



# Hidden treasures

Source-oriented sound and optimised room acoustics can offer venues options that are both innovative and subtle

**The main hall of the New Opera House in Oslo (above); the Folkteatern in Gothenburg (opposite, left); the new chorus hall at the Royal Opera House in Stockholm (opposite, right)**

**T**he science of designing room acoustics and sound systems for performing arts venues requires special attention to detail. Swedish acoustic consultant Artifon has made this its priority, having spent the past 10 years planning and designing source-oriented reinforcement (SOR) sound systems for three theatres across Scandinavia.

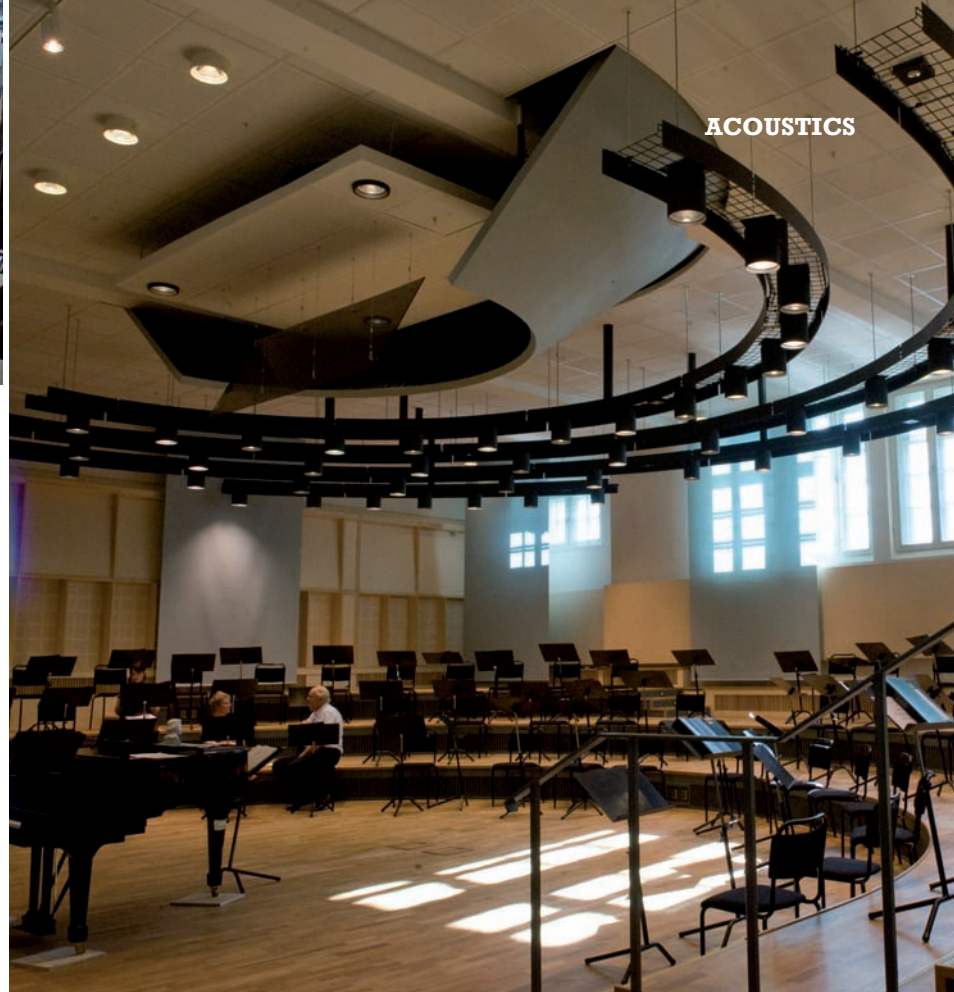
SOR technology makes it possible to reinforce sound while preserving the correct localisation. Effectively, this allows sounds from the actor on stage to be perceived as coming from the actor rather than the loudspeakers. For the opening performance at the Folkteatern in Gothenburg, Sweden in 2010, the SOR system ensured it was possible to localise the actors speaking despite the challenge of having the audience occupy either side of a 30m-long stage. Alf Berntson, chief consultant at Artifon,

says such technology provides a “giant leap” towards perfecting sound in theatres.

In 2002, Artifon was responsible for an SOR system for the Stadsteater in Gothenburg. The system featured a delay matrix that was dynamically controlled by the position of the actors on stage. More recently, systems with automatic control – using radio tracking of the actors’ positions – were designed for the New Opera House in Oslo and for the Folkteatern in Gothenburg.

In the Oslo Opera House, great effort was taken to make the loudspeakers invisible in order to enhance the illusion of natural sound. The main hall is fitted with 70 loudspeakers, but only one – the central cluster – is visible. Both sides of the stage opening are equipped with movable loudspeaker towers with sound-transparent cloth hiding the speakers. In the front edge of the stage, loudspeakers are hidden behind perforated steel, while fill and surround speakers are hidden in the balcony ceilings. “In musicals and in operettas where sound reinforcement is used, the illusion of totally natural sound is striking,” Berntson adds.

The new chorus rehearsal hall in the Royal Opera House in Stockholm has been designed to accommodate the acoustic needs of the singers. Features such as the conic reflector, the absorbing and diffusing walls, the seating layout and the motorised absorbing curtains are important design details for creating the optimum sound



ACOUSTICS

balance, as well as enabling adjustments in reverberation. Improvements to stage acoustics have also been made at the De Geer concert hall in Norrköping, as well as through a research project focusing on measures for reducing high sound levels in live rock clubs.

Many of Artifon's projects are focused on performer acoustics. As many of the company's employees have acting and performing experience, clients can be confident that these consultants understand the specific requirements of the performers on stage.

"The company is particularly proud of the Swedish Design Award and the Good Practice Award from the European Agency for Safety and Health at Work for our work with high levels at live music clubs," concludes Berntson. ■

[www.artifon.se](http://www.artifon.se)

# When Sound Becomes Art

"Artifon's contribution has been absolutely invaluable to the great results we see at the opera today."

NICOLAI NISHINO-EKEBERG, head of the sound and video department, Oslo Opera

"We are extremely pleased with Artifon's work. It has simply been brilliant!"

BERTIL KLEVNER, technical director, Folkteatern, Gothenburg

"Artifon has been able to put numbers on how we experience singing in the room. They have really contributed to that music and technology have been able to meet in this project."

CHRISTINA HÖRNELL, Chorus Master, Royal Opera, Stockholm



Consultants in acoustics,  
A/V-systems and Show Control  
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