THORBURN ASSOCIATES INC.
Acoustic and Technology Consultants
Newsletter

Summer 1999

The ICIA/AMX Design School is the industry's premier training program focused exclusively on the design of audio/video/presentations facilities and systems. We are pleased to announce that **Steve Thorburn** will once again be teaching the Onsite: Facilities Design Course September 19 –23, 1999 at the ICIA facility in Fairfax, VA. If you are interested in more information on this valuable education opportunity visit the ICIA web site at www.ICIA.org or contact us via email at DesignSchool@TA-Inc.com or 510-886-7826.

Display Technology – Part 1

Purchasing the right video/computer projector can be a challenge. First you see an ad in a magazine touting the benefits of a $6000 projector. Then you see a portable computer projector at the office supply store sitting next to a slide projector. Then you hear a colleague talking about digital versus analog and Plasma versus LCD.

What exactly are the differences in display technologies? What are digital mirrors? Should you even consider the old "3 tube" style ceiling projectors like the one installed in the training room? How bright of an image will you need? How does resolution affect image and cost? Does the type of information displayed (computer, video, or both) make a difference? How do you decide what technology will meet your needs?

The first step is to understand current terminology. In this issue we will address the difference between projectors and monitors. In the next issue we will look at features such as resolution, brightness and size.

Projectors are different from monitors. Both are display devices. However, projectors focus light from a bright lamp onto a surface to form an image. The image is then focused through a lens onto a screen. Monitors, on the other hand, do not use lamps or lenses. Instead you look directly into the display to see the image i.e., computer and television screens.

Monitors are direct view devices. Projectors can be either "direct view" or "reflected view". Direct view is the same as rear screen projection; you look directly at the source image. Reflected view is the same as front screen projection where you look at an image reflected off of the viewing surface. Direct view devices generally seem to the viewer to have better contrast and a brighter image. Reflective systems can be larger and are easier to install but have to contend with ambient room lights. If the system reflects light from a projector it also reflects light from any other light source in the room.

You also have to consider analog versus digital. Analog technology has been around for over 70 years and uses electronic scan lines to "write" information to the display. The most common of which is the Cathode Ray Tube (CRT). This is also referred to as the Raster method. Digital technology is relatively new and utilizes either small picture elements (pixels) which are turned on and off to create the image on the display or micro mirrors to direct the image either on or off the display.

CRTs can either be a single color (remember the old green CRT monitors?) or have three tubes. The three tube projector (sometimes referred to as a "barco" or "beamer") is an analog projection system. The three lenses concentrate and direct the image produced by the tubes inside the unit. The CRT then makes an image by scanning an electronic beam or line back and forth and up and down across the

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image tube. A CRT tube is the same type of system that makes the image on your television, but when used for projectors they are smaller, brighter, and are broken down into the primary lighting colors of Red, Green and Blue.

Advantages of CRT systems are that they can update the image quickly for fast moving video and that thin lines for computer aided design are more easily reproduced. This makes CRT great for applications that require very high resolution display or that need to display different types of sources (such as video, VGA, XGA, Mac, and workstation graphics) in rooms that have good light control and do not require a very bright image.

Digital projection systems are much brighter and easier to set up then CRT systems. The draw back is that they have a limited resolution and, in many cases, have problems displaying video. Digital displays make their image by turning on and off elements in the projection display. An easy way to understand this is to imagine a slide in a slide projector. Instead of a photographic image, a clear projection device opens and closes little "windows" on the surface of the slide. This allows light to shine through part of the slide part of the time and blocks it at other times. In principal, this is what Digital Projectors do. The biggest draw back is resolution. How close together are the "windows" on that slide? How big are the windows? How fast do they open and close? As technology improves, the area between "windows" is getting smaller and more "windows" can fit on the surface of the slide. This provides a higher resolution image. The speed at which the "windows" open and close also has a direct affect on the projector's ability to handle video images.

Another issue to consider is how well it handles color. In the analog projector, we said that there were three tubes that actively made up the image; red, green, and blue. In the digital projection system, we also use the same three colors, however a prism is used to split the colors up. So instead of having one slide projector with a single slide with lots of little windows, we have three slide projectors with identical slides with lots of little windows. One slide lets red light by, the next slide lets blue light by, and the last slide lets green light by. This projection process is really the CliffNotes™ version of a digital projector projection system. One example of digital projection is a Liquid Crystal Display (LCD). LCD systems are very useful for small portable projection systems. The draw back is that we can only shine so much light though the glass slide before the light creates heat damage. While the amount of light displayed is much greater than that of an analog CRT system it does not have the resolution or the quality needed for video.

Another example is Digital Light Processing (DLP) which uses a technology developed by Texas Instruments (TI), called Digital Micro-Mirror Devices or DMD. This system uses thousands and thousands of mirrors, with many mirrors for each of the pixels. Projectors with the DMD engine, as it is called, allow a person to sit closer to the image without seeing the artifices or the shadows caused by the window frames. Also, by using the tiny mirrors, the DMD engine can direct the light in a number of different directions. When a mirror is told to "activate", it reflects light out of the lens, when it is told to "go black" it reflects light away from the lens towards a heat sink, which is cooled by the projector's fan. The main advantage of this over other systems is that this "excess" light does not pass though the projection device. If light does not pass though, then heat build up is minimized.

A third option is Plasma Display Panels (PDP). The advantage of plasma displays are that they are only 4 to 8 inches thick. Also, advances in technology now allow for larger flat panel displays. There are two current drawbacks to large flat panel displays. The first is the price which is currently around $9000. Dollar for dollar flat panels are still more expensive than a monitor of the same size. The second drawback is the resolution. Just like its counterpart, the smaller flat panel computer display, plasma display devices use a pixel based grid system to display images. This technology works well for computer displays but does not work as well when used for video display because the resolution is currently limited to 852 pixels wide by 480 pixels high. Since this is the same number of pixels for most 15 inch monitors, but displayed on a 42 inch device, each "dot" is bigger and much more visible. If you are far enough

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away from the flat panel, you will not notice the display process. However, if you use the flat panel for a computer monitor (and sit relatively close) your monitor will only have 1/4 as may dots per-inch as does your typical .25 mm dot pitch monitor.

Now you know the differences between current projector and monitor technology. Be sure to stay tuned for our next issue Display Technology, The Continuing Saga!

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