

POWER TO THE PEOPLE

An experiment to design a door that generates electricity as people pass through produced unexpected results. **Stephen Cousins reports**

When door manufacturer Boon Edam was approached by a Dutch architect to design an entrance door at a refurbished railway station building that would use human propulsion to generate electricity, it wasn't sure where to start. Nobody had tried to develop such technology before and Boon Edam didn't know if it would work.

Installed at the entrance to a restaurant on the Driebergen-Zeist railway station's main concourse, the door was to be one of several technologies, including a wind turbine, solar panels and a ground source heat pump, specified by Netherlands-based architect RAU to make the refurbished restaurant and visitor centre building carbon neutral.

'The idea came about because we wanted to include human-generated power in the building. The fact that it's such a busy station and there's lots of foot traffic made a door particularly suitable,' says Dennis Schuivens, interior designer at RAU.

'Using human motion to generate power is not a new concept, but implementing it inside a door posed all sorts of problems,' adds Dirk

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Groot, door systems product manager for Boon Edam. 'But we were up for the challenge and determined to make it work. We had to ensure the door could produce enough electricity to power its own lights without over-reliance on mains electricity.'

A revolving door was considered the most

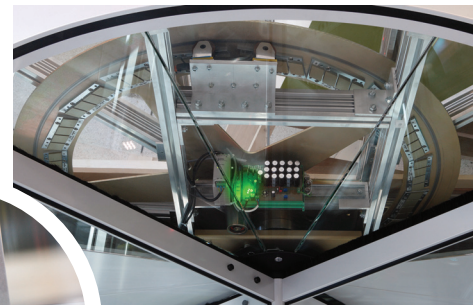


ENERGY EFFICIENT: Boon Edam's door at Driebergen-Zeist station (above) produces electricity using a fly-wheel and super capacitor in the canopy (right). An LED shows users how much power is generated (below)

logical way of harnessing human power to create energy, because the pressure applied is greater and is sustained for a few seconds. From an energy conservation perspective, revolving doors also dramatically cut thermal leakage compared to sliding or swing doors.

A box of tricks above the door, and visible through a panel of safety glass, converts the pushing power into electricity. When the door turns it rotates a fly-wheel with a gear ratio of 2:1 – every doorset rotation equals two revolutions of the fly-wheel. Several permanent magnets attached to the fly-wheel then pass a coil, which induces an electrical charge that's stored inside super capacitors. When sufficient charge is amassed the energy is used to power a 9W LED light inside the door. When the capacitors are empty, a control unit switches the power source back to the mains.

The amount of energy built up by the capacitors depends on the number of people passing through the door, plus the amount of force each one exerts when pushing it. Boon Edam estimates that around 100 people would pass through each hour at peak times and that each of these would generate between 10 and 15W per door revolution. 15W was the maximum because the pushing force required had to stay within a comfortable level of between 30 and 40 Newtons.



'This meant the door would generate an accumulated total of about 50-100kWh per year, which was quite a shock to us and way below what we had hoped for,' says Groot. 'When you compare that to the 4,600kWh per year of thermal energy saved by simply using a revolving door instead of a conventional door, it's not very significant.'

But RAU is happy with the results. 'One of our main objectives was to make people aware that by simply moving they can contribute to the energy consumed by a building, and this works great,' says Schuivens.

An LED display panel inside the door, which moves from red to orange to green, allows people passing through to see the amount of energy they generate, depending on the strength of their push. And the total energy accumulated by the door is displayed on a large screen inside the building.

Although Groot says Boon Edam has reached the boundaries of what a revolving door can achieve, he's hoping to fine tune its performance and promote the system to firms wanting to raise awareness of green issues. **cm**

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