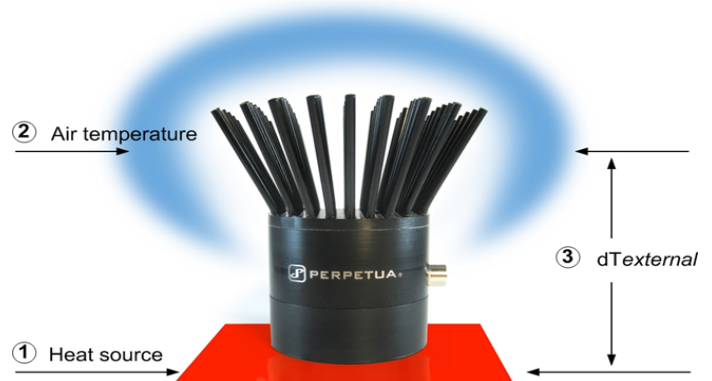




## Thermoelectric Energy Harvesting: How it Works

Thermoelectric energy harvesting is the process of creating energy from temperature differences, or what is commonly referred to as  $\Delta T$ . The technology has been utilized for over 50 years by organizations such as NASA, and does not utilize any moving parts or chemical reactions.

- 1 Energy harvesters are attached to warm-hot surfaces commonly found in industrial environments.
- 2 The air temperature (or ambient) creates a temperature gradient – or  $\Delta T$
- 3 The energy harvester produces usable power from the  $\Delta T$  that is delivered to the wireless device



Temperature deltas of  $30^{\circ}\text{C}$  -  $40^{\circ}\text{C}$  will power most industrial wireless sensors. An example of an ideal scenario for energy harvesting:

Sample Scenario	Celsius	Fahrenheit
Base (warm surface) Temp.	$52^{\circ}\text{C}$	$126^{\circ}\text{F}$
Ambient Temp.	$22^{\circ}\text{C}$	$72^{\circ}\text{F}$
dT (Temperature Delta)	$30^{\circ}\text{C}$	$54^{\circ}\text{F}$

Typical examples of heat sources in industrial environments that can be utilized for energy harvesting include pipes, machine casings, pumps, turbines, and boilers – anything that is consistently warm-hot and has a surface to attach to.