Choosing video wall technology
For control room environments

Receive information, analyze and collaborate to maintain status quo or respond to emergent situations – this is the reality of control room environments. The challenge lies in effectively visualizing real-time intelligence for efficient monitoring, awareness and communication. Where and how information is displayed are critical questions in determining the best technology to support those who are managing and monitoring operational continuity, and responding to actual or impending breaches in protocol.

When you need to create a focal point of information for a control room team, particularly in a large format that allows operators to view multiple feeds of content clearly and simultaneously, video walls are the prevalent solution.

Two primary categories of solid-state technology used for control room video walls include: LCD panels, and LED tiles.

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While LCD panels and LED tiles are both excellent choices for use in video wall displays, determining which category is most appropriate for the application or user depends on the top priorities of the application. Some of the most common priorities for control room displays include:

› Viewing angle	› Viewing distance
› Brightness	› Footprint
› Brightness uniformity	› Initial cost and total cost of ownership
› Brightness and color balance	› Ease of deployment
› Contrast	› High availability
› Seamlessness	› Serviceability
› Image quality	› Security

We will discuss which technology is best for each attribute to help you choose the best option for your application.

› LED tile

› LCD panel

Viewing angle

Most video wall solutions are designed to maximize the view of information when the user is not directly in front of the display screen. However, as you move further off-angle from the display, brightness and color may be affected to varying degrees. It is important to verify the product performance specifications in advance to understand how viewing angles will impact a person's interaction with the content.

For LCD panels, visibility can vary based on the manufacturer. When referencing LED video walls, there are no hard and fast rules; nevertheless, there are recommended optimal viewing distances depending on the pixel pitch. Each solution can provide very good viewing characteristics, but this all depends on the design requirements set for the application. LCD technology has very good viewing angles as well but it is the brightness difference off-axis that makes LED superior to LCD. This can increase the image sweet spot.

Brightness

Brightness requirements for video wall applications vary depending on the actual application. Higher brightness may be necessary to improve overall contrast in environments where ambient light is very high – such as rooms with walls of windows. However, for many control room applications, too bright can be considered a downside if people are working in front of the video wall for a full working shift. If the wall is very bright, those people may suffer from headaches or eye strain over time. On the other hand, if the wall is not bright enough, contrast will likely be too low, making it difficult to quickly and accurately discern information as required.

For typical control room applications, a nominal brightness of 500 cd/m² is quite adequate and reasonable. Brighter displays can be advantageous for control room applications as well.

Selecting an LED or LCD display that has higher brightness (700 nits up to 1000) can be advantageous for control room applications. By starting with a higher brightness display, you can reduce brightness to a level that is acceptable to the ambient light environment and gain a number of benefits, including:

› Power efficiency - Running a 700 nit panel at 500 nits draws less power than a 500 nit panel at 500 nits

› Extended life - Reduced power lowers the thermal profile on the display and can extend the life of the LEDs or LED backlight, prevent failures, and reduce cooling requirements

› Improved black and low-level gray on the LCD panels

If you're looking for brightness and uniformity across a tiled array, LED tiles offer the best performance for these attributes. Another benefit of LED tiled video walls is their ability to display content clearly even in high ambient light environments. This is a consequence not only of the high-brightness typical of LED tiles but of high contrast ratios. The result is an outstanding perceived level of black that results in a high contrast image even in elevated levels of indoor ambient light.

Brightness uniformity

Brightness uniformity contributes to the seamless appearance of a video wall. The uniformity for LED displays is typically 97% or better depending on the manufacturer's specification for its LED chip. Current LCD video wall products continue to improve in brightness uniformity and typically achieve 85 to 90% of the ANSI standard. It is important that LED walls are calibrated accurately as this influences brightness uniformity. LEDs generally can have brightness variation of 20% or more. LCD panel uniformity is not measured right to the edge of the bezel on LCD panels, so it is recommended to test and view the solution in advance with content that is the same as or similar to what will be displayed to ensure that the uniformity meets expectations.

Brightness and color balance

When multiple displays are used together in a tiled display array or video wall, it is critical that brightness and color from display to display are well-matched and remain that way over time. Our eyes are very sensitive to even subtle differences in color across multiple displays; therefore, video wall display products include capabilities to finely adjust the color for best matching performance. However, over time, color or brightness may slightly change or drift, requiring readjustment.

Some LCD panels and LED displays offer automatic calibration features that ensure the closest color match and uniformity at installation and over time as the brightness changes with age.

LED video walls offer a large achievable color gamut, which is the range and purity of the colors a display can reproduce. The red, green and blue LEDs used in LED display walls all emit a much narrower range of wavelengths than a broad-spectrum, white-light source like a lamp. This produces more deeply saturated colors and increases the range of reproducible colors. Best-in-class LED video walls also offer image processing capabilities to maintain image quality even at low brightness.

Contrast

Higher contrast enables easier and faster recognition of the information displayed and reduces eye strain. For control room design, the overall system contrast ratio is critical. This takes into account ambient lighting within the room as well as the imaging within the video wall display.

Display products have their own inherent contrast ratio which is used to help determine the overall system contrast ratio. Contrast ratios are typically 1500:1 for LCD panels, however, LCD panels can achieve up to 500,000:1 contrast with a dynamic backlight. Typical contrast ratio for LED video walls is 5000:1. High-quality LEDs provide outstanding contrast through the use of black printed circuit boards and black solder mask to maximize contrast.

Seamlessness

Ideally, a video wall display should be completely seamless so that viewers do not notice a transition from one display screen unit to the next in a tiled array. In reality, this is not 100% achievable with emissive display products and technologies currently on the market.

