

Thermoelectric

Thermoelectric (TE) effect is the direct conversion of a thermal gradient into electricity. It is based on the Seebeck effect associated with the generation of a voltage along a conductor when it is subjected to a temperature difference. Inversely, the Peltier effect is when a voltage is applied on it, it creates a temperature difference.



Key attributes & features

- Thermogenerator (TEG), device which convert heat directly into electrical energy, with typical efficiencies of around 5-10%
- Thermoelectric cooler (TEC) based on Peltier effect
Older Seebeck-based devices used bulky bimetallic junctions while more recent devices use Bi₂Te₃ semiconductor p-n junctions with thickness in millimeter range.



Applications

- TE thermometer, thermocouple, rapid response and safety compared to liquid-in-glass thermometer.
- TE power generator, for space exploration, use waste heat in combustion engines, powering microelectronic chip and wireless sensor module, smart clothing.
- Refrigeration, cooling electronic components (laser diode or infrared detector), portable refrigerator, air conditioning...



Customer benefits

- Thermoelectric generator modules can provide a powerful energy supply if a sufficient temperature differential is maintained onto the generator sides
- Direction of heating and cooling determined by sign of applied voltage, TE devices make very convenient temperature controllers.
- Thermoelectric generators provide advantages such as simplicity and ruggedness compared to thermo-mechanical conversion devices.
- A substantial positive environmental & economic impact: recycle waste heat from the exhausts of car engines, or for silent refrigerators with no compressor or harmful refrigerant.