DC Current Applications

Emerging in an AC Environment as Renewable Energies Grow

White Paper

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DC Current Applications

Advocates of the two distribution options for electrical energy have been at odds since the late 19th century. Back then, Thomas Edison was in one corner, punching his way to win with the DC method. His company later became General Electric. In the opposite corner was Nikola Tesla and George Westinghouse of Westinghouse Electric, touting the AC message. While this "War of Currents", as it became to be known, eventually gave credence to the AC distribution method due to economics and other factors, nearly 150 years later the drum of the DC band is making a comeback.

Over the years, powerful transformers were invented, enabling high voltage AC power to be transmitted over long distances and then converted to low voltage at its destination. Low voltage electricity does not flow efficiently through power lines, especially long distance lines.

Most of us don't realize that the majority of our energy-efficient equipment we use daily in our homes and businesses runs on direct current (DC). This includes computers, lighting, heating and cooling systems, to name a few. But, the power coming in to our buildings is alternating current (AC). The AC has to be converted to DC, this conversion results in lost energy.

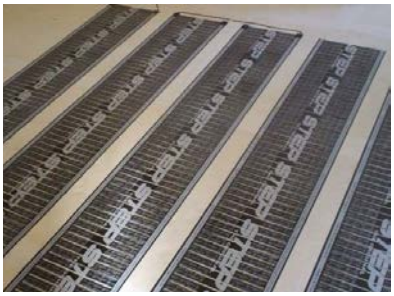
A solution to prevent this amount of lost energy is achieved by integrating dedicated DC systems in to the building. Dedicated systems eliminate the need for AC-to-DC conversion. There are many benefits as a result of this measure: financial and energy savings, as well as reduced carbon emissions.

AC-DC integration is expanding at a significant pace and is becoming an important aspect of generating useful data needed to improve the connectivity of building systems and the near-endless list components in the Internet of Things (IoT).

In a nutshell, IoT is a complex, fast growing array of devices connected by WiFi capabilities and sensors which can be managed by smartphones, and other methods, with on and off switches. Working through the Internet, IoT will affect nearly all aspects of our daily lives: from heating your home to automatically re-ordering inventories, to making your morning coffee. It is conservatively estimated that by 2020 there will be over 26 billion connected devices, managing even "smart cities" and their energy consumption, waste management and infrastructure to name a few key concerns. And with this, comes concerns over data sharing, privacy and security. The recent Solar Power International (SPI) in Las Vegas, sponsored by the Solar Energy Industries Association (SEIA) and the Smart Electric Power Alliance (SEPA), was the largest gathering of solar installers, manufacturers, and energy storage professionals. This event focused solely on creating an environment that fosters the exchange of ideas, knowledge and expertise for furthering solar energy development in the United States.

Among the topics were energy management systems to control an entire smart building with fully-functioning DC microgrid ecosystems. This could be used for something as small as an office or as large as an entire building or multiple buildings. The DC microgrid can be configured to manage DC for specific use or connect several buildings to onsite DC power generation, battery storage and other measures.

While the AC power grid will grow and be around for decades due to immediate needs and future planning, the DC presence will also grow and improve as entire buildings convert for better efficiency, as the EMerge Alliance states.



STEP Warmfloor's radiant heating systems are DC powered, providing energy-efficient, safe comfort for homes and businesses.

According to EMerge Alliance buildings will save seven to 28 percent overall by converting to DC microgrid.

The Department of Energy (DOE) released findings by a study of DC conversion. Among their findings were lower capital costs due to less components needed, better reliability due to the fewer parts used, better power quality and resilience when batteries are used, less chance of a crash and potential expansion of new capabilities because data and power can be integrated through Internet of Things (IoT).

STEP Warmfloor's radiant heating systems are DC powered, providing energy-efficient, safe comfort for homes and businesses. It is scientifically proven that STEP Warmfloor® is significantly more efficient than heating-cables and water tubing systems. The flat radiant heating element can be installed directly under the floor covering and holds self-regulating properties that enhances the efficiency even further. To get the same heat output, STEP Warmfloor® will require substantially less current. And as a result of a more efficient heat distribution, energy consumption will be reduced by 40-60% compared to other radiant heating options. To give the same heat output, electric cables require 2.5 times more energy while a water tubing system (hydronic) consumes 2.08 times more energy.

STEP Warmfloor® is a strong, thin, polymer mat, 3/64 inch (1.2 mm) thick. It comes in a roll, in different widths, and can be cut to the desired length and field-wired on site. Its low voltage system can be placed safely closer to the floor surface than any other heating system. With less mass to heat, the radiant heating system reacts fast to its regulated temperature. This eliminates the disadvantage of a large thermo-bed heating the house when the ambient temperature does not require additional heat.

STEP Warmfloor® radiant heating systems consists of low voltage heating elements that can be connected to an AC power supply or a DC controller. It can also be connected to solar and wind power. The radiant heating elements are 100% efficient. This means that all the energy used is converted to heat. When the heating elements are connected to the AC power supply which is 96% efficient, the remaining 4% still goes to heat in the building.

Heat is kept where it is needed – at the floor, keeping you more comfortable (even at a lower temperature setting) because when your feet are warm, you feel warmer.