

NUS engineers' new barrier to reduce noise

Customisable, modular system filters out low-frequency sounds from construction

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In the urban jungle that is Singapore, the roar of a jet plane and the rumble of construction machinery are constant reminders that the island never sleeps.

But engineers from the National University of Singapore (NUS) believe they can help.

They have designed unique noise-reduction barriers that reduce low-frequency sounds.

While there are commercially-available noise barriers, many are only effective in reducing high-frequency sounds such as traffic noise.

The low-frequency noise barriers are essentially panels with holes in them. Fitted into these air pockets are 6cm-wide blocks that "filter" out low-frequency noise.

The 3D-printed blocks are made of plastic and designed to target low-frequency sounds of 500Hz and lower. These sounds could come from construction machinery and aeroplanes, which are common sources of noise complaints.

Associate Professor Lee Heow

Pueh, from the Department of Mechanical Engineering at NUS, told *The Straits Times* that filtering out low-frequency noise could actually be good for one's health.

"Low-frequency noise is well known to cause negative health effects, like changes to blood pressure and breathing difficulties," said Prof Lee, who leads the project.

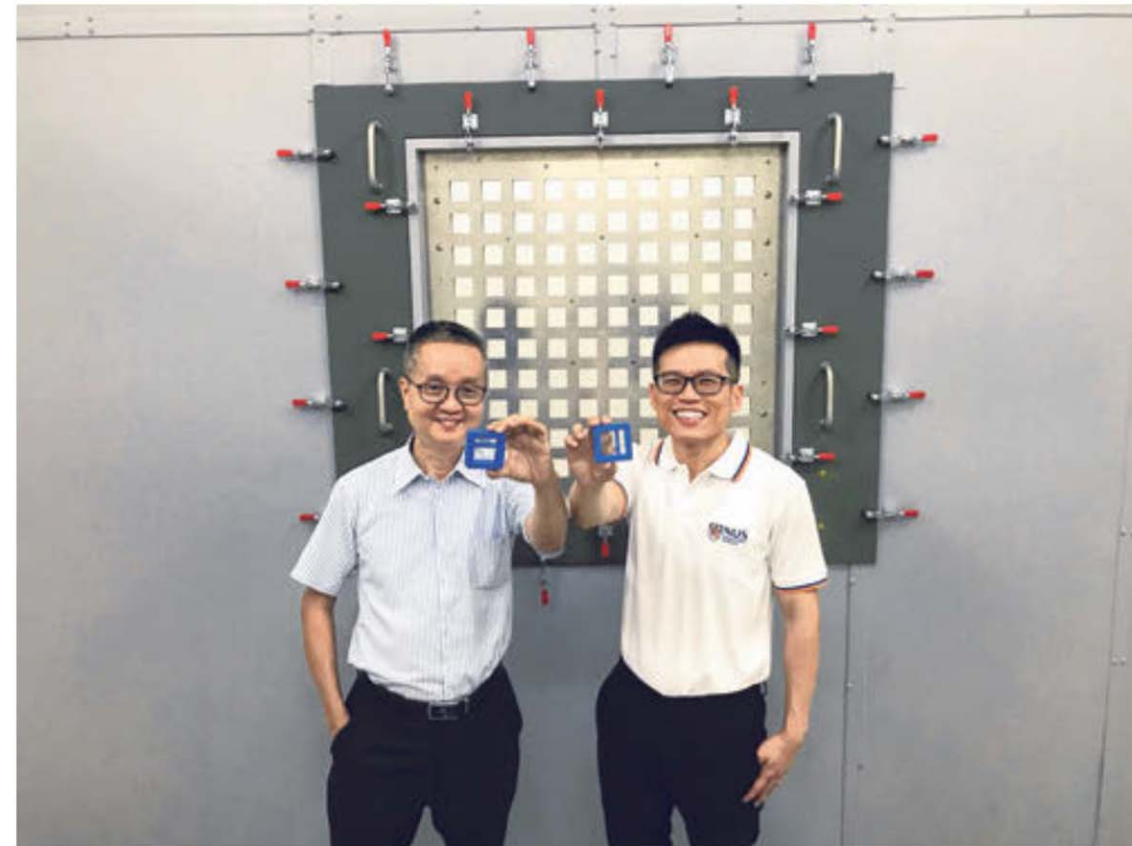
"Moreover, low-frequency noise transmits over long distances and causes disturbance to a wide area," he added.

Current technologies involve creating a barrier as thick as possible to shut the noise out.

But NUS' lighter and thinner barrier also does the job, while providing ventilation through the unplugged holes in its grid.

This is how it works: The vibrations caused by low-frequency sounds dissipate upon contacting the metal grid, which forms a resonating structure akin to a membrane. The sound energy is then reduced to barely audible internal reverberations.

This new technology might help



local residents annoyed by noise pollution in their neighbourhoods.

A 2017 study by NUS researchers found that the average outdoor sound level in Singapore throughout the day was 69.4 decibels, equivalent to the noise made by a

vacuum cleaner.

At the time, the readings exceeded the National Environment Agency's recommendation of no more than 67 decibels averaged over an hour.

Prof Lee said experiments con-

ducted over the course of two years showed that the barrier could cut low-frequency sounds by 10 decibels to 19 decibels, as compared with two common materials used for noise barriers at construction sites.

Associate Professor Lee Heow Pueh (far left) and doctoral student Ang Yinn Leng Linus with their 3D-printed noise reduction block designed to target low-frequency sounds of 500Hz and lower.

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"A 10 decibel reduction would mean that the loudness from the source of noise would be halved, which would be very significant for most people," he said.

This is six times more effective than other commonly used noise barriers.

Each noise reduction block can be customised to target a specific noise frequency, so that one host structure can block a full range of noise.

Prof Lee and his team are now in discussions with a local company to further develop and commercialise the noise reduction blocks.

They have also developed a noise tracking app, Noise Explorer, that will compile data on noise from all over Singapore, to help the authorities track and identify the source of noise disturbance.

"A modular noise barrier that can be customised, together with a handy and accurate noise meter, will enable the authorities and regulators to tailor their noise management strategies effectively to the nature of the noise transmitting in an area," said Prof Lee.

"In this way, the people living and working in the area could enjoy greater comfort," he added.

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