

# "IMPOSSIBLE," THEY SAID

*Controlling reverberations without minimizing  
crowd response at Mariucci Arena*

By Rebecca Hansen



## **THE VENUE:**

The University of Minnesota's state-of-the-art hockey facility.

## **THE CHALLENGE:**

To design a sound system that would deliver great speech intelligibility without the use of acoustical treatment.

## **THE SOLUTION:**

Bose® Panaray® LT system designed using Auditorer® technology.

## **THE RESULT:**

"Goose bumps all around" on opening night and fans that were "absolutely mesmerized" by the sound system.

**W**hen Mariucci Arena was built in 1993, athletic department officials decided against acoustical treatment, but not for financial reasons. The state-of-the-art hockey facility for the University of Minnesota boasts a top-quality ice refrigeration system and plush locker rooms – no expense was spared. The decision to remove acoustical treatment from the construction

budget was for strategic reasons.

In Minnesota, where sports rule, there's a tradition at both the pro and college levels of loud fan participation. It's believed that loud arenas help produce a home ice advantage, something the University of Minnesota didn't want to give up. "The old arena was a converted field house, which was really loud," says Scott Ellison, Mariucci's Program Manager. "We wanted to bring the same level of crowd noise across the street to the new arena."

Sound consultants tried to convince the university athletic department to go with the acoustical treatment. "They gave us demonstrations of what treating the ceiling would do," recalls Ellison, "but it actually worked against their cause. The sound was better, but what really struck us was that the crowd response sounded so dull. We knew that once we put the treatment in, it would be nearly impossible to remove it if we didn't like the results. We decided against it."

At which point, the consultants as well as the university's internal A/V specialist agreed that there was no point in spending money on a good sound system that wouldn't be appreciated. The new \$20 million, 9,300-seat arena received repainted loudspeakers from the university's old football stadium.

The results were disastrous. After the first game, the university was criticized by the media for building a state-of-the-art facility in which you couldn't hear the game announcer. Only a small percentage of seats, those at focal points of the speakers, had barely intelligible sound. For the rest, as one patron described it, "the announcer might as well have been speaking another language." Fans couldn't understand why penalties had been called, and missed the announcer's background commentary about players.

"After the first season," says Ellison, "we resigned ourselves to giving up the home ice crowd advantage." The university quickly made available an emergency \$150,000 for the necessary acoustical treatment.

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Then Ellison talked to Bose. EMI, a Minneapolis Bose dealer, brought in Phil Nelson, a Bose sound design engineer. Nelson suggested that the money earmarked for acoustic treatment could possibly be better spent. "There were two problems with the acoustical treatment approach," says Nelson. "One, they would lose the loud crowd level; and two, once the treatment was installed, they'd be able to hear their old sound system. I told them they weren't going to like it."

Nelson said there might be a way to improve sound quality, and in particular speech intelligibility, while retaining the loud crowd levels. “We told them that we didn’t know for sure whether it could be done,” recalls Ken Jacob, chief engineer of the Bose® Acoustic Research Group, “but we would find out.”



Using the Bose Modeler® design software, Jacob, Nelson, and the rest of the design team worked out a careful solution for controlling the reflections of sound waves off of Mariucci’s walls and ceilings.

In large spaces such as arenas, sound waves travel long distances from their source (a loudspeaker or a shouting fan) until they bounce off obstructing surfaces, such as walls or the ceiling. In small rooms, like living rooms, reflected sound comes back so quickly that the ear doesn’t distinguish it from the original sound – in fact, reflection adds to audio quality by creating rounder, warmer sound. In an arena, however, the sound takes long enough to reflect back that it may be distinguishable as an echo. In addition, reverberations (sound waves continuing to bounce back and forth while only gradually deteriorating) can muddy other sounds.

The Bose solution used four carefully positioned clusters of Panaray® LT (for Long Throw) 4402™ and 502®B speakers. The Panaray LT speaker projects sound in very narrow beams onto the audience. Outside the perimeter of each beam, acoustic energy falls off very quickly. This increases the amount of

sound received directly by the listener’s ear and keeps sound waves from reflecting off walls and other surfaces. The unique Panaray speaker design also minimizes overlaps between sound signals from different speakers. Overlaps can create hot spots, where sound levels are painful, or dead spots, where you have to strain to hear.

But no technical description would have convinced Athletic Department officials. “All of the experts we talked to outside of Bose,” says Ellison, “said flat out, it couldn’t be done.”

As it turned out, Ellison didn’t have to go on trust. Bose offered to let him hear what the Bose

system would sound like before anything was installed. In a private Bose suite at the nearby International Association of Auditorium Managers’ (IAAM) annual conference, Ken Jacob gave Ellison the opportunity to be one of the first to experience the Bose Auditor® audio demonstrator, a technology that could precisely create the sound of the proposed system before installation in Mariucci. “It was amazing,” recalls Ellison, “to sit in this hotel room and hear my arena. I heard it empty, half full, and with a full house. They even showed me what it would sound like in a particular seat.”

In fact, the Bose team took Ellison on a complete tour of the arena, letting him hear sound in many different seats. “We were able to provide 75-80% of the seats with very high speech intelligibility,” says Nelson, “while significantly improving intelligibility in the remainder. And at a price of just over half of what they would have spent on acoustical treatment.”

Ellison could hardly believe his ears. He called his boss, Mark Deinhart, Senior Associate Director of Athletics, and asked him to come over and listen for himself. But

when Deinhart arrived, he heard even more: Bose told him that the installed system would sound as good as the simulation – and Bose would guarantee the sound. In fact, they could even leave the existing system in place and compare the two. If they weren’t completely satisfied, Bose would remove the new system at no cost to the university.

“With that kind of guarantee,” says Ellison, “there was absolutely no risk to the university. We were able to get the deal approved very quickly.”

The system was installed in less than six weeks. Working from midnight to 7 a.m., the EMI team managed to complete the installation on schedule without disrupting ongoing sports activities. The debut was a Friday night hockey game in early October 1994.

At the opening of the game, the singer walked to the microphone and began doing the national anthem a cappella. “It was goose bumps all around,” recalls Nelson, who was in the audience. “There wasn’t a peep from the crowd. Her voice just glistened. The fans were absolutely mesmerized.”

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The following Monday morning, the university A/V expert who had argued most strongly that Mariucci’s sound couldn’t be improved without acoustical treatment, walked into Ellison’s office and said, “I’ve got to hand it to you. You stuck your neck out and you were right. It worked.”

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