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UNITED KINGDOM

WAT the hell is this?

Warwick University spin-off company is working on "sound as you've never seen it". Simon Duff reports

Unusual and innovative loudspeaker design in the UK continues apace with a new ground-breaking technology that resembles tin foil and is less than 0.25mm thick. Developed by University of Warwick spin-off company Warwick Audio Technologies (WAT), the Flat, Flexible Loudspeaker (FFL) can be hung on a wall like a picture, concealed inside ceiling tiles, used in car interiors, or for announcements in public spaces. Lightweight and inexpensive to manufacture, the technical feature that makes FFL different from other designs lies in the fact that the speaker's entire

surface area radiates in phase. This in turn produces planar directional sound waves giving features such as high directivity and exact sound imaging. Steve Couchman, CEO of WAT, has over 30 years of experience in senior/MD positions in the manufacture and distribution of electronics. He believes that FFL could replace many of the speakers currently used in homes and in cars, as well as in public address systems used at passenger terminals and shopping centres. He says: "We believe this is a truly innovative technology. Its size and flexibility means it can be used in all sorts of areas where

space is at a premium. Audiovisual companies are investigating its use as point-of-sale posters for smart audio messaging. In addition, car manufacturers are particularly interested in it for its light weight and thinness, which means it can be incorporated into the headlining of cars, rather than lower down in the interior." Explaining how it works he continues: "The FFL speaker produces planar sound waves that project further and are evenly distributed to an audience; the sound levels do not fall away rapidly as you stand further from the speaker. Instead, the sound remains at a more uniform level throughout the audience. Therefore, the speakers are ideal for auditoriums, conference venues, public spaces and presentation rooms." In its basic form, the FFL sound panel consists of three or more layers of



WAT CEO Steve Couchman with the sound panel material

thin, laminated flexible material. A typical design consists of an insulating sheet sandwiched between two conducting layers. One of these is perforated, allowing air to pass through, while the remaining layers combine as the sound-producing diaphragm. When an amplified audio signal is applied to the metallic layers, electrostatic forces drive the membranes to vibrate, so producing sound. The diaphragm has very little mass, enabling rapid motion without inertia effects. This ensures reproduction of a wide frequency range but in keeping with conventional audio systems, a woofer is required for accurate low-frequency reproduction. Large sound panels give greater sound levels. The loudest point ahead of a directional panel appears on a line perpendicular to the centre of the panel. WAT says it has achieved SPL levels of 80-105dB, depending on the area of the laminate material selected. Speakers are offered in standard A5, A4 and A3 European paper sizes and can be customised to suit clients with specific unusual applications.

The FFL was first developed by Dr Duncan Billson and Professor David Hutchins from the University of Warwick's School of Engineering in the department's Ultra Sonics laboratory. Early trials were made using just two sheets of tinfoil and an insulating layer of baking paper to produce sound. Since then the design has significantly evolved to its present format and the technology is now ready for commercial exploitation. Warwick Audio Technologies has been assisted by Warwick Ventures, created in April 2000 to build on the research successes of the University of Warwick. It is responsible for ensuring that the intellectual property that is the result of the university's annual research spend – some £86 million – is properly protected and commercialised for the benefit of the academics, the university, the region and the nation. The company is currently in negotiations with a number of commercial partners and continues to welcome fresh approaches. It expects to launch its first commercial product later this year.

To support this, WAT has secured £560,000 of investment out of £800,000 that is required to kick-start an ambitious growth plan. Funding has come from a combination of venture capital and private equity. The company has filed two patents on what it calls 'FFL' technology and conducted an extensive patent clearance/infringement search report, in respect of the company's intellectual property in Europe and the US. The report concluded "that there would appear to be no patents which are valid and subsisting in the chosen territories which have the identical claims to that of the company's first and second patents". Couchman is both ambitious and determined. He concludes: "Our vision is to be the leading supplier of thin film sound panels in an overall loudspeaker market that analysts are predicting will grow to \$4.2 billion in 2010 (source: Electronics.a Oct 2007). To achieve this we will target specific sectors in this market, estimated to be worth \$1 billion, where the features of our product provide the most benefits, that is, the markets for audiovisual displays, public address systems, the next generation OLED (organic light-emitting diode) TVs and automotive. Our aim is to create a highly profitable £30 million turnover company within five years." www.warwickaudiotech.com

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Sounds good: The flat loudspeaker that is as thin as a sheet of foil

By DAILY MAIL REPORTER
Last updated at 10:48 AM on 01st April 2009

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A groundbreaking new loudspeaker that can be printed on and used as a wall poster has been developed by British engineers. The lightweight and flexible speakers are less than 0.25mm thick and could also be concealed in car interiors or ceiling tiles.



The speaker is so thin it resembles a sheet of tin foil

They were developed by the University of Warwick spin-out company, Warwick Audio Technologies, who plan to start selling them later this year.

