Reaping the benefits of Energy Harvesting

By Greg Quirk

Energy harvesting is a rapidly growing industry. It is estimated that **energy harvesting** components will exceed $4 billion by 2020, which is significant considering that the market was $79.5 million in 2009 resulting in an average annual growth rate of over 73%. The current market leaders are Europe, North America, Japan and China.

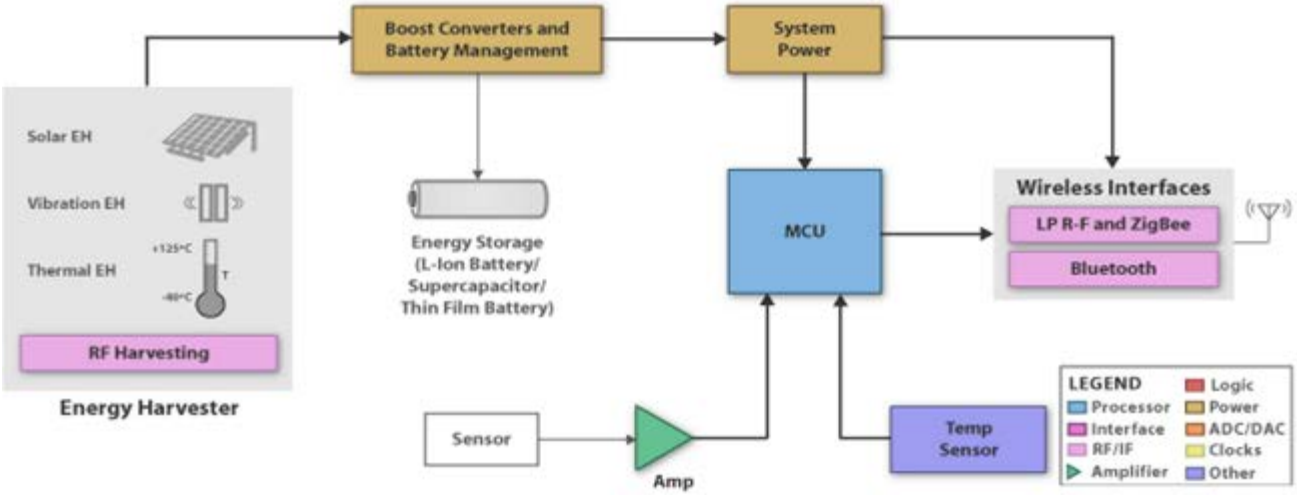
There are a number of reasons why companies are investing in energy harvesting. Some are looking to reduce the cost associated with powering systems. Depending on the life expectancy of the system an upfront cost to use energy harvesting could pay off in the long run, even if the energy generated is not substantial.

Alternative energy sources are a way to extend the life of an industrial system. Instead of having to access the system to change batteries or hardwire power, having a different type of energy source enables the application to be placed in otherwise inaccessible areas and operate longer without requiring maintenance.

One of the key applications for energy harvesting is wireless sensors. These are already deployed in many areas, specifically for smart meters, but the applications are growing as the technology develops and new ways to use the power are devised.

When power is created, using whichever method is chosen, it has to be stored. This is necessary because there is a fluctuation in how my power is generated. **Storage devices** include capacitors for low cost and spike power, supercapacitors for high energy output with a fast recharge time, and batteries for sustained power distribution. A battery like the **Cymbet Electronics EnerChip CBC 3150** can store power to be used as the system requires in a thin-film package. This thin film battery is rated at 50 uAh and features integrated battery management.

Example Energy Harvesting Application from T.I.



Photovoltaic (Solar) Panels

Photovoltaic, or **solar**, panels are one of the most common types of alternative energy sources. This

method of energy harvesting has been used in a number of applications, the most common and basic of which is the calculator. Photovoltaic panels are positioned to be in the sunlight which is converted into energy and stored in a battery.

The **Texas Instruments eZ430-RF2500-SHE** is a development tool that helps designers apply this type of technology to wireless networks. This kit is based on the ultra low power **MSP430 MCU** and includes a Cymbet solar panel that is optimized for operation from low intensity fluorescent lighting to power a wireless sensor application.

RF Energy

One alternative to photovoltaic panels is to convert **RF energy** into usable power. This is advantageous over solar power because it works in conditions where sunlight is not available. This type of technology has been used in the past for RFID systems, but it is also being explored for other applications. This is a unique way to generate energy as it is charged with RF energy allowing the system to be placed anywhere that a 2.4GHz signal can reach. And if you have a wireless network in your home you will realize that this means it can be placed nearly anywhere.

For companies looking to implement this type of technology there are development kits available, such as the **Powercast Lifetime Power Energy Harvesting Development Kit**. Included with this kit are a RF receiver board powered by the Powercast P2110 Powerharvester receiver, a 915 MHz RF transmitter, and wireless sensor boards which operate without battery power. The energy collected by the kit is stored in a supercapacitor.

Thermoelectric Harvesting

A third way to generate power is by using **thermoelectric** energy, or heat. Power is generated when there is heat created. While the power generated is typically low, it can be useful to capture the wasted energy from other power methods.

The Micropelt **TE-Power PROBE** Thermoharvesting Power Source can create up to 4.5V given enough heat, which is sufficient to recharge capacitors or thin film batteries. With a temperature difference of 75 C, this kit can produce up to 10mW of energy, equivalent to 30 AA batteries.

Piezoelectric Power

The final method for generating microelectricty is through the change in a substance as pressure is exerted. For example, piezoelectric power can be created by putting a thin layer of material under a walkway which contracts and expands as people walk overtop it. One novel idea of piezoelectric power was to operate a remote control simply by pressing the buttons to generate the power necessary to send the IR signal.

Conclusion

While micro-energy harvesting may not generate a lot of power, what is created can be enough to offset, or even replace, the reliance on traditional power supplies. This is particularly true when the proper type of alternative energy is selected based on the environmental conditions to optimize generation. Please visit Mouser's Energy Harvesting Page and Product Knowledge Center for the latest in micro energy harvesting technologies and products.

Greg Quirk has been a technical writer since 2004 focusing on semiconductor components, consumer devices and business trends. He has written numerous articles for industry publications and presented at technical conferences. His expertise has been sought by the financial community on multiple occasions to predict design-wins in popular consumer products.