LCD panels now minimize this transition by offering bezels of less than 1mm. For large video walls where operators and users are typically 3 meters (10 feet) away, the gap, in combination with the bezel, is considered negligible. LCD video walls have reached the state where rear projection displays left off in terms of bezel size. By nature, these near seamless LCD displays can be more fragile to handle. This can be overcome through installation by trained professionals.

By contrast, LED tiles achieve seamlessness and are designed to touch each other without increasing the distance between the pixels from one tile to the next. The area that surrounds LEDs in a typical tiled array makes it difficult to see where the tiles join from a normal viewing distance. Best-in-class LED solutions include direct-mount systems with advanced mechanical design integrating x, y and z-axis to fine-tune physical adjustment for near-perfect alignment. Advanced software capabilities including automatic seam correction further enhance the seamless image quality.

Image quality

When a video wall system is new, it can look brilliant, but will it maintain that same level of performance over time? If image-performance factors such as color uniformity, brightness uniformity and imaging quality are not the highest priorities for the application, then the use of LCD panels may be acceptable and the most cost-effective solution – especially if the application does not require 24/7 operation. However, if image quality is important at all times for 5+ years, LED displays might be the best choice. Best-in-class LED walls offer advanced capabilities that optimize the image, automatically maintaining uniformity of color and brightness over its lifetime.

Viewing distance

The optimal viewing distance is the point where the viewer can no longer distinguish individual pixels. Considerations for each product differ. For LED, the viewing distance is determined based on the pixel pitch selected. 'Optimal viewing distance' is calculated by multiplying the pixel pitch (mm) by 8. For a pitch of 1.25mm, the optimal viewing distance is 10 feet (1.25 x 8). Today's state-of-the-art tiled LCD solutions can achieve a pixel pitch as small as 0.37mm, making close-up viewing possible and viewing distance a non-issue.

Footprint and ease of deployment

If space is limited at the location of the video wall, then the physical depth of the solution may be a key deciding factor. Generally, most LCD panels and LED tiles are quite thin, often with a depth of less than 4" or 100mm and can be installed requiring only 4-8" of space front to back including the mount. If space is at a premium, these may be the best option.

As well, because of their minimal profile depth and smart design, LCD panels and LED tiles also offer ease of deployment. One intriguing possibility with LED tiles is the ability to mount them along a curve, or create any size or shape of display. Best-in-class LCD and LED walls are sold with direct mount systems allowing them to be installed on flat walls without third-party solutions, saving cost and reducing installation complexity.

Adhering to barrier-free guidelines

To ensure that your display complies with your country's guidelines for safer, accessible, barrier-free spaces and follows the principles of universal design, you will want to select a low-profile and narrow-depth display solution. In Canada and the United States, displays can extend no more than 4" or 100mm away from the wall to be considered barrier-free according to the Canadian Standards Association (CSA) and the Americans with Disabilities Act (ADA) respectively. LCD panels and LED tiles both fit well within spaces that have specific requirements to comply with these or similar guidelines.

Initial cost and total cost of ownership

A big benefit of LCD panels is their low initial price. For a given display surface area, LCD panels can be a fraction of the initial cost of an equivalent LED-based system.

Although operational lifetime is lower and there are other performance compromises, LCD panels could be the most appropriate solution for an application with a tight budget.

Power

Considering ongoing operational costs such as power consumption, HVAC and maintenance are also important in determining the right solution for your application.

All displays consume power and require cooling, but not all display technologies are the same in this regard. LED displays generally draw more power and require more HVAC than LCD displays. However, LED video walls consume energy more efficiently than most other display technologies. The difference in efficiency can be as high 400% or more, depending on which displays are being compared. Close analysis of your individual application will help identify the best option.

Lifetime

In a 24/7 or 20/7 control room you can expect LED tiles to have a useful life of approximately 11 years or more. The typical lifetime of an LCD wall is 5 to 7 years. These solutions are designed for high reliability, very low maintenance and minimal performance degradation over time. While LCD panels are more affordable than LED tiles, the trade-off is longevity, image quality, and other attributes.

Another strength of LED video walls is the long life of the LED pixels themselves. The useful lifetime of a display's light source is typically defined as the number of hours to reach half of the initial brightness. By this measure, LEDs typically last much longer. However, not all LEDs are created equally. High quality LEDs and components are critical to achieve maximum life. The buyer must beware of the significant range of product quality on the market.

High availability

Best-in-class LED and LCD video walls deliver high-reliability with high-quality components and system redundancy. While a customer may be able to reduce initial investment using suppliers with lower-quality components and limited service capabilities, such solutions can add risks. Services such as good customer support and warranties up to 5 years are good indications that the solution is high-quality and the company stands behind their products. System redundancy is also crucial to 24/7 availability. Best-in-class video walls with telecom-grade power supplies help ensure maximum uptime.

Serviceability

Best-in-class LCD and LED video walls enable full service from the front to reduce downtime, and don't require special mounts that add project cost and complexity. The best systems leverage remote video sources, controllers and power supplies to simplify maintenance and minimize disruption at the video wall.

Security

Protecting confidential or proprietary information is a key consideration of many control rooms, especially for military applications. Best-in-class LED and LCD video walls can deliver full solutions that use fiber-optic technology to ensure secure communications.
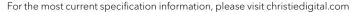
Conclusion

Based on the performance of each solution in relation to the most common control room priorities, you should now have a clearer understanding of which solution will work best for your control room. Once you narrow down which technology makes the most sense, we recommend doing in-depth research on the top brands for your solution of choice.

Connect with a consultant

If you have any questions or need some help in selecting brands to explore, contact us. We can connect you with a network of experts who are happy to help you work through the final steps of your procurement process.

Contact us

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