Good vibrations

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(PhysOrg.com) -- Energy harvesting - using vibrations from the environment to produce electricity - has been around for over a decade, but Dr Stephen Burrow and his team in the Department of Aerospace Engineering at the University of Bristol, UK, hope that within five years it could be powering devices such as heart monitors and mobile phones. Currently the team is exploring how vibrations caused by machines such as helicopters and trains could be used to produce power, but vibrations from household appliances and the movement of the human body could also be harnessed for this purpose.

“Vibration energy-harvesting devices use a spring with a mass on the end,” explains Burrow. “The mass and spring exploit a phenomenon called resonance - the production of a large vibration in one object as a direct result of a relatively small vibration in another object - to amplify small vibrations, enabling useful energy to be extracted. Even just a few milliwatts can power small electronic devices like a heart rate monitor or an engine temperature sensor, but it can also be used to recharge power-hungry devices likeMP3 players or mobile phones.”

Existing devices can only exploit vibrations that have a narrow range of frequencies, so if the vibrations don’t occur at the right frequency, very little power can be produced. This is a big problem in applications like transport or human movement where the frequency of vibrations changes all the time.

The Bristol team is therefore developing a new device where the mass and spring resonate over a much wider range of frequencies. This would

enable a much wider range of vibrations to be exploited and so increase the overall contribution that energy harvesting could make to energy supplies. The team believes it can achieve this by exploiting the properties of non-linear springs which allow the energy harvester to respond to a wider range of vibration frequencies.

Energy harvesters generate low-level power on a similar scale to batteries but without the need for battery replacement or disposal of potentially dangerous and polluting chemicals. They are also suited to applications where hard-wiring would be impracticable, vulnerable to damage, or difficult to access for maintenance purposes.

“There’s a huge amount of free, clean energy out there in the form of vibrations that just can’t be tapped at the moment,” says Burrow. “Wider-frequency energy harvesters could make a valuable contribution to meeting our energy needs more efficiently and sustainably.”

Provided by University of Bristol

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