THE NUTS AND BOLTS OF AUDIOVISUAL SYSTEM DESIGN

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Audiovisual systems can make or break an attraction or park. Recently, we were called in to help on a project where the show concept, set design, themeing and props were all excellent but the audio couldn't be heard. Unfortunately, the best design intentions are subject to budget realities and the original audiovisual system was downgraded. The following questions and design considerations should be addressed for any audiovisual system design -- whether new construction or upgrade.

The key to success is flexibility. Both the audiovisual system designer and owner must understand the goals of the project, visually and emotionally, as well as the budget constraints.

The first step is to decide the purpose of the audiovisual system.

- Is it to entertain? Will it be a part of the pre-show entertainment, supplement the live entertainment, or be used as part of a show for effect(s) or for the headline entertainment?
- Is the music intended to be in the background or the foreground?
- Will the audio system be used to promote other attractions and activities within the park, or for local or park-wide announcements/pages?

At our office we consider an "audiovisual system" anything from a background music system in a washroom to a multi-media theatrical production. Apart from complexity, these systems all have sources, a control system, cabling, and loudspeakers or monitor system in common. One is just bigger. General issues we try to understand and address during design include:

- What are the park or facility's future plans and growth issues?
- Are regional gate revenues growing or just reapportioned each year?
- Is it important to hide or "theme" loudspeakers, transducers and other items? Or is there an aesthetic desire to have these technical systems "exposed".

Next we need to determine who will be using the system. Will the user be a trained operator running the show every hour or an untrained "assistant" making an occasional announcement? The user may be a long term employee or seasonal staff. The operator's other job responsibilities help determine how "complex" the system should be.

Equipment Location

Next, consider the location of the equipment. Should it be centrally located or distributed throughout the facility? Centralized control rooms works very well for troubleshooting and maintenance of the equipment. However, when you are distributing amplified signals, the line loss associated with copper cables may be an issue.

Multi-mode fiber optic cables allow for transmission of audio, video, and control signals to distant amplifier and video distribution rooms. Fiber provides a relatively inexpensive distribution system after the cost of buried conduit and copper cable is taken into account. Fiber is immune to noise and is cost competitive to the installation of copper cable for distances greater than 1000 feet, a distance which is shrinking every day.

With distributed equipment rooms, amplifiers and distribution equipment can be located close to the loudspeakers and monitors. This provides the optimum signal-to-noise/power efficiency transfer. Source and control equipment can be put in a centrally located space near administration or engineering. This scheme allows the control equipment, sources, and maintenance systems to be located in a central rack room and minimizes the duplication of expensive devices.

Sources

Another question to address is the type of source used. Popular choices include digital cart machines for announcements and cross selling; digital audio tape for background music; reel-to-reel with auto reverse, compact and laser discs, or a subscription service for continuous music.

These systems all have different features and benefits. Digital cart machines allow you to provide CD quality audio on a quick, random access basis. Digital audiotape provides high quality audio, however, there is no ability for random access and there is significant wear and tear on the tape and heads. Reel-to-reel tapes, while an older technology, are very viable for long term playback of short run, themed music for seasonal shows that change every year. Compact and laser discs provide random access of high quality sound and are effective for long term playback of the same audio signal week after week.

Control Systems

How will the system be controlled? A live operator in a central equipment control room or standing over the mixing board provides immediate and fast response and the "intelligence" necessary to respond to every condition. However, computer control is sometimes better able to provide your guests with a consistent, repetitive experience, week after week.

Ambient Volume Control

Often it is desirable to have background sound levels automatically "track" the loudness of crowd activity. This is helpful for adjusting the volume for pages, quickly raising or lowering the volume for a fast-acting stadium event, or gradually increasing the sound levels in a park or attraction as crowd activity increases. Ambient Volume Control technology allows background ambient effects to be quiet on slow mid-week days, yet provides enough amplification for loud, busy weekends. On a recent project, an ambient volume control system allowed patrons and staff to hear and understand, for the first time, pages and announcements on New Year's Eve.

System Evaluation

The final question is how do you know what you have? In any system some type of "commissioning" or final test and adjusting should be required. This is very important and helps assure that the owner gets what they paid for and the guest is enjoying the best possible experience.

It is important to realize that not all facilities have the same requirements. A "cookie cutter" approach does not work. Family entertainment centers do not have the same needs as theme parks. The quality of the audio and video system should match the rest of the budget.

What does the future hold? Digital audio and video! Computer controls! Digital is the word of the future! It allows any system to grow in a flexible manner. Digital is the basis of most 'home entertainment'. Virtual reality and multi-media have a strong hold in the leisure entertainment business and need to be appropriately supported in the pre-show cues and effects. Just remember, the best design may get cut due to budget constraints, but if the infrastructure is provided, then upgrades can be easy and inexpensive.

Steven J. Thorburn, P.E., is co-founder of Thorburn Associates (TA), a full service Acoustical Consulting and Audiovisual System Design Firm Providing a full range of services to Themeparks, Destination Resorts, Family Centers, Hotels, Casinos, Rides, Attractions, Auditoria, Theatres, Arcades, and Water Parks. Services include: room acoustics, sound isolation, mechanical noise and vibration control, audio, video and control system design, construction administration, and expert testimony.

At TA we do whatever is takes to help make your project a success. This includes keeping up-to-date on the latest technologies; developing in-house procedures to insure the quality of our work such as custom computer programs to improve efficiency and provide quality control for redundant calculations; and utilizing the latest automated equipment, such as AutoCADr.14 with relational database overlays to produce design documents. Our office is fully computer networked. Extensive laboratory and electronic text equipment allows us to efficiently document all aspects of acoustic and audiovisual system designs.

Our Audiovisual System Design packages are very complete and require minimal clarification during the construction phase. Standard details include equipment lists with catalog cut sheets, estimated installation budgets, front and rear rack elevations, schematic drawings, and cable run lines. This level of detail allows for true competitive bidding from installation contractors. Our principals take an active role throughout a project. This insures that you, our clients, are getting the level of quality you deserve and require. Our experience with the construction process provides the practical background experience necessary to make acoustical recommendations that are both innovative and effective.