

Silicon carbide technology preferred over traditional silicon technology

Improvement in power conversion by using silicon carbide will increase demand for the technology in developing countries, says Allied Market Research.

Silicon carbide (SiC) is used in a wide range of industries such as IT & telecoms, aerospace, defense, energy, power, and automotive applications, and the material's adoption in various industrial sectors has boosted growth in the silicon carbide market worldwide. The market is expected to grow through the period 2014–2022 due to various advantages of using SiC, such as low conductance loss at high temperature and low switching and input losses compared with traditional silicon power semiconductors. A market report published by Allied Market Research offers key insights of the silicon carbide (SiC) market, such as market share, size, and growth. Great demand is developing for advanced ICs operating at high temperature and voltage levels, and the ever growing electronic industry is a major driver of the market.

Silicon carbide used to develop new inverter

In 2010, the US Department of Energy set a target to manufacture efficient electric vehicle inverters. The organization urged manufacturers to produce inverters from 4.1kW/L to 13.4kW/L by 2020. In September 2016, a 12.1kW/L received a green signal from the Department of Energy. The inverter is a stepping stone towards the goal set by the organization and will help other manufacturers to manufacture efficient and reliable electric vehicle inverters. Silicon carbide was used to manufacture the electric inverter which has improved the performance significantly.

Iqbal Hussain, a professor at North Carolina State University (NCSU), throws light on the matter by revealing how wide-bandgap power switches offer higher-temperature, higher-voltage operation capability with minimum losses compared with the silicon-based power switches that are widely used today. In addition to the improved performance exhibited by the new inverter, the packaging of the inverter is simple, as it can be packaged in a smaller and lighter module. As a result, fuel efficiency will also show a significant improvement for a wide range of hybrid electric and all-electric vehicles (HEV/EV). The professor claims that, with more research, the

target set by the DoE can be reached through development at the component level.

SiC technology to be adopted in railways

There is great demand for power electronics components in modern trains. The components are required to be light to enhance the system energy efficiency in local transport means such as trams and trains. In long-distance and high-speed transportation, the need for powerful and reliable devices is on the rise as fuel efficiency is an important parameter that needs to be considered to safeguard resources and the environment.

Borderline BC is a new battery that has been developed by ABB by incorporating SiC technology for the first time. With the help of silicon carbide technology, satisfactory levels of power density and performance was achieved that is beyond the scope of regular silicon power semiconductors. SiC technology reduces the size, weight, and cooling requirements. It is also said to have helped to improve the system efficiency and all the crucial parameters considered by rail operators in modern times.

The president of ABB's Discrete Automation and Motion department revealed that the newly developed battery charger leverages the benefits of SiC and soft switching technologies. This opens the door to achieving improved performance levels for power electronics in railway applications. The technology will be implemented in Europe for the first time in high-speed trains operated by the Swiss Federal Railways.

Silicon carbide in solar efficiency

In modern times, the need to develop and manufacture products that are environmentally friendly and comply with environmental norms has been identified. The use of conventional energy resources is discouraged and non-conventional resources are gradually making their way into manufacturing processes and energy production.

In September, GE unveiled its new silicon carbide technology, which will enhance the efficiency of the North America region's solar energy production. The SiC technology introduced by GE can enable the

renewable energy industry to improve efficiency, along with reducing the cost of electricity. The SiC technology is the unique feature of the firm's new LV5+ Series Solar Inverter, which improves power conversion efficiency by up to 99%. By achieving higher power conversion efficiency, greater levels of energy can be produced from the same renewable resources over time.

Silicon carbide technology is gradually being adopted in different industries. Demand for traditional silicon power semiconductors is declining, as SiC technology is cost-effective and complies with environmental norms. The silicon carbide market is thriving in developed regions such as the USA and Europe owing to the

advances made in technology as well as research and development activities in the region. However, developing regions such as the Asia-Pacific are making widespread use of silicon carbon technology due to the growth in the electronic industry, power sector, and the automotive industry. The silicon carbide market has a few obstacles that need to be addressed, such as the high initial capital investment required for manufacturing facilities. However, the demand in China, Brazil, and India for photovoltaic cells that use SiC will also offer commendable opportunities for market growth in the aforementioned regions, concludes the report. ■

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