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Steve Couchman, CEO of Warwick Audio Technologies said: "We believe this is a truly innovative technology. Its size and flexibility means it can be used in all sorts of areas where space is at a premium."

All speakers work by converting an electric signal into sound. Usually, the signal is used to generate a varying magnetic field, which in turn vibrates a mechanical cone to produce a sound.

The new 'Flat, Flexible Loudspeaker' uses a bendy laminate made up of thin, conducting and insulating materials, which when vibrated by an electrical signal produces a clearer, crisper noise.

The makers say the sound is projected further and doesn't deteriorate in quality or volume like conventional speakers. It can also be angled in a certain direction.

The FFL was first developed by Dr Duncan Billson and Professor David Hutchins, both from the University of Warwick, with early trials using just two sheets of tinfoil and an insulating layer of baking paper to produce sound.

They hope they will one day replace all traditional speakers used in our homes and cars.

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April 3, 2009, 7:48 PM

Flat, Thin, Loud

By STEPHEN WILLIAMS

You would think a flat-panel television would be a more arduous technological challenge that a flat loudspeaker — there's all that color, all those pixels, all those hues — but the thin speaker has been an elusive quest for acoustic engineers for decades.

Perhaps it will come to be, thanks to researchers at the little University of Warwick in the heart of England. Hang one of their Flat, Flexible Loudspeakers in the dining room, and prepare to wow friends and family. Stick one in the glove compartment of your Bentley, or in the bedroom ceiling.

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NBCi ROFL: Is that bee on crack? Oh, wait...it is.

Speakers that Bend, Stretch, and Fit in a Folder

Scientists in the flexible electronic industry have long promised us products like rubbery circuits that will make portable devices truly unbreakable. So when UK researchers announced they had developed flexible speakers, the latest flexible electronic product to hit headlines, we listened. The ultra thin speakers—appropriately named the Flat, Flexible Loudspeaker (FFL) (pictured left)—is only 0.25mm thick.

The speakers are made of a flexible laminate material that can bend like paper and stick to uneven surfaces—a huge upgrade from the current model made primarily of tin foil.

Warwick Audio Technologies, the company commercializing the speakers, claims the newly minted FFLs can produce sounds at 80-105 decibels. The flat design allows sound to travel through the material differently than it does typical boom boxes. When an electrical signal goes through the FFL, it shoves and sends a rush of air through the whole sound system. So in technical speak, when the air moves through the sheets in bulk mass, planar directional sound waves are created. The resulting sounds are "clearer, crisper, and easier to hear" than traditional speakers.

Unfortunately, we will have to wait a year to see if the speakers actually reach stores—or if they join the other flexible electronic technologies like flexible laptops that have yet to make it into the market. Ahem, E-paper, where are you?

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Thin speaker offers 'crisp sound'

Anyone who has struggled to understand speaker announcements at train stations will be heartened by work initially done at Warwick University in the UK.

Engineers claim their new ultra-thin speakers, as well as looking good and being easy to conceal, will also deliver clearer, crisper sound.

The loudspeakers could replace public address systems in passenger terminals and shopping centres.

They could also be used as speaking posters to deliver adverts.

The system, dubbed flat, flexible loudspeaker (FFL), started life as a piece of tin foil and some baking paper.

These materials were first used to produce sound by Warwick University professor Dr Duncan Billson.

It provided proof of concept and since then the system has developed into a complex set of flexible laminates made up of different conducting and insulating polymers.

Traditional speakers work by converting an electric signal into sound. What makes the FFL different from existing speakers is that when stimulated by an electrical signal it moves air as a bulk mass rather than from a point source.

This means sound is more evenly distributed around a room without the blasting effect of traditional systems.

Steve Couchman, the chief executive of Warwick Audio Technology, the spin-off firm created to sell the speakers, said: "We believe this is a truly innovative technology. Its size and flexibility means it can be used in all sorts of areas where space is at a premium."

The speakers could be concealed inside ceiling tiles in the home, printed with a design and hung on the wall like a picture or even wrapped around a lampshade.

He said the firm had had interest in the speakers from audio-visual companies for use in digital signage.

Car manufacturers are also interested in the speakers because they allow sound to be directed which means, for example, music could be heard in the back of the car but not the front.

But the design could make the speakers particularly useful for PA systems, said Mr Couchman.

"The sound produced by FFLs can be directed straight at its intended audience. The sound, volume and quality does not deteriorate as it does in conventional speakers which means that public announcements in passenger terminals could be clearer, crisper and easier to hear."

The firm hopes to launch its first commercial product later this year.

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Our public relations work with Warwick Audio Technologies began while the company was looking for fresh funding. A launch press release attracted worldwide media attention and generated dozens of enquiries from potential business partners. One year on, the company has attracted £1.5 million in investment and we're very glad to have contributed to that success.