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TALENT FROM THE HORN OF AFRICA

In this day and age, the acquisition of clean energy sources is a top priority for many civil and environmental engineers. Immense focus has been put on renewable energy because it is clean and an effective way to create electric power. Often, renewable energies are derived directly or indirectly from the sun. Rays can be captured using solar technologies or heat driven winds used to power turbines. Not all renewable energy sources rely on the sun. For instance, geothermal energies utilise the Earth's internal heat, tidal energy uses the gravitational pull of the moon and hydropower needs flowing water to keep going. Renewable energy methods account for 13.5% of the world's supply and 22% of global electricity so it is a highly significant topic. Recently, kinetic energy has been discussed widely - especially how it can be implemented successfully in future construction projects.

Kinetic energy is possessed by an object due to its motion or movement. The faster or heavier an object is, the bigger the kinetic energy - and vice versa. There's motion everywhere in our world, and a big question is what if we could harness it to generate clean electricity? There are companies actively exploring this and popular methods range from using energy created on pavements by pedestrians, to vehicles on the roadways. Unlike solar and wind energy, kinetic energy hasn't received the proper amount of attention or funding it should. However, that is hopefully set to change as companies like **Pavegen** and **Underground Power** continue exploring its potential. The everyday activities of humans (walking, running, cycling, driving) are now effective generators. Kinetic energy has the potential to have a substantial impact on the world's electricity supply which is exciting and also relevant at a time when global warming is an issue high on the agenda.

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Pavegen

Pavegen was founded in 2009 by Laurence Kemball Cook. The company has revolutionised harnessing energy from footsteps to create electricity. Their advanced floor-tiles also collect data around walking and traffic patterns. Each tile consists of a single triangular composite tile and an electro-magnetic generator. Power is generated when a foot compresses the slab by about 5mm (0.2 in) and on average 5 watts is produced each time. That's equivalent to around 20 seconds of light from an LED streetlamp so small – but useful if implemented on a large scale. Another essential use for this technology is its ability to track volume and direction of traffic flow, thus providing useful metrics in a range of situations. Pavegen's technology has already been implemented at 200 sites around the world. They include West Ham Underground station in London, Kia motor factories in Korea, soccer pitches in Nigeria and Rio de Janeiro and during the Paris Marathon energy was harvested from runners. The beauty of Pavegen tiles is that they can be placed literally anywhere there is foot traffic. Think retail destinations, airport terminals, sidewalks, and playing fields. For that reason, the company have a growing list of clients including Abu Dhabi International Airport, Google, Siemens and Transport for London. It's no wonder this technology has now attracted support from prestigious companies like Shell and Adidas.

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Menelik's thoughts on Pavegen

Some criticisms have been raised due to the fact energy produced by Pavegen tiles can be small. For the 2013 Paris Marathon, they laid down a 25m strip which ended up generating 4.7 kilowatt of energy - enough to keep an LED bulb burning for over a month, but nowhere near enough to power our homes. Granted, this technology will not outperform solar or wind power anytime soon - but it is unique, clean and can be useful in many different circumstances. This company are making changes and the technology is showing continuous improvements. Pavegen have what it takes to go the distance in providing eco-friendly energy.

UP (Underground Power)

Founded in 2011, the Italian start-up **Underground Power** is exploring innovative energy harvesting techniques and the potential of kinetic energy from roadways. In cooperation with the Polytechnic University of Milan, a technology called Lybra has been introduced. This technology operates on the principle that a braking car dissipates kinetic energy. It is able to collect and convert that energy into electricity before passing it on to the national grid. Lybra can also be described as a "Speed Absorber". It is installed at ground level and sheets are laid down in areas where vehicles are expected to reduce their speed for road safety reasons. The sheets themselves are 100mm in depth, 3000mm wide and 10000mm long.

"What we propose is an innovative and smart system to recover and absorb movement from cars by slowing them down, increasing road safety and producing green kinetic energy. Every car creates it anyway – so why put that to waste?!."

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Libra works when energy is collected from the floor surface and transferred to generators. Once set in motion, these generators turn kinetic and mechanical energy into electricity. A special conversion system also turns the impulse energy into continuous energy. The system is designed to slow down cars wherever the speed limit requires it. That is why Pirisi (CEO of Underground Power) plans on installing his invention near roundabouts, pedestrian crossings, motorway tollgates and exit ramps, and in shopping centre car parks. The company claim that one bump located in a zone with heavy traffic could produce as much as 100,000 kWh per year. That is the exact quantity of energy produced by 19 tons of oil. Another way to put in in perspective - in one year, an average family consumes approximately 2,700 kWh. Facts such as this have made Libra technology even more convincing for investors. Recently UniCredit Group invested 1 million Euros in Underground Power and has full support from the Italian Ministry of Environment. Last year they were ranked as one of the 10 best clean energy SMEs in the World. I hope we will see more and more of this technology on our roads.

Words – Menelik Eshetu, Civil and Environmental Engineering Graduate (AAiT)

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