

New technology modifies music hall acoustics

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A new technology that relies on a system of inflatable sound absorbers may help make any performance hall instantly convertible into a venue for music ranging from classical to hard rock. The technology will be described at the 21st International Congress on Acoustics (ICA 2013), held June 2-7 in Montreal.

Getting the right vibe for listeners from a particular kind of [music](#) is an acoustic challenge. Music genres differ radically both in the [sound energy](#) they generate and in how that sound interacts with the ceiling and walls of a performance space.

A hall for [classical music](#) must bring forward the sound of the orchestra by itself, and this is generally accomplished by using only sparing amounts of sound absorptive materials to coat surfaces. This allows for a long reverberation time – the time it takes for the sound to die out.

While the long decay of a classical hall makes an orchestra sound rich and full, a rock band playing in the same space may sound undefined and distant because excellent-sounding rock and pop music depends on an amplification and loudspeaker system, which benefits from shorter reverberation times at [low frequencies](#) in the 63-250 Hertz (Hz) octave bands.

So how can concertgoers have their Bach and "Beat It" too?

Danish jazz and rock drummer, Niels W. Adelman-Larsen, set out to help concert halls accommodate acoustic variability over a range of musical styles while still a student of acoustics at the Technical University of Denmark in Kongens Lyngby. Over the past 10 years he developed a patented inflatable, adaptable absorption system that modifies the reverberation time of a room.

"A longer reverberation time in these bandwidths is needed in order to obtain warmth at classical

music concerts, which is a defining aesthetic trait of the classical genre," said Adelman-Larsen, who is CEO of Flex Acoustics. "This means a venue has to have the ability to accommodate variable acoustics that also varies the reverberation at low frequencies to provide the best results for multipurpose use."

Adelman-Larsen has accomplished this by designing airtight membranes made of fire retardant plastic foil that can be inflated and deflated with the switch of a single on/off button. When the membranes are inflated, the plastic foil vibrates due to the different sound levels on the inside and outside of the cavity. The vibrations lower the reverberation time of the room. When the switch is on the off position and the membranes are deflated, this absorption effect is avoided, allowing for the long reverberation times most suited to classical music. The whole system can be mounted flush to walls or above a [sound](#) transparent ceiling so it is not visibly intrusive.

Certified measurements of the reverberation time show the activated absorbers can lower the reverberation time of a hall by up to nearly 45 percent in the relevant octave bands for rock and pop music. Across the frequency bands from 63-1,000 hertz (Hz), the absorption coefficients are nearly constant.

"The system is an efficient way to optimize the acoustics of one space for multiple acoustic styles," Adelman-Larsen said.

More information: The presentation 2pAAa1, "Amplified music and measurement results regarding inflatable membrane absorber technology," is in the afternoon session of Tuesday, June 4. Abstract: asa.aip.org/web2/asa/abstracts...ch.jun13/asa535.html

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