastructure that will meet our future economic and environmental objectives at the same time chart the course of advancing future mobility.

References

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