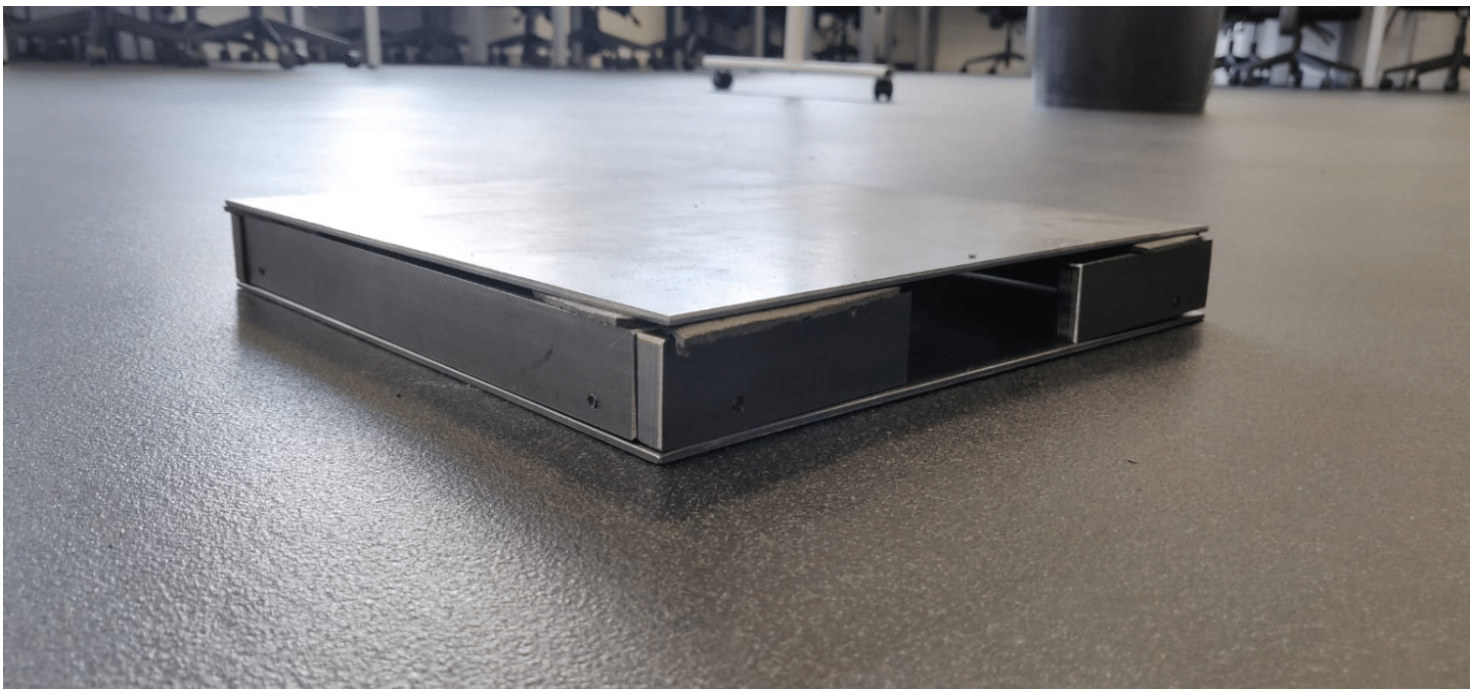

A rendering of the current design of the tiles | Photo source Humza Gillett-Waller / Dyson Award

PAVEMENT TILES GENERATE ELECTRICITY FROM PEDESTRIANS

AGRICULTURE & ENERGY

The tiles use piezoelectric materials to generate electrical power when a load is applied

Spotted: University of Bath graduate student, Humza Gillett-Waller, has developed a pavement tile that can harvest energy from footsteps. The design was inspired by a trip to the Leonardo Da Vinci museum in Florence, where Gillett-Waller saw a model showing a method of harnessing hydro energy for moving large objects.

The tiles use piezoelectric materials to generate electrical power when a load is applied. When a force is applied, for example, from a person walking across the tile, the electrons are displaced, which creates a potential difference (voltage). As the charges accumulate for each cell, a potential difference is produced across the whole material. The energy accumulates after every footfall. A full-wave rectifier is used to harvest energy on both the 'downstroke' and the 'upstroke' of the footfall.

This is not the first energy-harvesting pavement tile to be developed. Pavegen has created tiles that use electromagnetic induction and have an energy input based on linear motion. Gillett-Waller argues that, because piezoelectric materials rely on force rather than motion for energy input, the tiles are more stable to walk on. He also believes that piezoelectric tiles can generate a larger voltage for a given load, and are cheaper to manufacture.

For the prototype, Gillett-Waller tested the tiles under footfall of varying weights. From CAD drawings, he was able to successfully translate the load to the piezo and return the tile to its original position. He says: "In order to gain a better understanding of the mechanisms I 3D printed a scaled version. I tested these under the force of my hand to see if the tile returned to its original."

In addition to these tiles, the idea of harvesting energy generated through piezoelectric materials is gaining ground. At Springwise, we have covered a number of innovations in this area, including using piezo vibrations to remove microplastics from the wash and fabrics woven from piezoelectric yarn to create clothing that generates its own electricity.

Written By: Lisa Magloff

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Website: jamesdysonaward.org

Takeaway:

While this was just a concept, produced for a Dyson Award entry, it does demonstrate that there are several practical ways to generate energy from walking. Analysis of Gillett-Waller's design indicates that the economic break-even point for the tiles is 70 years, and the environmental break-even point (the time needed to generate more energy than it takes to produce the tiles) is five years. Both are too long to make the tiles of practical use. However, improvement to the energy harvesting technology could soon make this and similar designs much more effective.